United States Department of Agriculture
Forest Service
September 2016

Upper Green River Area Rangeland Project

Draft Environmental Impact Statement

Pinedale Ranger District, Bridger-Teton National Forest, Sublette County, Wyoming
Portions of Townships 37 to 42 N and Ranges 108 to 111 W of the 6th principle meridian

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Reviewers Comments

It is important that reviewers provide their comments at such times and in such a way that they are useful to the Agency’s preparation of the EIS. Therefore, comments should be provided prior to the close of the comment period and should clearly articulate the reviewer’s concerns and contentions. The submission of timely and specific comments can affect a reviewer’s ability to participate in subsequent administrative review or judicial review.

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Upper Green River Area Rangeland Project
Draft Environmental Impact Statement
Sublette County, Wyoming

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Abstract: The Pinedale Ranger District of the Bridger-Teton National Forest proposes to authorize continued livestock grazing on the Badger Creek, Beaver-Twin, Noble Pastures, Roaring Fork, Wagon Creek, and the Upper Green River allotments using livestock management strategies designed to maintain or improve resource conditions. Four alternatives, one no livestock grazing and three cattle and horse grazing alternatives, were developed and analyzed to provide a choice in livestock management in the Upper Green River project area. The preferred alternative is Alternative 3 - Modified Grazing Management (Modified Proposed Action). Under Alternative 3, livestock grazing would continue to be authorized on all six allotments, using livestock management strategies designed to sustain resource conditions where desired conditions are being met and improve resource conditions where a gap between existing conditions and desired conditions has been identified.Executive Summary

Executive Summary

Overview

The project area for this rangeland project is located approximately 30 miles northwest of Pinedale, Wyoming in the Pinedale Ranger District of the Bridger-Teton National Forest (Figure ES-1). The majority of the project area lies within Sublette County, with portions that extend into Teton and Fremont Counties. The 170,643-acre project area encompasses the headwaters of both the Green River drainage of the Colorado River System and the Gros Ventre River drainage of the Snake/Columbia River Basin System. The Gros Ventre River is designated a Scenic River and the Green River, Roaring Fork River, and Tosi Creek are eligible for Wild and Scenic River designations. Portions of the Gros Ventre and Bridger Wildernesses are located in the project area (12,447 acres and 5,371 acre, respectively). State and private lands lie adjacent to the southern portion of the project area and private land is also located inside the project area boundary. The northern boundary of the project area is near the Continental Divide, which separates the Bridger-Teton and Shoshone National Forests.

During the early 1900s, the Forest Service developed a livestock grazing allotment system in the project area. There are currently six cattle and horse allotments included in this analysis: Badger Creek, Beaver-Twin Creeks, Noble Pastures, Roaring Fork, Wagon Creek, and Upper Green River allotments. Currently 21 different term grazing permit holders are authorized to graze approximately 9,089 cow/calf pairs or yearlings and includes 47 horses in the six allotments from June 14th to October 15th. Permitted animal unit months are approximately 46,148. An animal unit month is the amount of forage for one mature cow or equivalent for one month based upon an average daily forage consumption of 26 pounds of dry matter per day. This is the maximum permitted use; actual use is often less than this ceiling level. Monitoring conducted in the project area indicates that current grazing use is meeting resource objectives in most areas; however, monitoring has also identified some areas of concern where resource objectives are not being achieved.

The project area is also located within the Greater Yellowstone Ecosystem which supports a full complement of native birds, mammals, and fish, including predators such as grizzly bears and some of the last large herds of migratory ungulates in North America. The terrestrial and aquatic species present in the area reflect the relatively intact environmental conditions found in the area. Grizzly bears inhabit the Upper Green River project area and have increased their distribution and abundance in the Greater Yellowstone since the 1970s.

The purpose of the project is to continue to authorize livestock grazing in a manner that will maintain or improve resource conditions. The Bridger-Teton Land and Resource Management Plan (Forest Plan, U.S. Forest Service 1990) provides direction to support community prosperity in part through livestock grazing (Goal 1.1 and Objective 1.1(h), U.S. Forest Service 1990, p. 112-113) in a manner that avoids unacceptable effects from livestock use on range, soils, water, wildlife, and recreation values or experiences (Goal 4.7, U.S. Forest Service 1990, p. 120).

Gap between Desired and Existing Conditions

A comparison between desired and existing conditions with respect to rangeland vegetation, riparian areas, water, soils, fisheries, wildlife, cultural resources and recreation values was conducted. The existing resource conditions were compared with desired conditions to determine if there was a gap between the two that needed to be addressed. Desired conditions were described in part by resource objectives established for this project. A list of objectives for highlighted resources is summarized below.

Resource Objectives

1. Rangelands
   Ground cover objective: 80 to 95 percent ground cover depending on vegetation type
   Species composition objective: Mid or late seral plant community with a stable or upward trend
   Invasive plant species objective: Control or reduce the distribution and abundance of invasive plants

2. Riparian areas
   Stream bank stability objective: 75 to 85 percent depending on Rosgen channel type
   Stream temperature objective: 68 degrees Fahrenheit
   Riparian function objective: A riparian system that captures sediment, maintains a high water table, and supports hydric vegetation that is capable of slowing high flows and protecting and stabilizing the stream banks.

3. Soils
   Soil quality objective is satisfactory.

4. Grizzly bear
   Grizzly bear management objective is to minimize the livestock related grizzly bear mortality.

5. Sage grouse
   Herbaceous canopy cover objective: grass canopy cover is >15 percent in nesting habitat during the nesting season and herbaceous canopy cover is ≥15 percent in the summer habitat.

   Grass height objective is ≥ 7 inches during the nesting season and ≥4 inches post nesting season in upland nesting habitat. Retain 4-inch stubble height for herbaceous riparian and meadow vegetation in all sage grouse habitat.

   Riparian function objective is described above.
   Preferred forb availability objective is preferred forbs are common with several species present.

6. Amphibians: boreal toad, Columbian spotted frog, boreal chorus frog
   Riparian function objective is described above.
   Herbaceous retention objective is 70 percent.

7. Elk
   Forage availability objective is to provide 2.5 million pounds of forage per year for 1,089 elk.

8. Recreation-related Resources
   Recreation objective is management of recreation and livestock use that meets resource objectives while minimizing conflict between these uses.
   Wilderness & Wilderness Study Areas' objective is management emphasis is to provide for the protection and perpetuation of natural biophysical conditions and a high degree of solitude for visitors but with some perceptible evidence of past human use.
   Eligible Wild & Scenic Rivers' objective is river segments that have been determined eligible for potential addition to the National Wild and Scenic River system are protected from activities that could diminish or change the free-flowing characteristic, water quality, or the scenic, recreational, fish and wildlife, and other values which make the river eligible for designation.
   Designated Wild & Scenic Rivers' objective is all designated river segments will be managed to protect and enhance their outstandingly remarkable values, free-flowing condition, and water quality for future generations.

Existing Conditions

The existing conditions in the 170,643-acre project area encompassing the six allotments predominantly meets the resource objectives, and the desired conditions. Limited areas of concern, in which there is a gap

between desired and existing rangeland and riparian conditions have been identified (Table ES-1, Figure ES-2). Existing conditions arose from current management of livestock which is described in Alternative 2 – Current Management and reflects the actual livestock use over a five year period from 2009 to 2013.

Issues

Four issues were identified through public scoping and are carried forward in Final Environmental Impact Statement (FEIS) analysis.

Issue 1: Effects on Threatened, Endangered, and Sensitive Species (TES), as well as Other Species of Interest. The concern is that livestock grazing may affect the recovery of threatened, endangered, proposed, candidate and sensitive species, in addition to viability and habitat objectives for other species in the project area. Species of particular concern in this project include Grizzly bear, amphibians, Greater sage-grouse, elk, and Colorado River cutthroat trout.

Issue 2: Effects on Riparian and Aquatic Conditions. The concern is that livestock grazing may affect riparian areas, riparian vegetation, fisheries and overall stream function and health.

Issue 3: Effects on Social and Economic Impacts. Permitted livestock grazing contributes to the economic wellbeing of local communities. Continuing to authorize livestock grazing in the project area would support the custom and culture in surrounding communities and contribute to the achievement of Forest Plan goals.

Issue 4: Effects on Rangeland Function. Livestock grazing may affect vegetation and soils, which are the components of overall rangeland function. Vegetation communities and watersheds that are not functioning properly provide less than optimum conditions for wildlife, rangeland health and productivity and soil stability.

Alternatives Considered in Detail

The Forest Service developed four alternatives, including the No Action (Alternative 1- No Livestock Grazing), Grazing as Currently Permitted and Current Management (Alternative 2), Modified Grazing Management (Alternative 3- Modified Proposed Action and Preferred Alternative), and Modified Grazing Management with Riparian Emphasis (Alternative 4). The alternatives were developed to address issues and were refined by the interdisciplinary team based on comments to the draft supplemental EIS, management direction, data analysis and resource needs. A comparison of the livestock grazing alternatives is provided in Table ES-2. A summary of each alternative is provided below.

Alternative 1 – No Livestock Grazing (No Action Alternative)

Under Alternative 1, livestock would no longer be permitted to graze on the six allotments in the Upper Green River project area. Livestock grazing would be eliminated and current term grazing permits would be cancelled. Livestock grazing would cease two years after notice of cancellation. Allotment management would likely not change during this two-year interval from the current management. Selection of Alternative 1 would eliminate the number of animal unit months (AUMs) allocated to permitted livestock in the project area by approximately 46,148 AUMs or 9,089 cow/calf pairs.

Approximately 62 miles of existing interior fence, four water developments, four rider cabins/facilities, and nine water crossings (e.g., culverts and bridges) would be considered for removal, as they would no longer be needed for livestock management but may be retained to serve other purposes. Approximately 14 miles of boundary fences, Kendall Warm Springs' fence, campground fences, or fences along private inholdings would be maintained. The responsibility for maintaining fences would revert to the permittees on adjacent grazing allotments, private landowners, or the Forest Service, as applicable.

Alternative 2 - Grazing as Currently Permitted and Current Management

Livestock grazing would continue to be authorized on the six allotments as currently permitted in the term grazing permits. Table ES-2 summarizes permitted livestock numbers, kind and class of livestock, animal unit months, season of use, forage utilization level and management system by allotment under Alternative 2. Grazing as currently permitted provides the sideboards, or maximum allowed grazing use in terms of: the kind and class of livestock, livestock numbers, grazing season and allowable use of forage. This alternative also describes the current management or the actual livestock use over a recent five year period. Current management includes actions that are authorized under permit, and adjusted through routine permit administration and, reflect permittee livestock management adjustments in cooperation with the Forest Service to address resource concerns in the project area. Actual livestock use under current management has been at a reduced level compared to the permitted use allowed under the term grazing permits. Existing conditions resulted in part from current management, described under Alternative 2- Current Management. It is possible, however, that permittees would manage their livestock at the maximum permitted use on the term grazing permit. Therefore, livestock management as described under Alternative 2- Grazing as Currently Permitted was used by resource specialist to analyze and describe the maximum potential effects on their resources.

Under Alternative 2-Grazing as Currently Permitted, the permitted season of use varies by allotment but generally occurs from June 14th to October 15th annually across the project area. The permitted number of livestock would remain unchanged from that currently permitted (9,089 head of livestock). Season-long grazing would continue in the Badger Creek, Beaver-Twin Creeks, Roaring Fork and Wagon Creek allotments. The maximum forage utilization on key forage species would range from 50 to 60 percent in the uplands and 55 to 65 percent in the riparian areas depending on the allotment.

Under Alternative 2- Current Management, actual number of livestock across the project area has averaged 6,192 livestock (68% of permitted) with actual use ranging from 30 to 50 percent forage utilization on key forage species depending on the allotment.

A decision to implement Alternative 2 would not change the number of permitted livestock or the permitted season of use from that authorized under the current term grazing permits. Actual livestock numbers and/or season of use could be administratively adjusted within the established permitted use in any given year in order to meet allowable use standards and/or resource objectives under this alternative.

Allowable Use in Allotments/Pastures: Forage Utilization

The maximum forage utilization on key forage species in Badger Creek Allotment, Beaver-Twin Allotment, and the South Pasture of the Roaring Fork Allotment would continue at 50 percent in the uplands and 55 percent in the riparian areas under Alternative 2. The Roaring Fork East and West pastures and Noble Pastures Allotment, Wagon Creek Allotment, Upper Green River Allotment, and the River Bottom Pasture would continue at a maximum forage utilization of 60 percent in the uplands and 65 percent in the riparian areas on key forage species. Key forage species are primarily Idaho fescue (*Festuca idahoensis*) in the uplands and sedges (*Carex* species) or tuffed hairgrass (*Deschampsia*) in riparian/meadow areas. Other key species may be identified on a site specific basis.

Focus Area Prescription

A focus area is an area in need of special management consideration due to its unique characteristics or sensitivity to disturbance. They typically do not currently meet desired conditions for one or more resource. Focus areas do not represent the entire pasture or allotment. There are seven focus areas within the project area: Waterdog Lake, Tosi Creek, Klondike Creek, Roaring Fork, Fish Creek, Wagon Creek, Tepee Creek focus areas (Figure ES-2).Under Alternative 2 - Grazing as Currently Permitted, there are no specific grazing

prescriptions in the focus areas. Under Alternative 2 - Current Management, Waterdog Lake, Wagon Creek, and Tepee Creek focus areas have been managed to reduce impacts of livestock use. Under this alternative, no focus area prescriptions would be implemented on the remaining four focus areas (Tosi Creek, Klondike Creek; Roaring Fork, and Fish Creek focus areas, Figure ES-3).

Structural Improvements

Under Alternative 2, existing structural improvements on the six allotments, including approximately 76 miles of existing fence and four water developments, would continue to be maintained or reconstructed by the permittees as needed. There are no proposed structural improvements under Alternative 2. In addition, no new roads are proposed and none will be removed under this alternative.

Design Features Common to the Action Alternatives

The Forest Service also developed measures common to Alternatives 2, 3, and 4 to ensure compliance with various Forest Plan standards and guidelines. These include protection of heritage resources, grizzly bear conservations measures and terms and conditions, and best management practices for livestock distribution and range improvements.

Monitoring Common to the Action Alternatives

Monitoring would be conducted under all action alternatives to insure that the management is implemented as described and to evaluate whether the livestock grazing prescriptions are effective in achieving, or establishing an adequate trend towards the desired conditions.

Alternative 3- Modified Grazing Management (Modified Proposed Action and Preferred Alternative)

Alternative 3 was developed in response to public comments on the DSEIS, permittee comments, refinement of rangeland and riparian desired conditions using resource objectives, further data collection and analysis, and updated identification of gaps between desired and existing rangeland and riparian resource conditions.

The permitted livestock grazing management for the six allotments are presented in Table ES-2. Under Alternative 3, the permitted season of use varies by allotment but generally occurs from June 14th to October 15th annually across the project area and is the same as proposed under Alternative 2. Alternative 3 would authorize 8,819 head of livestock, which is a 270 head reduction in the Mosquito Lake Rotation of the Upper Green River Allotment from that proposed under Alternative 2. The Forest Service would initiate a deferred or rotational grazing system in the Badger Creek, Beaver-Twin Creeks, Roaring Fork and Wagon Creek allotments to meet Forest Plan requirements to eliminate season long grazing. Items Common to Action Alternatives which include design features, grizzly bear conservation measures, terms and conditions, and monitoring would be part of Alternative 3.

Allowable Use in Allotments/Pastures: Forage Utilization and Stubble Height

Under Alternative 3, the permitted allowable use standards in the six allotments would be more conservative than allowable use proposed in Alternative 2- Grazing as Currently Permitted. Alternative 3 would establish maximum allowable use with site specific prescriptions and/or structural improvements tailored to improve all areas of concern that are currently not meeting resource objectives.

Generally, a maximum of 50 percent forage utilization on key forage species would be allowed in the upland, riparian, and wetland areas and irrigated pastures across the six allotments. Additionally, a 4-inch stubble height minimum would be retained at the greenline of streams for each pasture in all six allotments with the exception of South Gypsum Creek in Lower Gypsum Pasture and Strawberry Creek in the Fish Creek

Pasture of the Upper Green River Allotment. These areas would have a 6-inch stubble height minimum along the greenline. The allowable use in the livestock driveway would be to maintain greater than or equal to 60 percent ground cover. Allowable use thresholds in focus areas differ from those stipulated for allotments and pastures. Prescriptions for focus areas include retaining 6-inch stubble height along the greenline, stream bank alternation limits, willow plantings, and/or fencing.

The exceptions to the general allowable use levels are: Noble Pasture 1 in the Noble Pastures Allotment would have a maximum forage utilization of 40 percent on key forage species in the pasture with a more restrictive focus area prescription on Tosi Creek; and Mosquito NW and SW in the Upper Green River Allotment would have an average forage utilization of 30 percent in the upland and riparian areas over a five year period with a maximum forage utilization of 50 percent in any given year.

Structural Improvements

Construction of approximately 6 miles of permanent fence, 1.2 miles of electric fence, and a hardened water crossing are proposed to improve livestock management and resource conditions. Permanent fences would be constructed to effectively divide the Beaver-Twin Allotment into three pastures, add the South Kinky Creek Pasture to the Tosi Creek-Tepee Creek rotation of the Upper Green River Allotment, and manage the riparian area along segments of Klondike and Tepee creeks in the Noble Pastures Allotment. A holding area would be constructed in an unfenced portion of Noble Pasture 4. The fence dividing Mud Lake East and West would be relocated uphill to move Crow Creek into Mud Lake West pasture. An electric fence would be maintained along the Wagon Creek focus area with an option to erect an electric fence along Tosi Creek focus area if streambank alteration and stubble height requirements prove difficult to implement or ineffective. Existing structural improvements, including approximately 76 miles of fence line, would be maintained. No new roads are proposed and none would be removed under Alternative 3.

Adaptive Management

Adaptive management would be implemented when livestock grazing is determined to be a causative factor and allowable use levels, design features, and structural improvements proposed in Alternative 3 do not result in meeting or moving towards desired rangeland and riparian conditions. More stringent allowable use standards, including a reduction in forage utilization of key forage species to 30 percent and/or increases to 6-inch stubble height along the greenline of streams, would be implemented incrementally under Alternative 3 to improve resource conditions if satisfactory progress toward meeting desired conditions were not achieved.

Alternative 4- Modified Grazing Management with Riparian Emphasis

Alternative 4 is similar to Alternative 3 with the primary difference being a reduction in the maximum forage utilization of key forage species in riparian and meadow areas on four allotments (Badger, Beaver-Twin, Roaring Fork and Upper Green River allotments). In these four allotments, Alternative 4 proposes a maximum of 35 percent forage utilization of key forage species in riparian and meadow areas meeting desired conditions as compared with Alternative 3 which proposes a maximum of 50 percent forage utilization of key forage species in riparian and meadow areas meeting desired conditions. Implementing a 35 percent maximum forage utilization level in riparian and meadow areas would promote healthy streams and meadows and provide suitable habitat for riparian-dependent wildlife species while providing reduced livestock grazing opportunities.

Other than the limits on forage utilization in riparian and meadow areas on these four allotments, Alternative 4 is identical to Alternative 3.

Environmental Consequences

Major conclusions related to impacts of the alternatives on rangeland vegetation, soils, riparian areas, fisheries, wildlife, sensitive plants, recreation and related resources, cultural resources, and socio-economic resources are summarized in Table ES-3. The ability of alternatives to meet the purpose and need of the project and address issues identified by the public is summarized in the Table ES-4.

Decision Framework

Based upon the purpose and need for the project and the effects of the alternatives on the resources, the Responsible Official will decide:

Whether livestock grazing should be authorized on all, part, or none of the project area; and

If the decision is to authorize some level of livestock grazing, then which livestock management strategy, including the grazing system, allowable use standards, design features, structural range improvements, adaptive management, and monitoring requirements, would be applied to ensure that resource objectives are met or that movement towards those objectives would occur.

Comments

The complete text of the Upper Green River Area Rangeland Project Draft Environmental Impact Statement is available for public review and comment. The DEIS is available on the Bridger-Teton National Forest website. Use the link: http://www.fs.usda.gov/project/?project=3049 to download the document. You may also request to receive the DEIS on a compact disk by contacting the Pinedale Ranger District, P.O. Box 220, Pinedale, Wyoming, 82941, (307) 367-4326 or email dbooth@fs.fed.us.

Information concerning the deadline for comments and methods to submit those comments will be published in the Federal Register and posted at the website address listed above.

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Individuals and entities (non-governmental organizations, businesses, partnerships, state and local governments, Alaska Native Corporations, and Indian Tribes) who submit timely, specific written comments regarding this project during this comment period or who have submitted timely, specific written comments during previous comment periods may subsequently file an objection when the draft record of decision is published. All timely, specific written comments that have been received during previous comment periods are filed in the project record, have been considered in the preparation of this document, and will be considered again by the deciding officer before a decision is made. These previously submitted comments need not be resubmitted.

Tables

Table ES-1. Areas of concern or areas that are not meeting resource objectives

Allotment	Pasture or Focus Area	Existing Ground Cover	Ground Cover Objective	Trend of Species Com-position	Creek Segment below desired condition	Existing Stream bank#	Stream bank Stability Objective	Existing Stream Temp. (68ºF objective)	Riparian Function/ Soil Quality
Beaver-Twin	(Proposed Twin Creeks Pasture - two sites)	64% 68%	85% (sage-brush) 80% (tall forb)	downward	No concerns identified	No concerns identified	No concerns identified	No concerns identified	No concerns identified
Beaver-Twin	Waterdog Lake Focus Area*	Cattle mortality due to poisonous plants*	No concerns identified	No concerns identified	No concerns identified	No concerns identified	No concerns identified	No concerns identified	No concerns identified
Noble Pastures	Pasture 3	No concerns identified	No concerns identified	No concerns identified	No concerns identified	No concerns identified	No concerns identified	No concerns identified	Soil compaction, hummocking
Noble Pastures	Tosi Creek Focus Area	No concerns identified	No concerns identified	No concerns identified	Lower Tosi Creek+	In 2009: 34% In 2012: 71%	@ 5yrs stable/ upward trend, @ 10 years upward trend, long-term 75%	No concerns identified	Unstable banks
Noble Pastures	Klondike Focus Area	No concerns identified	No concerns identified	No concerns identified	Klondike Creek+	48%	Stream channel type pending	No concerns identified	Unstable banks; low willow recruitment
Roaring Fork	Roaring Fork West Focus Area	No concerns identified	No concerns identified	downward	No concerns identified	No concerns identified	No concerns identified	No concerns identified	No concerns identified

Allotment	Pasture or Focus Area	Existing Ground Cover	Ground Cover Objective	Trend of Species Com-position	Creek Segment below desired condition	Existing Stream bank#	Stream bank Stability Objective	Existing Stream Temp. (68ºF objective)	Riparian Function/ Soil Quality
Upper Green River	Mud Lake East	No concerns identified	No concerns identified	No concerns identified	Crow Creek segment at SW pasture corner	No concerns identified	No concerns identified	No concerns identified	Impaired soil quality, willow pedestalling
Upper Green River	Mud Lake East Pasture	No concerns identified	No concerns identified	No concerns identified	Green River+ at confluence of Roaring Fork near elk feedground	No concerns identified	No concerns identified	No concerns identified	Functioning at Risk, Impaired soil quality, willow pedestaling
Upper Green River	Fish Creek Focus Area	No concerns identified	No concerns identified	No concerns identified	Fish Creek (site 1 & 2)	46 percent & 76 percent (site 1 & 2)	75%	No concerns identified	No concerns identified
Upper Green River	Fish Creek Pasture	No concerns identified	No concerns identified	No concerns identified	Strawberry Creek	In 2009: 80% In 2012: 48%	75%	No concerns identified	No concerns identified
Upper Green River	Mosquito SE Pasture	No concerns identified	No concerns identified	No concerns identified	Wagon Creek	No concerns identified	No concerns identified	71 – 73.9º F	No concerns identified
Upper Green River	Wagon Creek Focus Area	No concerns identified	No concerns identified	No concerns identified	Wagon Creek	No concerns identified	No concerns identified	No concerns identified	Increased erosion near stream crossing
Upper Green River	Mosquito NW Pasture	No concerns identified	No concerns identified	downward	Wagon Creek	75%	85%	No concerns identified	No concerns identified

Allotment	Pasture or Focus Area	Existing Ground Cover	Ground Cover Objective	Trend of Species Com-position	Creek Segment below desired condition	Existing Stream bank#	Stream bank Stability Objective	Existing Stream Temp. (68ºF objective)	Riparian Function/ Soil Quality
Upper Green River	Mosquito SW Pasture	No concerns identified	No concerns identified	downward	No concerns identified	No concerns identified	No concerns identified	No concerns identified	No concerns identified
Upper Green River	Tepee Creek Focus Area	No concerns identified	No concerns identified	No concerns identified	Tepee Creek	40%	@ 5yrs stable/ upward trend, @ 10 years upward trend, long-term 80%	No concerns identified	Incised channel; unstable banks; low riparian willow recruitment
Upper Green River	57 acre pasture adjacent to Darwin Ranch in the Kinky Creek Pasture	No concerns identified	No concerns identified	No concerns identified	Kinky Creek segment near Darwin Ranch +	No concerns identified	No concerns identified	No concerns identified	Soil compaction, hummocks
Upper Green River	Lower Gyp Pasture	No concerns identified	No concerns identified	No concerns identified	S. Gypsum Creek	2009 59 percent, 2012 73 percent	75%	No concerns identified	No concerns identified

Stability measured in 2012 unless otherwise noted.

*Existing condition at Waterdog Lake focus area is at desired condition due to current management.

+ River segments not meeting resource objectives for Wild and Scenic Rivers

Table ES-2. Differences in livestock grazing management among action alternatives

Livestock management	Alternative 2- Current Management (Actual Use)	Alternative 2- Grazing as Currently Permitted	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
Allowable use in **riparian** and **meadows** areas that are meeting resource objectives	**30%** forage utilization in Badger, Beaver-Twin, Roaring Fork, and Upper Green allotments **50%** forage utilization in Noble and Wagon Creek allotments	**65%** maximum forage utilization in Noble, Roaring Fork (north of river), Wagon Creek and Upper Green allotments **55%** maximum forage utilization of key forage species in Badger, Beaver-Twin, and Roaring Fork (south of river) allotments	**50%** maximum forage utilization of key forage species for all six allotments **4-inch** stubble height minimum retained along greenline for all allotments	**35%** maximum forage utilization in Badger, Beaver-Twin, and Noble allotments and certain pastures in the Upper Green allotment **50%** maximum forage utilization in Wagon Creek allotment and certain pastures of the Upper Green allotment **4-inch** stubble height minimum retained along greenline for all allotments
Allowable use in **uplands** that are meeting resource objectives	**30%** forage utilization in four allotments **50%** forage utilization in two allotments	**60%** maximum forage utilization in Noble, Roaring Fork (north of river), Wagon Creek and Upper Green allotments **50%** maximum forage utilization in Badger, Beaver-Twin, and Roaring Fork (south of river) allotments	**50%** maximum forage utilization of key forage species in all allotments	**50%** maximum forage utilization of key forage species in all allotments
Number of livestock across the six allotments	6,192 (average number of livestock excluding non-use years)	9,089 (permitted)	8,819 (permitted)	8,819 (permitted)
Prescription in pastures, allotments, and areas of concern, including focus areas, that do not meet resource objectives and desired conditions	Stubble height retained along greenline for Tepee Creek focus area, Mosquito Lake, South Gypsum Creek, and electric fence on Wagon Creek focus area.	No prescription specified in FEIS, use of administrative action to implement changes to livestock management as necessary subsequent to the Record of Decision.	Specific prescriptions tailored to meet or move range and riparian conditions towards objectives. Includes adjustments to: management system, number of livestock, allowable use, structural	Specific prescriptions tailored to meet or move range and riparian conditions towards objectives. Includes adjustments to: management system, number of livestock, allowable use, structural

Livestock management	Alternative 2- Current Management (Actual Use)	Alternative 2- Grazing as Currently Permitted	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
	Waterdog Lake focus area has prescription such that the focus area meets desired conditions. Other areas of concern not addressed.	Exception: Waterdog Lake focus area has prescription such that the focus area meets desired conditions.	improvements and focus area prescriptions. Adaptive management used to address future areas not meeting or moving towards desired conditions (Same as Alternative 4).	improvements and focus area prescriptions. Adaptive management used to address future areas not meeting or moving towards desired conditions (Same as Alternative 3)
Structural improvements	Maintain existing fences, cattle guards, water developments. No proposed structural improvements.	Maintain existing fences, cattle guards, water developments. No proposed structural improvements.	Maintain existing fences, cattle guards, water developments. Construct 6.0 miles of permanent fence and 1.2miles of electric fence. Install culvert in Noble Pasture 3. Construct hardened water crossing and gate at Wagon Creek focus area.	Maintain existing fences, cattle guards, water developments. Construct 6.0 miles of permanent fence and 1.2miles of electric fence. Install culvert in Noble Pasture 3. Construct hardened water crossing and gate at Wagon Creek focus area.
Management system	Season-long grazing, deferred rotation, and rest rotation	Season-long grazing, deferred rotation, and rest rotation	Deferred grazing, deferred rotation, rest rotation, and variable entry date depending on allotment.	Deferred grazing, deferred rotation, rest rotation, and variable entry date depending on allotment.

Table ES-3. Summary of effects on resources by alternative

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
Rangeland Vegetation					
Ground Cover	Sites not meeting desired conditions would remain stable or improve.	Sites not meeting desired conditions would remain stable or decline.	Some sites do not meet desired condition for ground cover.	Sites not meeting desired conditions would remain stable or improve at a slower rate than Alt. 1.	Same as Alternative 3.
Species Composition	Sites not meeting desired conditions would remain stable or improve.	Sites not meeting desired conditions would remain stable or decline.	Some sites do not meet desired condition for species composition.	Sites not meeting desired conditions would remain stable or improve at a slower rate than Alt. 1.	Same as Alternative 3.
Soils					
Percent Detrimental Disturbance	Percent Detrimental Disturbance (DD) would remain the same for the 2 year transition period. After that, DD would decrease gradually over a 10 to 20 year period to zero.	Percent DD would remain the same in all pastures.	Some sites exceed recommended DD thresholds.	Percent DD would decrease slightly overall across the project area. In some pastures percent DD would decrease substantially over time due to proposed fencing.	Same as Alternative 3
Compaction	Dissipates over time as grazing is phased out.	May increase on compaction prone soils at maximum utilization levels.	Some compacted areas exist.	Decreases overall compaction.	Decreases overall compaction, especially in riparian and meadow areas.
Erosion	Erosion decreases overtime as grazing is phased out.	May increase on soils prone to erosion at maximum utilization levels.	Some areas with bare soil are subject to erosion.	Decreases overall erosion.	Decreases overall erosion the most of the action alternatives
Soil Quality	Improves over time as grazing is phased out.	Declines over time at maximum utilization levels.	Soil quality is impaired in some areas.	Improves over time.	Improves over time the most for action alternatives.

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
Riparian Areas					
Stream Bank Stability and Water Quality	Current conditions would be maintained or would improve along all streams and riparian areas where livestock grazing is the primary source of direct and indirect impacts to these resources. Stream bank alteration would decrease on all stream reaches with the removal of livestock. Bank stability would increase over time. Water quality would improve at the Lower Tosi Creek, Raspberry Creek, Strawberry Creek, South Fork Fish Creek, Wagon Creek, and Tepee Creek over time via improved riparian and stream channel conditions.	Tosi Creek, South Fork Fish Creek, Klondike Creek, South Gypsum Creek, Strawberry Creek, Tepee Creek, and Wagon Creek stability ratings would likely remain below the 75-85% stability objective for their respective stream types. Tosi Creek, South Fork Fish Creek, Strawberry Creek, Raspberry Creek, Tepee Creek, Wagon Creek, Klondike Creek, and South Gypsum Creek would likely continue to not meet water quality standards. 65 % forage utilization in riparian areas would result in greater bank alteration and loss of ground cover which would result in lower bank stability.	Water quality standards and stream bank stability objectives are not met in some stream reaches.	The livestock grazing of riparian standard would be met. Over time, conditions would move towards meeting the stability guideline and water quality standard at Tosi Creek, Raspberry Creek, Fish Creek, Tepee Creek, Klondike Creek, Strawberry Creek, and Wagon Creek as stream channels and riparian areas improve in condition. In some areas this would occur at a slower rate than under Alt. 4. Fencing along Tepee and Klondike Creeks would enhance stream bank stability recovery compared with current management.	The livestock grazing of riparian standard would be met. Over time, conditions would move towards meeting the stability guideline and water quality standard at Tosi Creek, Raspberry Creek, Fish Creek, Tepee Creek, Klondike Creek, Strawberry Creek, and Wagon Creek as stream channels and riparian areas improve in condition. In some areas this would occur at a faster rate than under Alt. 3. Fencing along Tepee and Klondike Creeks would enhance stream bank stability recovery compared with current management at the fastest rate of action alternatives.
Riparian Function	Improves general riparian conditions, quickest recovery of focus areas.	Reduces general riparian conditions under maximum utilization levels; focus areas would remain below desired conditions.	Except for some focus areas, most riparian areas are currently functioning at desired conditions.	Maintain or improve areas currently functioning; improvement to focus areas; possible increase in riparian forage utilization.	Maintain or improve areas currently functioning; improvement to focus areas. Riparian forage utilization would remain similar to utilization under current management. Generally fewer impacts

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
					to stream and riparian conditions than under Alternatives 2 and 3.
Fisheries					
Fine Sediment	Reduces fine sediment delivery to streams.	Increases fine sediment delivery to streams.	Erosion related to grazing use is contributing some fine sediment to streams.	Slightly reduces fine sediment delivery; elevated delivery relative to natural levels.	Moderately reduces fine sediment delivery; fine sediment above natural levels.
Stream Temperature	Increases shade and improves channel form, which would improve buffering from temperature fluctuation	Reduces shade and channel complexity, which would result in increased summer stream temperatures	Some sites exhibit summer peak stream temperatures above desirable levels for trout streams due to reduced shade and reduced channel complexity.	Maintains current conditions	Maintains or modestly improves current conditions
Kendall Warm Spring dace (endangered)	*Not likely to adversely affect individuals or habitat. Some minor disturbance from grazing may benefit the species and its habitat.*	*Not likely to adversely affect individuals or habitat. Livestock would be excluded from grazing within the exclosure the species is found. Some minor disturbance from grazing may benefit the species and its habitat.*	*Not likely to adversely affect individuals or habitat. Livestock would be excluded from grazing within the exclosure the species is found. Some minor disturbance from grazing may benefit the species and its habitat.*	*Not likely to adversely affect individuals or habitat. Livestock would be excluded from grazing within the exclosure the species is found. Some minor disturbance from grazing may benefit the species and its habitat.*	*Not likely to adversely affect individuals or habitat. Livestock would be excluded from grazing within the exclosure the species is found. Some minor disturbance from grazing may benefit the species and its habitat.*
Colorado River cutthroat trout (sensitive and MIS species)	*No impact*: Improves habitats, but populations continue to decline.	*Will impact individuals or habitat with a consequence that the action may contribute to a trend towards federal listing or cause a loss of viability to the population or species.* Degrades habitats and increases declines in populations.	*May impact individuals or habitat but will not likely contribute to a trend towards federal listing or loss of viability to the population or species. Maintains or improves habitats, but populations continue to decline.*	*May impact individuals or habitat but will not likely contribute to a trend towards federal listing or loss of viability to the population or species*. Maintains or improves habitats, but populations continue to decline.	*May impact individuals or habitat but will not likely contribute to a trend towards federal listing or loss of viability to the population or species. Maintains or improves habitats, but populations continue to decline.*

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
Wildlife					
Grizzly bear (threatened and MIS species)	*May affect, not likely to adversely affect individual* grizzly bears. The elimination of livestock-related management removals and relocations of grizzly bears from the project area contribute positively to the existing growth or stability of the grizzly bear population in Western Wyoming and the Yellowstone Ecosystem. Less (cattle) carrion would be available.	*May affect, likely to adversely affect individual grizzly bears.* Some incidental take is authorized by the USFWS in the current Biological Opinion. Allows for the continued recovery of the species, provides for a grizzly bear population that meets its demographic recovery criteria, and maintains population growth or stability.	Same as Alternative 2 Grazing as Currently Permitted.	Same as Alternative 2 Grazing as Currently Permitted.	Same as Alternative 2 Grazing as Currently Permitted.
Gray wolf (experimental, non-essential)	*Not likely to jeopardize continued existence.* Supports recovery of the wolves by eliminating mortalities associated with livestock depredation in the project area. Would also provide beneficial, habitat-related effects on wolf prey by sustaining favorable range conditions.	*Not likely to jeopardize continued existence.* Wolf mortalities that result from livestock depredations would not affect the long-term persistence of wolves in the project area and would not impede the continued recovery of the wolf population in the Northern Rocky Mountain region.	*Same as Alternative 2 Grazing as Currently Permitted.*	*Not likely to jeopardize continued existence. Wolf mortalities that result from livestock depredations would not affect the long-term persistence of wolves in the project area and would not impede the continued recovery of the wolf population in the Northern Rocky Mountain region. Would also provide beneficial, habitat-related effects on wolf prey by sustaining favorable range conditions.*	Same as Alternative 3.
Canada lynx (threatened)	*May affect, not likely to adversely affect individual lynx or critical habitat.* Consistent with the Northern Rockies Lynx Management Direction and carries no adverse effects on the	*May affect, likely to adversely affect individual lynx. May affect, not likely to adversely affect critical habitat.* Not consistent with the Northern Rockies Lynx Management Direction	*May affect, not likely to adversely affect individual lynx or critical habitat.* Consistent with the Northern Rockies Lynx Management Direction because the grazing objective and all four	*May affect, not likely to adversely affect individual lynx or critical habitat.* Consistent with the Northern Rockies Lynx Management Direction because the grazing objective and all four grazing guidelines for lynx	*May affect, not likely to adversely affect individual lynx or critical habitat.* Consistent with the Northern Rockies Lynx Management Direction. Provides for the recovery

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
	primary constituent elements lynx critical habitat. Contributes most favorably of all alternatives toward desired habitat conditions for snowshoe hares (lynx prey) and lynx in the project area.	because two out of four grazing guidelines would not be met under conditions of maximum permitted use (65 percent forage utilization in riparian areas). Would not provide for the recovery of lynx and does not maintain or improve lynx critical habitat.	grazing guidelines for lynx management would be met. Provides for the recovery of lynx and maintains or improves lynx critical habitat. The current amount of actual grazing use is maintaining most riparian areas, aspen and willow stands which provide forage and cover for lynx prey species.	management would be met. Provides for the recovery of lynx and maintains or improves lynx critical habitat.	of lynx and maintains or improves lynx critical habitat. Provides lynx habitat of action alternatives because forage use by cattle is reduced to 35 % in riparian areas. This would not result in cattle browsing of willows, aspen, and other shrubs that provide habitat for snowshoe hares.
Wolverine (proposed)	*No effect.* Because no wolverine losses are expected to occur due to management actions in this alternative, there will be no negative effects on the local population or at the scale of the Greater Yellowstone Ecosystem.	*Not likely to jeopardize continued existence.* Small risk of incidental trapping resulting in harm or death of one or more wolverines as a result of livestock-related conflict-response management actions.	*Same as Alternative 2 Grazing as Currently Permitted.*	*Same as Alternative 2 Grazing as Currently Permitted.*	*Same as Alternative 2 Grazing as Currently Permitted.*
Amphibian - boreal toad (sensitive & MIS species)	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability*. Riparian health would improve relative to existing conditions. Focus areas: rapid improvement toward desired condition. Meets desired condition for riparian function. Estimated retention of herbaceous cover in key mesic meadows approaches 100 % due to the absence of cattle	*Likely to result in a trend to federal listing or loss of viability'*. High forage use (55 - 65%) puts riparian function at risk, especially in areas currently in less than desired condition. Low expected stubble heights (< 3" at greenline) would trigger fall browsing on willows by cattle that is detrimental. Focus areas: Not in desired condition (at risk) due to lack of adjustments to grazing	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability.* Current management has resulted in relatively low-levels of utilization in riparian areas that would be similar to levels seen under Alternatives 3 and 4.	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability*. Riparian areas that are currently in desired condition remain so, but with less certainty than in Alternative 4. A 4-inch min stubble height (greenline) and moderate grazing use (50%) sustains riparian function. Some fall browsing on willows is expected. Application of adaptive management, design features & other adjustments in	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability*. Riparian areas that are currently in desired condition remain so with high certainty. A 4-inch min stubble height (greenline) and light to moderate grazing use (35 - 50%) sustains riparian function. Fall browsing on willows is not expected. Application of adaptive

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
	grazing. Meets desired condition for retention (70% retention objective would be met).	management. Estimated herbaceous retention is 42 - 50%. Would not meet retention objective of 70%. Strong negative effects on riparian function and habitat components that stem from heavy grazing would contribute to declines in the project area and negatively affect a substantial proportion of the species breeding range on the Forest.		livestock management would improve riparian function where needed. Focus areas: Trend toward desired condition due to design features like a 6" (greenline) stubble height & limits on bank alteration. Meets desired condition for riparian function. Estimated herbaceous retention is 54%. Would not meet retention objective of 70%.	management, design criteria, and other adjustments in livestock management improve riparian health in areas that are currently in less-than-desired condition. Focus areas: Trend toward desired condition due to designed features like a 6" (greenline) stubble height & limits on bank alteration. Meets desired condition for riparian function. Estimated herbaceous retention is 66% at 35% key forage use. Meets or nearly meets desired condition for retention, except at Noble Pastures and Wagon Creek allotments with a proposed 50% key forage use and estimated herbaceous retention of 54%.
Amphibian - Columbia spotted frog (sensitive species)	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability*. Riparian health would improve relative to existing conditions. Focus areas: rapid improvement toward desired condition. Meets desired condition for riparian function. Estimated	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability* because the species' broad distribution in the northern and southwestern portions of the Forest. Strong negative effects on riparian function and habitat components that stem from	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability.* This species and its breeding sites are well distributed on the Forest (Blackrock, Jackson, and Greys River Ranger Districts) and in adjacent Grand Teton National Park. Thus, a	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability*. This species and its breeding sites are well distributed on the Forest (Blackrock, Jackson, and Greys River Ranger Districts) and in adjacent Grand Teton National Park. Thus, a reduction in breeding in the project area	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability*. Meets desired conditions for riparian function, and meets or nearly meets desired conditions for herbaceous retention.

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
	retention of herbaceous cover in key mesic meadows approaches 100 % due to the absence of cattle grazing.	heavy grazing would contribute to declines in the project area.	reduction in breeding in the project area through current grazing management would not substantially reduce population viability on the Forest.	through implementation of Alternative 3, would not substantially reduce population viability on the Forest.	
Boreal chorus frog (MIS)	*Riparian health would improve relative to existing conditions. The positive effects of this alternative on riparian function and cover contribute to maintaining populations that are stable, or at least not declining.*	*Strong negative effects on riparian function and habitat components that stem from heavy grazing would contribute to population declines in the project area.*	*This species and its breeding sites are well distributed on the Forest. Thus, a reduction in breeding in the project area through current grazing management would not substantially reduce population viability on the Forest.*	*This species and its breeding sites are well distributed on the Forest. Thus, a reduction in breeding in the project area through implementation of Alternative 3 will not likely result in declining frog populations and wetland habitat conditions on the Forest.*	*Meets desired conditions for riparian function, and meets or nearly meets desired conditions for herbaceous retention. Thus, Alternative 4 does not contribute sufficient negative effects to cause a decline in the forest-wide population*
Greater sage-grouse (sensitive species)	*Beneficial Impact:* Provides suitable nesting and summer habitat. Provides the best nesting cover with tallest grass height and greatest herbaceous canopy cover. No livestock trampling of nests. Provides best summer habitat in terms of greatest riparian function with moderate availability of preferred forbs in riparian areas. Lowest potential for collision with fences.	*Likely to result in a trend to federal listing or loss of viability*. Provides unsuitable nesting and summer habitat. Provides the least amount of nesting cover, shortest grass height and lowest amount of herbaceous canopy cover. Greatest potential for nest trampling. Provides low quality summer habitat with reduced riparian conditions, herbaceous stubble height and availability of preferred forbs. Potential for collision with fences is the same as under existing conditions. High potential for additional administrative actions	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability*. Provides high nesting cover with moderate to high grass height and herbaceous canopy cover. Low to moderate potential for nest trampling. Provides moderate quality summer habitat in terms of herbaceous stubble height, riparian conditions and availability of preferred forbs. The potential for collision with fences still exists. AOIs are being updated to comply with the Greater Sage-grouse Wyoming Plan Amendment including the	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability.* Provides suitable nesting and summer habitat. Provides moderate nesting cover with moderate grass height and herbaceous canopy cover. Moderate potential for nest trampling. Provides moderate quality summer habitat in terms of riparian conditions and availability of preferred forbs. Slight increase in potential for collision with fences, offset by fence design to increase visibility. Moderate potential for additional administrative actions necessary to meet grazing guidelines (USFS 2015).	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability. Provides suitable nesting and summer habitat.* Provides moderate nesting cover with moderate grass height and herbaceous canopy cover. Moderate potential for nest trampling. Provides high quality summer habitat in terms of riparian conditions and availability of preferred forbs. Slight increase in potential for collision with fences, offset by fence design to increase visibility. Low

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
		necessary to meet grazing guidelines (USFS 2015)	grazing guidelines (USFS 2015).		potential for additional administrative actions necessary to meet grazing guidelines (USFS 2015).
Trumpeter swan (sensitive species)	*Beneficial Impact:* Provides the best protection to breeding and nesting swans and their habitat. Provides suitable nesting habitat with increased herbaceous cover reducing nest predation, improved water quality, and reduced nest trampling. Potentially fewer swans would die as a result of collisions with fences as a result of substantial fence removal.	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability'.* Provides the least protection to breeding and nesting swans and their habitat. Provides unsuitable nesting habitat with decreased herbaceous cover which potentially increases nest predation, reduced water quality and increased nest trampling.	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability'*. Provides moderate protection to breeding and nesting swans and their habitat.	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability'*. Provides moderate protection to breeding and nesting swans and their habitat. Provides suitable nesting habitat with moderate herbaceous cover, good water quality and decreased potential for nest trampling due to a 270 cattle reduction in Mosquito Lake rotation. New fencing in riparian areas is mitigated by wooden top rail which improves visibility and reduces swan injury.	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability'.* Provides the greatest protection to breeding and nesting swans and their habitat of all action alternatives. Would improve wetland and riparian conditions which could improve or provide additional nesting sites with greater protection from predators and disturbances. New fencing in riparian areas is mitigated by wooden top rail which improves visibility and reduces swan injury.
Great gray owl, Bald eagle, Peregrine falcon and Northern goshawk (sensitive species)	*Beneficial Impact:* Provides suitable foraging habitat in meadow areas by retaining herbaceous vegetation for meadow voles. Meets objectives for riparian function, stream bank stability, herbaceous retention and species composition. Provides the	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability'.* Provides unsuitable foraging habitat in meadow areas by reducing habitat for voles. Would not meet objectives for riparian function, stream bank stability, and herbaceous retention, species	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability'.* Provides moderately suitable foraging habitat in meadow areas by retaining lesser amounts of herbaceous vegetation for meadow voles. The reduced cattle numbers associated with current vs permitted has	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability'.* Provides moderately suitable foraging habitat in meadow areas by retaining lesser amounts of herbaceous vegetation for meadow voles. Meets objectives for riparian function, stream bank stability, and species composition.	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability'*. Provides suitable foraging habitat in meadow areas by retaining herbaceous vegetation for meadow voles. Meets objectives for riparian function, stream bank stability,

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
	best foraging habitat of all alternatives.	composition, and structural characteristics of riparian habitat.	resulted in meeting objectives for riparian function, stream bank stability, and species composition.	Provides more foraging habitat than Alt. 2 but less than Alt. 4.	herbaceous retention and species composition. Provides the best foraging habitat of action alternatives.
Elk, Mule Deer, Pronghorn and Moose (MIS)	Retains suitable and adequate amounts of forage for elk.	Although sufficient herbaceous forage would be remain across the project area, intensive grazing in riparian or focal areas may negatively impact the species; resulting in animals having to move farther to find suitable and adequate forage.	Retains suitable and adequate amounts of forage.	Retains suitable and adequate amounts of forage.	Retains suitable and adequate amounts of forage.
Brewer's sparrow (MIS)	Provides suitable nesting and foraging habitat. Sufficient sagebrush canopy cover provided. Upward trend in herbaceous species composition would benefit Brewer's sparrows by increasing the amount of nesting cover, seed production, and insect availability. Absence of cattle would reduce nest trampling and cowbird nest parasitism, resulting in improved nesting success for Brewer's sparrows.	Provides unsuitable nesting and foraging habitat. Sufficient sagebrush canopy cover provided. Downward trend in herbaceous species composition would result in a negative impact on nesting and foraging habitat due to reduction in nesting cover, seed production, and insect availability. Potential for trampling of nests by livestock and cowbird parasitism, resulting in reduced nesting success for Brewer's sparrows.	Provides suitable nesting and foraging habitat. Sufficient sagebrush canopy cover and herbaceous species composition provided. Potential for trampling of nests by livestock and cowbird parasitism, resulting in reduced nesting success for Brewer's sparrows.	Same as Alternative 2 – Current Management	Same as Alternative 2- Current Management
Migratory birds	No potential, with respect to livestock grazing, to contribute toward population declines of any migratory bird species. Contributes	Potential to negatively impact migratory birds to the highest extent of all alternatives, would provide benefits to a few migratory bird species	Negative impacts on migratory birds that would be similar to Alternatives 3 and 4. Would provide benefits to a few migratory bird species	Negative impacts on migratory birds that would fall between Alternatives 2 (Permitted) and 4. Would provide benefits to a few migratory bird species that	Potential to negatively impact migratory birds would be the lowest of action alternatives. Would provide benefits to a few

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	toward restoring riparian habitat and herbaceous species composition, returning fire to the landscape, retaining larger amounts of herbaceous vegetation in riparian areas and upland rangelands which would reduce the potential for nest depredation. Lower levels of nest loss due to the absence of trampling by cattle and large reduction in fences that pose a threat to birds.	that benefit from grazing, and would contribute to population declines of several species primarily due to cowbird nest parasitism, increased nest depredation due to removal of herbaceous cover, and nest trampling, as well as mortality due to striking fences and nest loss due to flood irrigation.	that benefit from grazing, and would have the potential to contribute negligibly toward population declines of several species primarily due to elevated cowbird nest parasitism, increased nest depredation in riparian and meadow communities due to removal of herbaceous cover, and relatively-high levels of nest trampling in riparian and meadow communities, as well as mortality due to striking fences and nest loss due to flood irrigation	benefit from grazing, and would have the potential to contribute negligibly toward population declines of several species primarily due to elevated cowbird nest parasitism, increased nest depredation in riparian and meadow communities due to removal of herbaceous cover, and relatively-high levels of nest trampling in riparian and meadow communities, as well as mortality due to striking fences and nest loss due to flood irrigation	migratory bird species that benefit from grazing, and may have the potential to contribute negligibly toward population declines of several species due to cowbird nest parasitism, and mortality due to striking fences and nest loss due to flood irrigation but all other risk factors would be sufficiently mitigated.
Botany					
Payson's milkvetch (Sensitive Species)	Low to No Impacts.	No change from effects described under current management.	Trampling and removal of plant biomass. May create habitat.	No change from effects under current management.	No change from effects under current management.
Boreal draba (Forest Plan MIS)	Low to No Impacts.	No change from effects described under current management.	May have moderate impacts from grazing activities, but will not lead to re-listing as a sensitive species.	No change from effects under current management.	No change from effects under current management.
Aspen (Ecological MIS)	Low to No Impacts.	No change from effects described under current management.	May have high impacts from grazing but the impacts will not pass the thresholds for understory cover or species composition.	No change from effects under current management.	No change from effects under current management.

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
Recreation and Related Resources					
Recreation and Related Resources	The effects described in Alternative 2, Current Management would not occur if livestock grazing was curtailed.	The additional number of cattle graining in this alternative would increase the effects expected in this alternative over those described in Alternative 2 - Current Management. However, best management practices would mitigate some effects. Cattle would be actively herded away from the Green River Forest boundary, Kendall Bridge, and Dollar Lake to minimize or avoid potential conflicts with Forest recreationists and visitors and address visual concerns. Restrictions on salt placement would also result in improved visual quality and improved resource conditions affecting recreation use. Additional requirements concerning livestock carcass removal would improve recreation user safety (grizzly bear hazard).	Livestock grazing is not affecting the provision of a spectrum of recreation opportunities or use at developed recreation sites. Conflict between dispersed camping and livestock within the project area is rarely reported. Some of the livestock fencing disrupts cross-country travel. Livestock carcasses located near dispersed recreation sites, trails, and roads pose a safety concern for recreationists throughout the project area. Reported conflict between outfitted use and domestic livestock grazing is extremely rare. Cattle congregating along roads cause hazardous conditions for motorists.	Six miles of new fence are expected to increase the amount of disruption of cross country travel. Cattle would be actively herded away from the Green River Forest boundary, Kendall Bridge, and Dollar Lake to minimize or avoid potential conflicts with Forest recreationists and visitors and address visual concerns. Restrictions on salt placement would also result in improved visual quality and improved resource conditions affecting recreation use. Additional requirements concerning livestock carcass removal would improve recreation user safety (grizzly bear hazard).	Same as Alternative 3.
Reports of Visitor-Livestock Conflict & Human-Bear conflict associated with livestock carcasses, Recreation	Human-livestock conflict and human-bear conflict associated with livestock carcasses would discontinue; Improved effect to dispersed	No change from effects described under current management.	Some human-livestock conflict and human-bear conflict associated with livestock carcasses occurs. Grazing causes minor negative effects to dispersed	Human-bear conflict associated with livestock carcasses would be expected to remain low; minor effect to dispersed recreation; fences required to be retained for developed	Same as Alternative 3

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
Opportunity Spectrum (ROS)	recreation and developed recreation; No effect to ROS.		recreation and creates an expense at developed site for construction and maintenance of fences.	recreation; positive effect to ROS as physically closes unauthorized motorized route in Wagon Creek designated as Semi-primitive/non-motorized.	
Wilderness, Wilderness Study Areas, and Wild and Scenic Rivers	Removal of domestic livestock in the Bridger Wilderness and Gros Ventre Wilderness and removal of the existing one-mile long fence within the Gros Ventre Wilderness would improve natural integrity, apparent naturalness, remoteness, solitude, and opportunities for primitive recreation within this wilderness. Concerning designated and eligible WSRs, conditions would improve at focus areas and areas of concern where livestock grazing has adversely impacted resource conditions.	Wilderness character (i.e. natural integrity) of the Gros Ventre Wilderness would be slightly more compromised than under Alt. 2 Current Management because season-long grazing would continue in the Beaver-Twin Allotment and the allotment would be fully stocked. A fence located in the Gros Ventre Wilderness would remain, maintaining the current impact to Wilderness character. Locations in designated and eligible WSR segments or their tributaries where livestock grazing has created conditions that do not meet resource objectives would deteriorate at a greater rate than under Alternative 2 Current Management.	Season-long grazing occurs in Beaver-Twin Allotment within the Gros Ventre Wilderness. The Wilderness character (i.e. natural integrity) has not been compromised because, under current management the allotment has not been fully stocked. Existing livestock management fences negatively affect wilderness character. There are no known effects to Wilderness or WSA ecological or social conditions as a result of current livestock grazing. There are several site-specific locations where conditions caused by livestock grazing are not meeting resource objectives along segments of tributaries to designated and eligible Wild and Scenic Rivers.	Rotational grazing would be implemented in Beaver-Twin Allotment, improving the natural integrity within the Gros Ventre Wilderness. The negative effect of the fence located in the Gros Ventre Wilderness would remain. Concerning designated and eligible WSRs, conditions would improve at focus areas and areas of concern where livestock grazing has adversely impacted resource conditions.	Rotational grazing would be implemented in Beaver-Twin Allotment, improving the natural integrity within the Gros Ventre Wilderness. The negative effect of the fence located in the Gros Ventre Wilderness would remain. Alternative 4 provides the most rapid improvement of riparian and wetland health which would be expected to improve conditions related to Wilderness and Wild and Scenic Rivers.
Cultural Resources					
Green River Drift Trail (i.e., livestock driveway).	The Green River Drift Trail would disappear and cease	Continued use of the Green River Drift Trail will allow for traditional use of this historic	The Green River Drift Trail is a traditional cultural property.	Same as Alternative 2.	Same as Alternative 2.

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
	to exist as a traditional cultural property. There would be no potential for removal of vegetation by livestock and no potential for trampling induced compaction that could lead to erosion. Decreased visibility of surface materials and unauthorized artifact collection. Potentially some beneficial effects to cultural resources because the lack of cattle grazing in the area would reduce the potential for cultural resources to be damaged by activities associated with grazing.	driveway and maintain its significance. Livestock trailing and use is not expected to result in significant negative effects to cultural resources.	Removal of vegetation and trampling induced compaction create runoff that causes sheet erosion. The loss of vegetation causes the loss of artifact context through down slope transportation, stream bank destabilization, and increased visibility of surface materials and subsequent unauthorized artifact collection. Current livestock grazing within the allotments has not resulted in direct effects to cultural resources.		
Socio-Economic Resources					
Livestock grazing authorized?	NOT authorized	Authorized – highest numbers	Livestock grazing is authorized on all allotments; Permittees have grazed fewer cattle than they are permitted.	Authorized – moderate numbers	Same as Alternative 3
Relative feasibility for Permittee implementation of design features	Lowest feasibility of all alternatives	Highest feasibility to implement grazing requirements.	It is feasible to implement the design features required to graze livestock.	Moderate feasibility to implement required grazing requirements.	Lowest feasibility of action alternatives
Environmental benefits of changes in livestock grazing practices	Lowest risk of productivity loss	Highest risk of productivity loss	There are some grazing practices that pose a risk to environmental productivity.	Intermediate risk of productivity loss	Lowest risk of productivity loss for action (grazing) alternatives

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
Employment and income information at the county level	Limited effect	Limited effect	Employment and income related to this project, are limited in the context of county wide economy.	Limited effect	Limited effect
Traditional use of the project area	Highest risk to traditional uses	Least risk to traditional uses	Livestock grazing in the project area supports traditional uses.	Intermediate risk to traditional uses	Same as Alternative 3

Table ES-4. Comparison of the alternatives' ability to meet the purposes and need for the project and ability to address issues

Purpose & Need or Issue	Alternative 1 – No Livestock Grazing (No Action Alternative)	Alternative 2 - Grazing as Currently Permitted	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
Purpose & Need: Continue to authorize livestock grazing in a manner that will maintain or improve resource conditions	*Does not meet.* Livestock grazing would not be reauthorized, but most to all resource conditions affected by livestock grazing would meet or move towards desired conditions.	*Partially meets.* Livestock grazing would be reauthorized at current permitted levels. Actual livestock numbers and use under current management has been less than permitted levels. Resource conditions affected by livestock grazing, including areas of concern, would not meet desired conditions. Riparian and many wildlife desired conditions would not be met.	*Meets.* Livestock grazing would be reauthorized with slightly fewer cattle than currently permitted, but more than actual use under current management. Maximum allowable use would be lower than currently permitted and more than actual use. Most resource conditions would meet or move towards desired conditions, with possible exceptions for some wildlife species.	*Meets.* Livestock grazing would be reauthorized with slightly fewer cattle than currently permitted, but more than actual use under current management. Maximum allowable use in riparian/ meadow areas would be substantially lower than currently permitted, but similar to actual use levels under current management. Most to all resource conditions affected by livestock grazing would meet or move towards desired conditions.
Purpose & Need: Contribute toward achievement of Goal 1.1 of the Bridger-Teton Land and Resource Management Plan (Forest Plan) which directs the Bridger-Teton National Forest to support community prosperity	*No Contribution*. Potential for 46,148 AUMs of livestock grazing in the project area are eliminated. Reduction in AUMs in opposition to the Forest Plan Objective 1.1(h) to provide forage for about	*Greatest Contribution.* A maximum of 46,148 AUMs of livestock grazing could be provided in the project area. Maximum allowable use in areas meeting desired conditions ranges from 55 –	*Moderate Contribution.* A maximum of 44,722 AUMs of livestock grazing could be provided in the project area. Maximum allowable use in areas meeting desired conditions is 50% in riparian/	*Least Contribution of action alternatives.* A maximum of 44,722 AUMs of livestock grazing could be provided in the project area. However, maximum allowable use in areas meeting desired conditions ranges from 35 – 50% in

Purpose & Need or Issue	Alternative 1 – No Livestock Grazing (No Action Alternative)	Alternative 2 - Grazing as Currently Permitted	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
(U.S. Forest Service 1990, p. 112).	260,000 Animal Unit Months (AUMs) of livestock grazing annually Forest-wide.	65% in riparian/meadow areas and 50-60% in upland areas. The maximum number of AUMs is greater than the average number of AUMs used under current management (5 year period) by about one-third.	meadow and uplands areas. The maximum number of AUM provided is more than the average number of AUMs used under current management.	riparian/meadow areas and 50% in uplands which, in effect, reduces allowable grazing use or AUMs compared to Alternative 3. Alt. 4 may provide similar AUMs to current management.
Purpose & Need: Update the allotment grazing management to reflect the Forest Plan direction	Not applicable	*Does not meet* because season-long grazing would be permitted on the Badger, Beaver-Twin, Roaring Fork and Wagon Creek allotments.	*Meets* because season-long grazing would be changed to rotational grazing in all six allotments.	*Meets* because season-long grazing would be changed to rotational grazing in all six allotments.
Purpose & Need: Avoid unacceptable effects from livestock use as outlined in Goal 4.7 of the Forest Plan which directs that grazing use of the National Forest sustain or improve overall range, soils, water, wildlife, and recreation values or experiences (U.S. Forest Service 1990, p. 120).	*Meets.* Unacceptable effects from livestock use would be avoided on range, soils, water, wildlife, and most recreation values or experiences. The Green River Drift Trail would no longer be used by livestock and would cease to exist as a traditional cultural property. Meets Forest Plan standards and guidelines.	*Does not meet*. Does not address all areas not meeting or moving towards upland and riparian desired condition. No additional design features are initiated to help move conditions toward desired conditions for upland and riparian areas currently in unsatisfactory condition. The potential to sustain negative environmental effects exists by implementing 60 – 65% forage utilization levels. Least likely to meet wildlife objectives. Does not meet some Forest Plan standards or guidelines for range, riparian area, fisheries, wildlife, and recreation.	*Meets*. Implements livestock grazing strategies that addresses all areas not meeting or moving towards upland and riparian desired condition. Changes in design features are implemented to improve resource conditions in areas of concern. 50% forage utilization in uplands, riparian and meadow areas and 4-inch stubble height retained along streams is expected to maintain riparian and upland conditions in areas currently at desired conditions. Site-specific allowable use standards, structural improvements and adaptive management are implemented, as needed, to maintain or improve riparian and upland conditions toward	*Meets.* Implements livestock grazing strategies that addresses all areas not meeting or moving towards upland and riparian desired condition. Changes in design features are implemented to improve resource conditions in areas of concern. 50% forage utilization in uplands, and 35 to 50% forage utilization in riparian and meadow areas and 4-inch stubble height retained along streams is expected to improve or maintain riparian and upland conditions in areas currently at desired conditions. Site-specific allowable use standards, structural improvements and adaptive management are implemented, as needed, to maintain or improve riparian and upland conditions toward desired conditions. Meets

Purpose & Need or Issue	Alternative 1 – No Livestock Grazing (No Action Alternative)	Alternative 2 - Grazing as Currently Permitted	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
			desired conditions. Meets Forest Plan standards and guidelines.	Forest Plan standards and guidelines.
Issue 1: Effects on Threatened, Endangered, and Sensitive Species (TES), as well as Other Species of Concern	*Best addresses* Issue 1 of all alternatives, because the greatest amount of suitable forage and cover is provided in upland, riparian and wetland areas for wildlife. Grizzly bear mortalities & conflict associated with livestock grazing management would be nearly eliminated after a two-year period during which livestock grazing would be phased out. All upland and riparian areas of concern would be addressed. Complies with direction in applicable federal law and policy pertaining Sensitive and/or Management Indicator amphibians	Least likely to address Issue 1 of all alternatives, because the least amount of suitable forage and cover is provided in upland, riparian and wetland areas for wildlife. Grizzly bear mortalities & conflict associated with livestock grazing management would continue at similar rate to other action alternatives, but would not trend this threatened species from maintaining population stability or slow growth, and from achieving a positive trajectory toward delisting. Least likely to meet wildlife objectives and desired condition. Would not meet several Forest Plan standards, guidelines, or DFC prescription.	*Moderately addresses* Issue 1 of all action alternatives, because a moderate amount of suitable forage and cover is provided in riparian and wetland areas for wildlife. Grizzly bear mortalities & conflict associated with livestock grazing management would continue at similar rate under all action alternatives, but would not trend this threatened species from maintaining population stability or slow growth, and from achieving a positive trajectory toward delisting. All upland and riparian areas of concern would be addressed. Likely would not meet some wildlife objectives for desired conditions.	*Best addresses* Issue 1 of all action alternatives, because the greatest amount of suitable forage and cover is provided in riparian and wetland areas for wildlife. Grizzly bear mortalities & conflict associated with livestock grazing would continue at similar rate under all action alternatives, but would not trend this species from maintaining population stability or slow growth, and from achieving a positive trajectory toward delisting. All upland and riparian areas of concern would be addressed. Would best meet wildlife objectives and desired conditions among action alternatives.
Issue 2: Riparian and Aquatic Conditions	Best addresses Issue 2 of all alternatives. Stream bank stability would increase over time due to the lowest amount of channel alteration and greatest amount of riparian vegetation of all alternatives. Riparian areas of concern would be addressed. Water quality	Least likely to address Issue #2 of all alternatives. Stream bank stability would decrease over time due to the greatest amount of channel alteration and lowest amount of riparian vegetation of all alternatives. Riparian areas of concern would not be addressed. Likely continue to not meet water	Effectively addresses Issue 2. Stream bank stability would be maintained or increased over time due to a moderate amount of channel alteration and riparian vegetation compared with other action alternatives. Riparian areas of concern would be addressed. Water quality would improve	Best addresses Issue 2 of all action alternatives. Stream bank stability would be maintained or increased over time at a faster rate than under Alt. 3 due to a lower amount of channel alteration and greater amount of riparian vegetation. Riparian areas of concern would be addressed. Water quality would improve and meet water quality standards.

Purpose & Need or Issue	Alternative 1 – No Livestock Grazing (No Action Alternative)	Alternative 2 - Grazing as Currently Permitted	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
	would improve and meet water quality standards.	quality standards in limited areas.	and meet water quality standards.	
Issue 3: Social and Economic Impacts	Least likely to contribute because livestock grazing would not be authorized.	Most likely to contribute because the greatest number of livestock and the most liberal allowable use would be permitted.	Moderate contribution because 270 fewer livestock would be permitted than Alt. 2 and more conservative allowable use would be permitted.	Lowest contribution of action alternatives because 270 fewer livestock would be permitted than Alt. 2 (same as Alt. 3) and the most restrictive allowable use would be permitted.
Issue 4: Rangeland Function	Upland vegetation conditions in most areas would remain at desired conditions. Vegetation conditions in areas of concern would improve over time.	Upland vegetation in most areas would remain at desired conditions unless maximum allowable use (forage limits) were reached, then rangeland function could be at risk. Areas of concern would be unlikely to fully meet desired conditions. Restoration would not be planned for areas where the cumulative effects of a variety of activities have resulted in degraded conditions.	Upland vegetation in most areas would be expected to remain at desired conditions. Areas of concern would be expected to improve as a result of new grazing practices. Restoration projects would be planned for some degraded areas, and the areas would be expected to show improvement.	Upland vegetation in most areas would be expected to remain at desired conditions. Areas of concern would be expected to improve at a similar rate to Alt. 3 as a result of similar grazing practices. Restoration would be planned for some degraded areas, and the areas would be expected to show improvement.

Figures

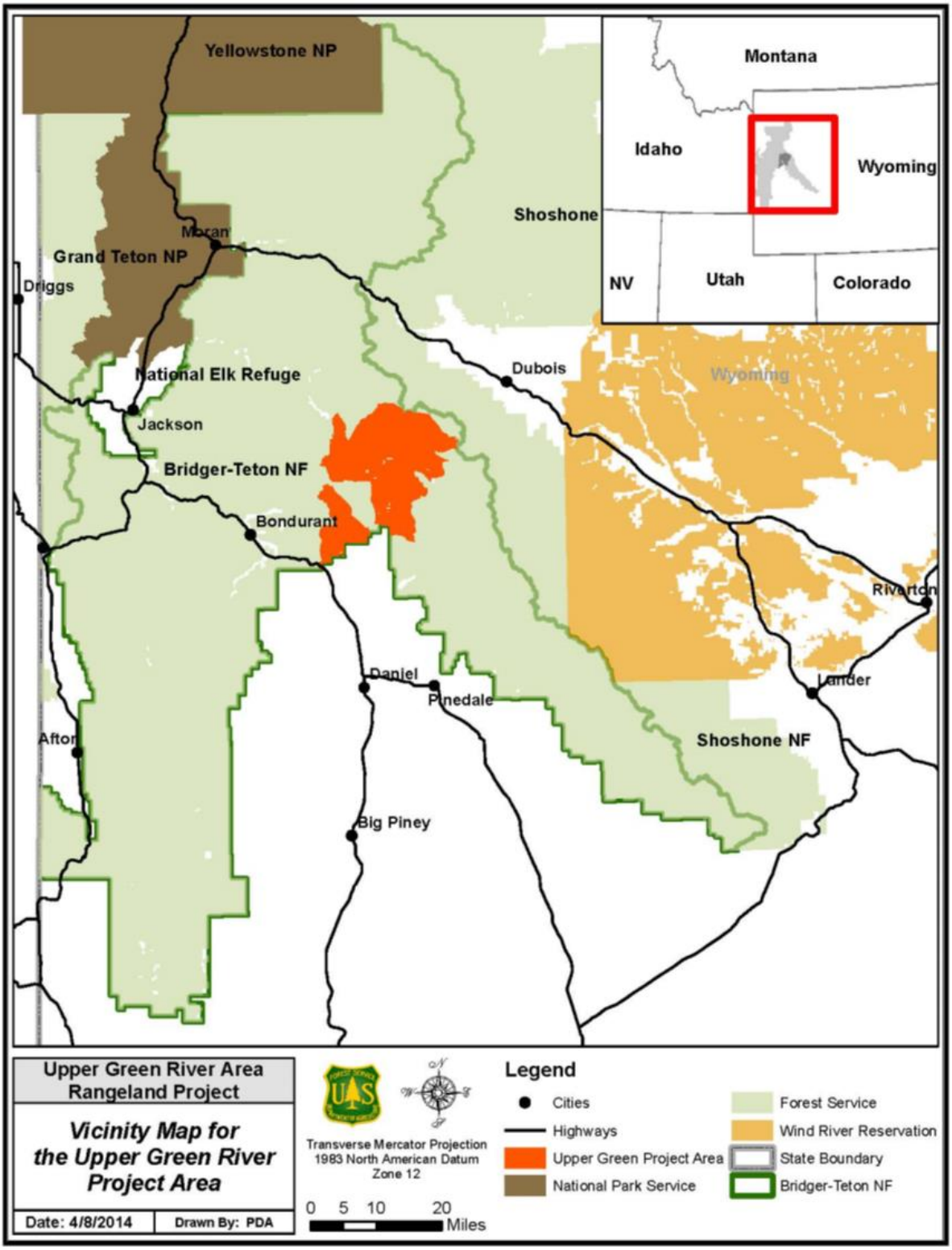

Figure ES-1. Vicinity map for the Upper Green River project area, Bridger-Teton National Forest

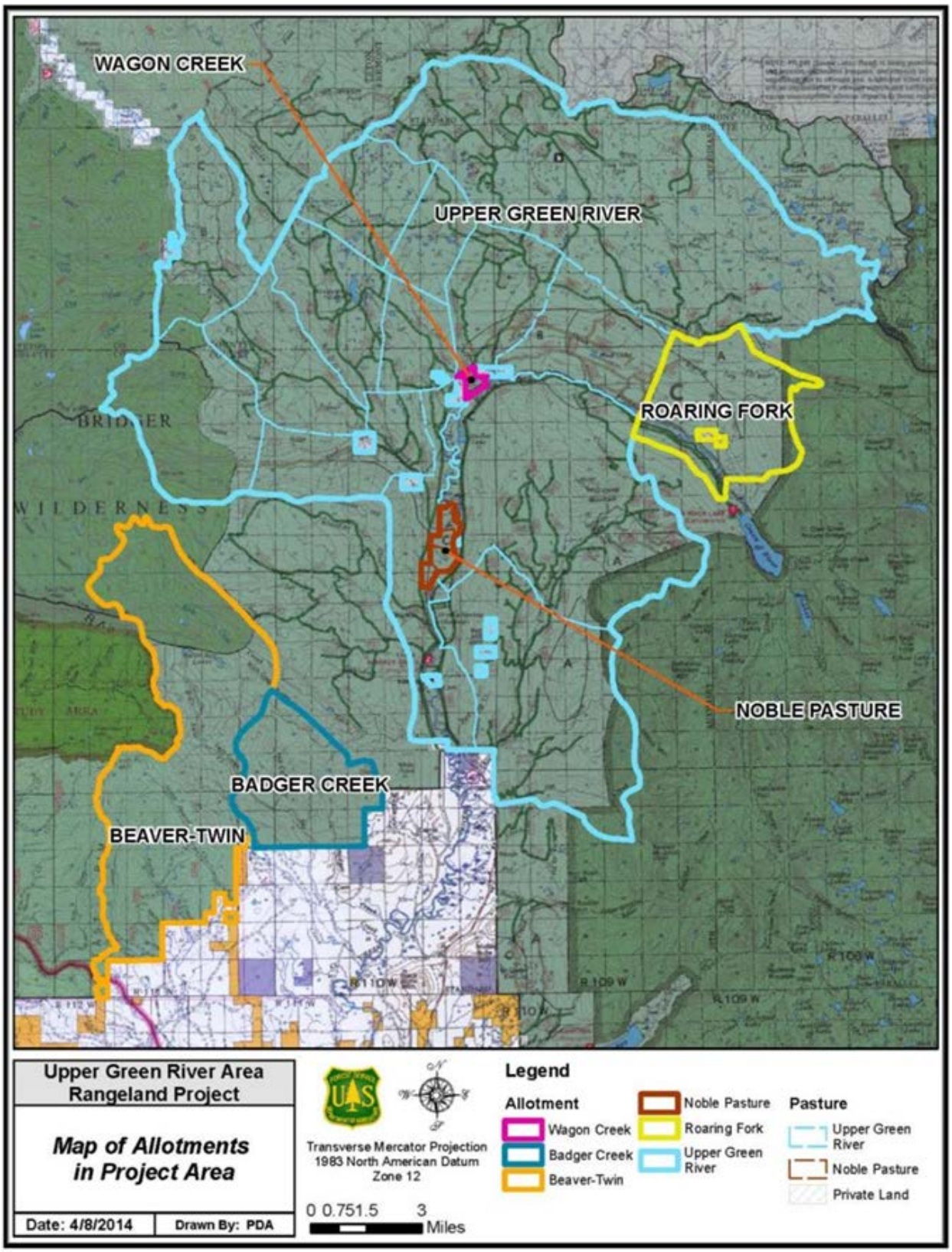

Figure ES- 2. Map of the six allotments in the project area: Badger, Beaver-Twin, Noble Pastures, Roaring Fork, Wagon Creek and Upper Green River allotments

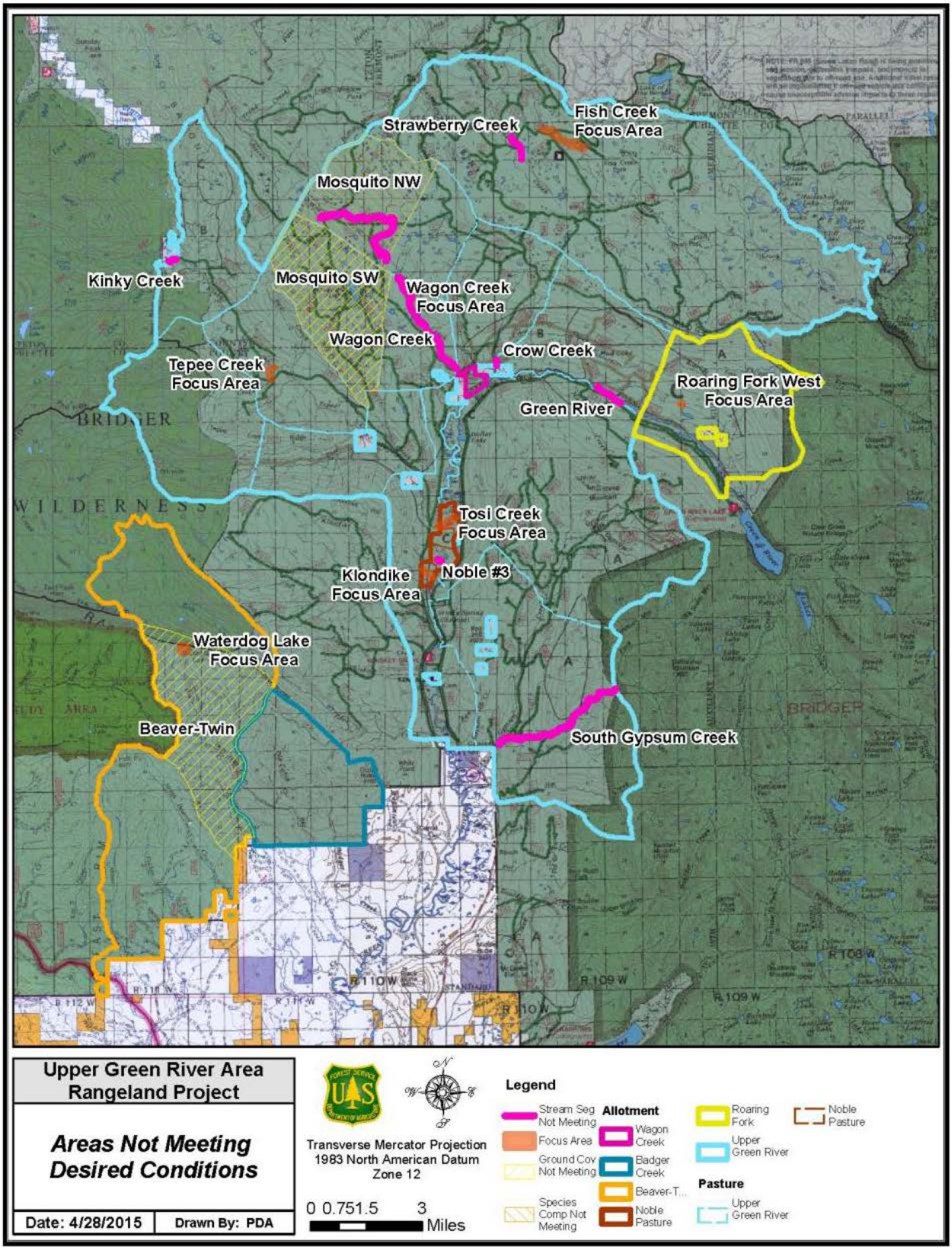

Figure ES-3. Map of areas of concern or areas not meeting resource objectives within the Upper Green River project area

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Chapter 1. Purpose of and Need for Action

Introduction and Document Structure

The Forest Service has prepared this draft environmental impact statement (DEIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This environmental impact statement discloses the direct, indirect, and cumulative effects of implementing four alternatives. This DEIS is prepared according to the format established by the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 United States Code of Federal Regulations 1500-1508). The Forest Service interdisciplinary team used a systematic approach for analyzing the effects of the proposed project and alternatives to it. Planning was also coordinated with the appropriate Federal, State, and local agencies, and local, federally recognized tribes. Additional documentation, including more detailed analyses of project area resources, may be found in the project planning record located at the Pinedale Ranger District in Pinedale, Wyoming.

The document is organized into six parts:

- **Chapter 1**- Purpose and Need for Action: The chapter includes information on the history of the project proposal (background), describes the purpose and need for the project, the gap between desired and existing conditions and the decision to be made. It also details the public involvement process and identifies significant issues driving the analysis.
- **Chapter 2**- Alternatives, including the Proposed Action: This chapter provides a detailed description of four alternatives: Alternative 1- No Livestock Grazing (No Action Alternative), Alternative 2- Grazing as Currently Permitted and Current Management, Alternative 3- Modified Grazing Management (Modified Proposed Action and Preferred Alternative), and Alternative 4- Modified Grazing Management with Riparian Emphasis. These alternatives were developed based on issues raised by the public, other agencies and the interdisciplinary team. This section also provides summary tables comparing the alternatives, their ability to meet the purpose and need for the project, and a summary of the environmental effects associated with each alternative.
- **Chapter 3**- Affected Environment and Environmental Consequences: This chapter describes the existing conditions in the natural and human environments that are potentially affected by the alternatives and describes the relative environmental effects of implementing the alternatives. Within each section, the effects of the No Action Alternative and/or the current management provide a baseline for evaluation of and comparison with the three livestock grazing alternatives. Environmental effects are described assuming that design features, which are part of the action alternatives described in Chapter 2, would be implemented. The chapter is organized by resource area. Chapter 3 also includes the Literature Cited section.
- **Chapter 4**-: Consultation and Coordination: This chapter provides a list of preparers and agencies consulted during the development of the DEIS, the Distribution List, Glossary, and Index.
- **Appendices**- Appendix A - Past, present, and reasonably foreseeable future activities considered for the cumulative effects analysis, Appendix B – Response to Comments, and Appendix C- Monitoring Plan.

Background

The project area for this rangeland project is located approximately 30 miles northwest of Pinedale, Wyoming in the Pinedale Ranger District of the Bridger-Teton National Forest (Figure 1). The majority of the project area lies within Sublette County, with portions that extend into Teton and Fremont Counties. The

170,643-acre project area encompasses the headwaters of both the Green River drainage of the Colorado River System and the Gros Ventre River drainage of the Snake/Columbia River Basin System. The Gros Ventre River is designated a Scenic River and the Green River, Roaring Fork River, and Tosi Creek are eligible for Wild and Scenic River designations. Portions of the Gros Ventre and Bridger Wildernesses are located in the project area (12,447 acres and 5,371 acre, respectively). State and private lands lie adjacent to the southern portion of the project area and private land is also located inside the project area boundary. The northern boundary of the project area is near the Continental Divide, which separates the Bridger-Teton and Shoshone National Forests.

During the early 1900s, the Forest Service developed a livestock grazing allotment system in the project area. There are currently six cattle and horse allotments included in this analysis: Badger Creek, Beaver-Twin Creeks, Noble Pastures, Roaring Fork, Wagon Creek, and Upper Green River allotments (Figure 2). Currently 21 different term grazing permit holders are authorized to graze approximately 9,089 cow/calf pairs or yearlings and includes 47 horses in the six allotments from June 14th to October 15th. Permitted animal unit months are approximately 46,148. An animal unit month is the amount of forage for one mature cow or equivalent for one month based upon an average daily forage consumption of 26 pounds of dry matter per day. This is the maximum permitted use; actual use is often less than this ceiling level. Monitoring conducted in the project area indicates that current grazing use is meeting resource objectives in most areas; however, monitoring has also identified some areas of concern where resource objectives are not being achieved. These unresolved issues are described in the Gap between Desired and Existing Conditions sections (Chapter 1), summarized in Table 1, and are carried through this environmental analysis.

The project area is also located within the Greater Yellowstone Ecosystem which is one of the largest intact ecosystems remaining in the temperate zones of the world (Keiter and Boyce 1991). The Greater Yellowstone Ecosystem support a full complement of native birds, mammals, and fish, including predators such as grizzly bears and some of the last large herds of migratory ungulates in North America. The terrestrial and aquatic species present in the area reflect the relatively intact environmental conditions found in the area. Grizzly bears inhabit the Upper Green River project area and have increased their distribution and abundance in the Greater Yellowstone since the 1970s. Conflicts between grizzly bears and humans and livestock have increased in recent years in the project area. This has resulted in the relocation, removal, or direct mortality of grizzly bears. The Forest Service in cooperation with the Wyoming Game and Fish Department and in consultation with the U.S. Fish and Wildlife Service have implemented conservation measures and terms and conditions aimed at minimizing human and livestock conflicts with grizzly bears.

On July 23, 2003, a notice of intent to publish an environmental impact statement (EIS) was published in the Federal Register for the proposal to continue to authorize livestock grazing on the six allotments in the Upper Green River project area. A FEIS and record of decision were released in October 2004; the record of decision was later withdrawn to conduct additional analysis. A notice of intent to prepare a supplement was published in the Federal Register on December 1, 2009. This DEIS contains additional information regarding the gap between existing and desired conditions (unresolved issues), changes to the proposed action (Alternative 3: Modified Grazing Management) that includes livestock grazing prescriptions designed to close the gap, an additional alternative, and additional environmental analysis.

Purpose and Need for Action

Purposes of the Upper Green River Rangeland Area Project are to:

1. Continue to authorize livestock grazing in a manner that will maintain or improve resource conditions;

2. Contribute toward achievement of Goal 1.1 of the Bridger-Teton Land and Resource Management Plan (Forest Plan) which directs the Bridger-Teton National Forest to support community prosperity (U.S. Forest Service 1990, p. 112-113); and
3. Update the allotment grazing management to reflect Forest Plan direction.

Need for Action

1. National Forest System lands provide an important source of livestock forage during portions of the year. Forest plans allocate areas of land suitable for domestic livestock grazing. There is a need for continued livestock grazing on the Bridger-Teton National Forest to contribute towards meeting the direction provided by the Forest Plan Goal 1.1 and Objective 1.1(h). Authorization of livestock grazing is needed on the six allotments in the Upper Green River project area because:
    a. Where consistent with other multiple use goals and objectives, there is Congressional intent to allow grazing on suitable lands (Multiple Use-Sustained Yield Act of 1960, Forest and Rangeland Renewable Resource Planning Act of 1974, Federal Land Policy and Management Act of 1976, and National Forest Management Act of 1976);
    b. Continued authorization of grazing on the six allotments in the Upper Green River project area would contribute to Forest Plan Goal 1.1 and Objective 1.1(h):
        - Communities continue or gain greater prosperity (Goal 1.1, U.S. Forest Service 1990, p. 112);
        - Provide forage for about 260,000 animal unit months (AUMs) of livestock grazing annually (Objective 1.1(h), U.S. Forest Service 1990, p. 113). Currently the Bridger-Teton National Forest authorizes permittees to graze their livestock for approximately 181,600 AUMs or about 70 percent of the 260,000 AUMs Forest objective;
        - Federal regulation (36 CFR 222.2©) states that “forage producing National Forest System lands will be managed for livestock grazing and the allotment management plans will be prepared consistent with [forest] plans.”

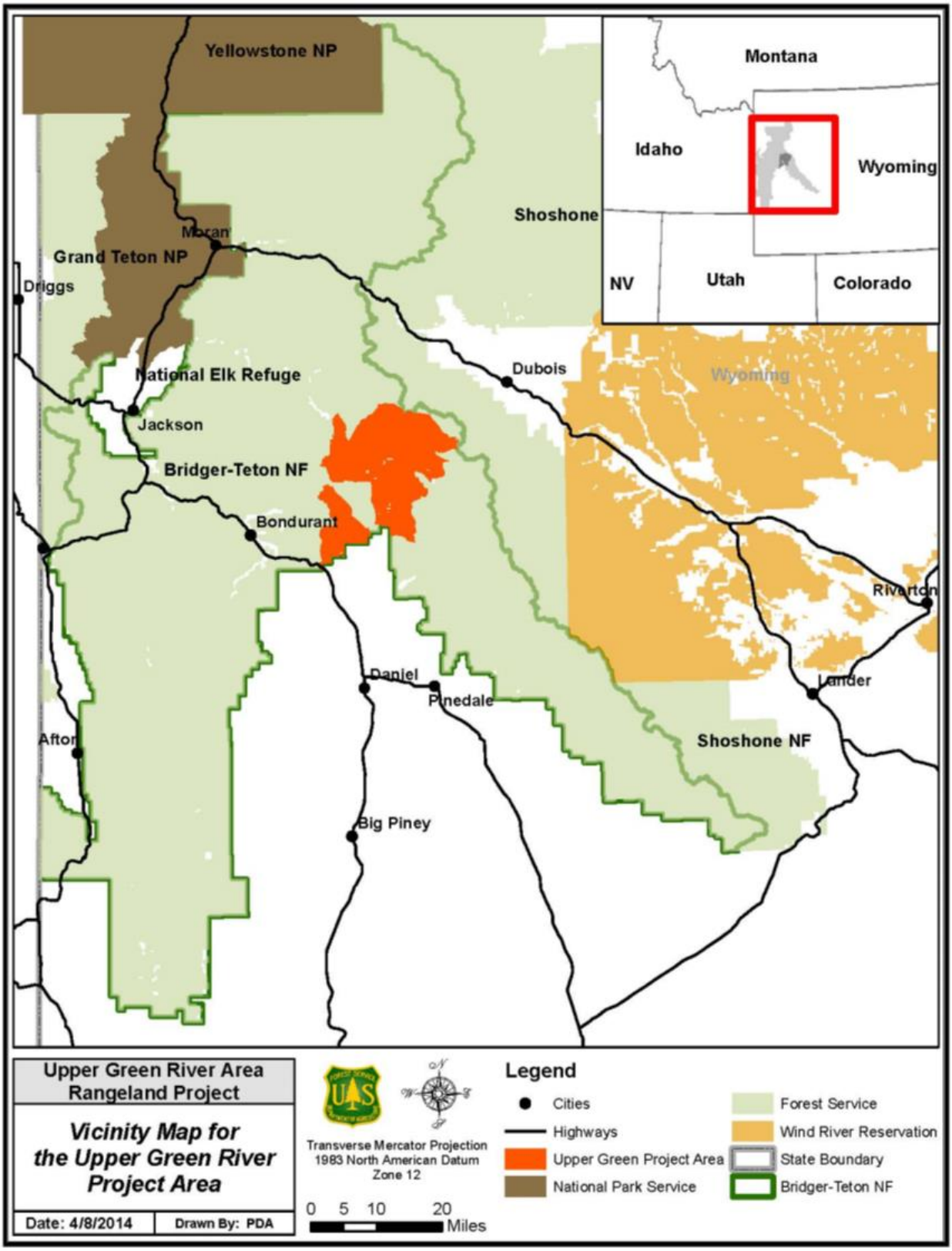

Figure 1. Vicinity map for the Upper Green River project area, Bridger-Teton National Forest

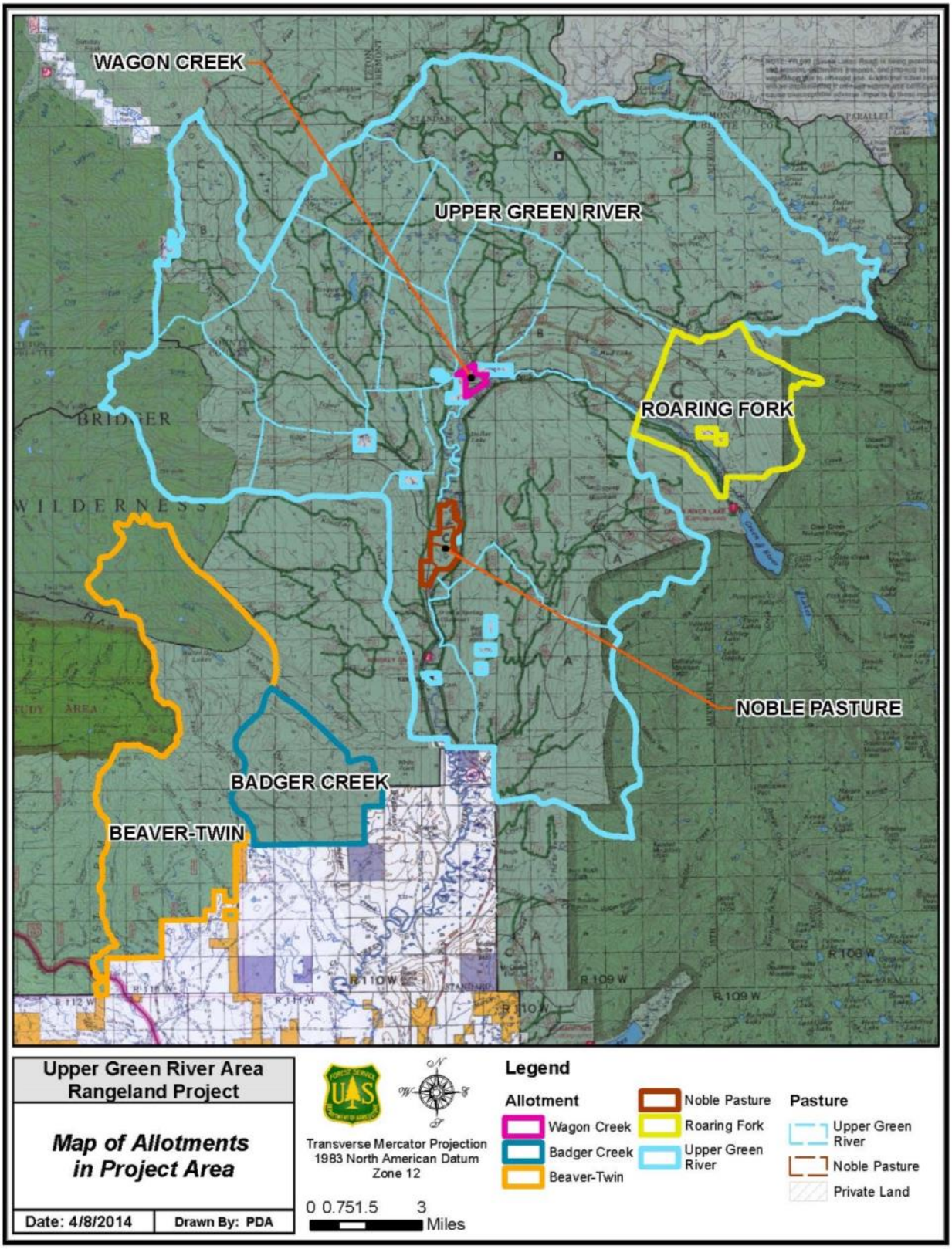

Figure 2. Badger, Beaver-Twin, Noble Pastures, Roaring Fork, Wagon Creek and Upper Green River Allotments

There is a need to avoid unacceptable effects from livestock use as outlined in Goal 4.7 of the Forest Plan which directs that grazing use of the National Forest sustain or improve overall range, soils, water, wildlife, and recreation values or experiences (U.S. Forest Service 1990, p. 120). The difference between the existing condition and desired condition in terms of resource objectives for rangeland vegetation, riparian areas, soils, water, fish, wildlife, and recreation values describes the need for federal action. Resource objectives established for this project are summarized below under Gap between Desired and Existing Conditions (Chapter 1). Monitoring conducted in the project area indicates that resource conditions are at desired condition in most cases; however, areas not at desired condition were identified (Table 1, Figure 3). Areas of concern were identified as issues that were carried forward through this analysis.

A summary of the identified gaps between desired and existing conditions is described below in the Gap between Desired and Existing Conditions section and are discussed in more detail in Chapter 3 and in the specialist reports. Chapter 3 also describes the factors that caused or resulted in the gap between existing and desired conditions. In some cases, current livestock management is one of many causative factors contributing to the existing condition. In other cases, historical and/or current livestock management is the primary causative factor contributing to the existing condition.

Gap between Desired and Existing Conditions

The Forest Plan directs that unacceptable effects from livestock are avoided and that livestock grazing use of the Bridger-Teton National Forest sustain or improve overall range, soils, water, wildlife, and recreation values or experiences (Goal 4.7, U.S. Forest Service 1990, p. 120). A comparison between desired and existing conditions with respect to these resources was conducted as outlined by the Grazing Permit Administration Handbook Chapter 90 – Rangeland Management Decision Making (Forest Service Handbook 2209.92.1). Indicators and associated resource objectives were used to describe and compare desired conditions and existing conditions. The differences between desired conditions and existing conditions in the six allotments were identified as areas of concern (Table 1). In Chapter 2, alternatives were developed to address the areas of concern and additional issues identified through public and internal Forest Service scoping. Resource objectives were based on direction from the Forest Plan (U.S. Forest Service 1990), Forest Service handbook, manual and interim direction, best science, and the interdisciplinary team professional judgement.

Summary of Resource Objectives

A list of objectives for highlighted resources pertinent to this project is first summarized and then described in more detail below along with the existing conditions. Additional information is provided in the specialist reports.

9. Rangelands
    - Ground cover objective: 80 to 95 percent ground cover depending on vegetation type
    - Species composition objective: Mid or late seral plant community with a stable or upward trend
    - Invasive plant species objective: Control or reduce the distribution and abundance of invasive plants
    - Sagebrush canopy cover objective for rangelands:
        - 10 percent of the sagebrush area has 0-5 percent shrub canopy cover.
        - 50 percent of the sagebrush area has 6-15 percent shrub canopy cover.
        - 40 percent of the sagebrush area has greater than15 percent shrub canopy cover.
10. Riparian areas
    - Stream bank stability objective: 75 to 85 percent depending on Rosgen channel type
    - Stream temperature objective: 68 degrees Fahrenheit

- Riparian function objective: A riparian system that captures sediment, maintains a high water table, and supports hydric vegetation that is capable of slowing high flows and protecting and stabilizing the stream banks.

11. Soils
    - Soil quality objective is satisfactory.
12. Grizzly bear
    - Grizzly bear management objective is to minimize the livestock related grizzly bear mortality.
13. Greater Sage-grouse
    - Herbaceous canopy cover objective: grass canopy cover is >15 percent in nesting habitat during the nesting season and herbaceous canopy cover is ≥15 percent in the summer habitat.
    - Grass height objective is ≥ 7 inches during the nesting season and ≥4-inches post nesting season in upland nesting habitat. Retain 4-inch stubble height for herbaceous riparian and meadow vegetation in all Greater Sage-grouse habitat.
    - Riparian function objective is described above.
    - Preferred forb availability objective is preferred forbs are common with several species present.
14. Amphibians: boreal toad, Columbian spotted frog, boreal chorus frog
    - Riparian function objective is described above.
    - Herbaceous retention objective is 70 percent.
15. Elk
    - Forage availability objective is to provide 2.5 million pounds of forage per year for 1,089 elk.
16. Recreation-related Resources
    - Recreation objective is management of recreation and livestock use that meets resource objectives while minimizing conflict between these uses.
    - Wilderness & Wilderness Study Areas' objective is management emphasis is to provide for the protection and perpetuation of natural biophysical conditions and a high degree of solitude for visitors but with some perceptible evidence of past human use.
    - Eligible Wild & Scenic Rivers' objective is river segments that have been determined eligible for potential addition to the National Wild and Scenic River system are protected from activities that could diminish or change the free-flowing characteristic, water quality, or the scenic, recreational, fish and wildlife, and other values which make the river eligible for designation.
    - Designated Wild & Scenic Rivers' objective is all designated river segments will be managed to protect and enhance their outstandingly remarkable values, free-flowing condition, and water quality for future generations.

Table 1. Areas of concern or areas that are not meeting resource objectives

Allotment	Pasture or Focus Area	Existing Ground Cover	Ground Cover Objective	Trend of Species Com-position	Creek Segment below desired condition	Existing Stream bank#	Stream bank Stability Objective	Existing Stream Temp. (68ºF objective)	Riparian Function/ Soil Quality
Beaver-Twin	(Proposed Twin Creeks Pasture - two sites)	64% 68%	85% (sage-brush) 80% (tall forb)	downward	No concerns identified	No concerns identified	No concerns identified	No concerns identified	No concerns identified
Beaver-Twin	Waterdog Lake Focus Area*	Cattle mortality due to poisonous plants*	No concerns identified	No concerns identified	No concerns identified	No concerns identified	No concerns identified	No concerns identified	No concerns identified
Noble Pastures	Pasture 3	No concerns identified	No concerns identified	No concerns identified	No concerns identified	No concerns identified	No concerns identified	No concerns identified	Soil compaction, hummocking
Noble Pastures	Tosi Creek Focus Area	No concerns identified	No concerns identified	No concerns identified	Lower Tosi Creek+	In 2009: 34% In 2012: 71%	@ 5yrs stable/ upward trend, @ 10 years upward trend, long-term 75%	No concerns identified	Unstable banks
Noble Pastures	Klondike Focus Area	No concerns identified	No concerns identified	No concerns identified	Klondike Creek+	48%	Stream channel type pending	No concerns identified	Unstable banks; low willow recruitment
Roaring Fork	Roaring Fork West Focus Area	No concerns identified	No concerns identified	downward	No concerns identified	No concerns identified	No concerns identified	No concerns identified	No concerns identified

Allotment	Pasture or Focus Area	Existing Ground Cover	Ground Cover Objective	Trend of Species Com-position	Creek Segment below desired condition	Existing Stream bank#	Stream bank Stability Objective	Existing Stream Temp. (68ºF objective)	Riparian Function/ Soil Quality
Upper Green River	Mud Lake East	No concerns identified	No concerns identified	No concerns identified	Crow Creek segment at SW pasture corner	No concerns identified	No concerns identified	No concerns identified	Impaired soil quality, willow pedestalling
Upper Green River	Mud Lake East Pasture	No concerns identified	No concerns identified	No concerns identified	Green River+ at confluence of Roaring Fork near elk feedground	No concerns identified	No concerns identified	No concerns identified	Functioning at Risk, Impaired soil quality, willow pedestaling
Upper Green River	Fish Creek Focus Area	No concerns identified	No concerns identified	No concerns identified	Fish Creek (site 1 & 2)	46 percent & 76 percent (site 1 & 2)	75%	No concerns identified	No concerns identified
Upper Green River	Fish Creek Pasture	No concerns identified	No concerns identified	No concerns identified	Strawberry Creek	In 2009: 80% In 2012: 48%	75%	No concerns identified	No concerns identified
Upper Green River	Mosquito SE Pasture	No concerns identified	No concerns identified	No concerns identified	Wagon Creek	No concerns identified	No concerns identified	71 – 73.9º F	No concerns identified
Upper Green River	Wagon Creek Focus Area	No concerns identified	No concerns identified	No concerns identified	Wagon Creek	No concerns identified	No concerns identified	No concerns identified	Increased erosion near stream crossing

Allotment	Pasture or Focus Area	Existing Ground Cover	Ground Cover Objective	Trend of Species Com-position	Creek Segment below desired condition	Existing Stream bank#	Stream bank Stability Objective	Existing Stream Temp. (68ºF objective)	Riparian Function/ Soil Quality
Upper Green River	Mosquito NW Pasture	No concerns identified	No concerns identified	downward	Wagon Creek	75%	85%	No concerns identified	No concerns identified
Upper Green River	Mosquito SW Pasture	No concerns identified	No concerns identified	downward	No concerns identified	No concerns identified	No concerns identified	No concerns identified	No concerns identified
Upper Green River	Tepee Creek Focus Area	No concerns identified	No concerns identified	No concerns identified	Tepee Creek	40%	@ 5yrs stable/ upward trend, @ 10 years upward trend, long-term 80%	No concerns identified	Incised channel; unstable banks; low riparian willow recruitment
Upper Green River	57 acre pasture adjacent to Darwin Ranch in the Kinky Creek Pasture	No concerns identified	No concerns identified	No concerns identified	Kinky Creek segment near Darwin Ranch +	No concerns identified	No concerns identified	No concerns identified	Soil compaction, hummocks
Upper Green River	Lower Gyp Pasture	No concerns identified	No concerns identified	No concerns identified	S. Gypsum Creek	2009 59 percent, 2012 73 percent	75%	No concerns identified	No concerns identified

Stability measured in 2012 unless otherwise noted *Existing condition at Waterdog Lake focus area is at desired condition due to current management. + These river segments are also not meeting resource objectives for Wild and Scenic Rivers

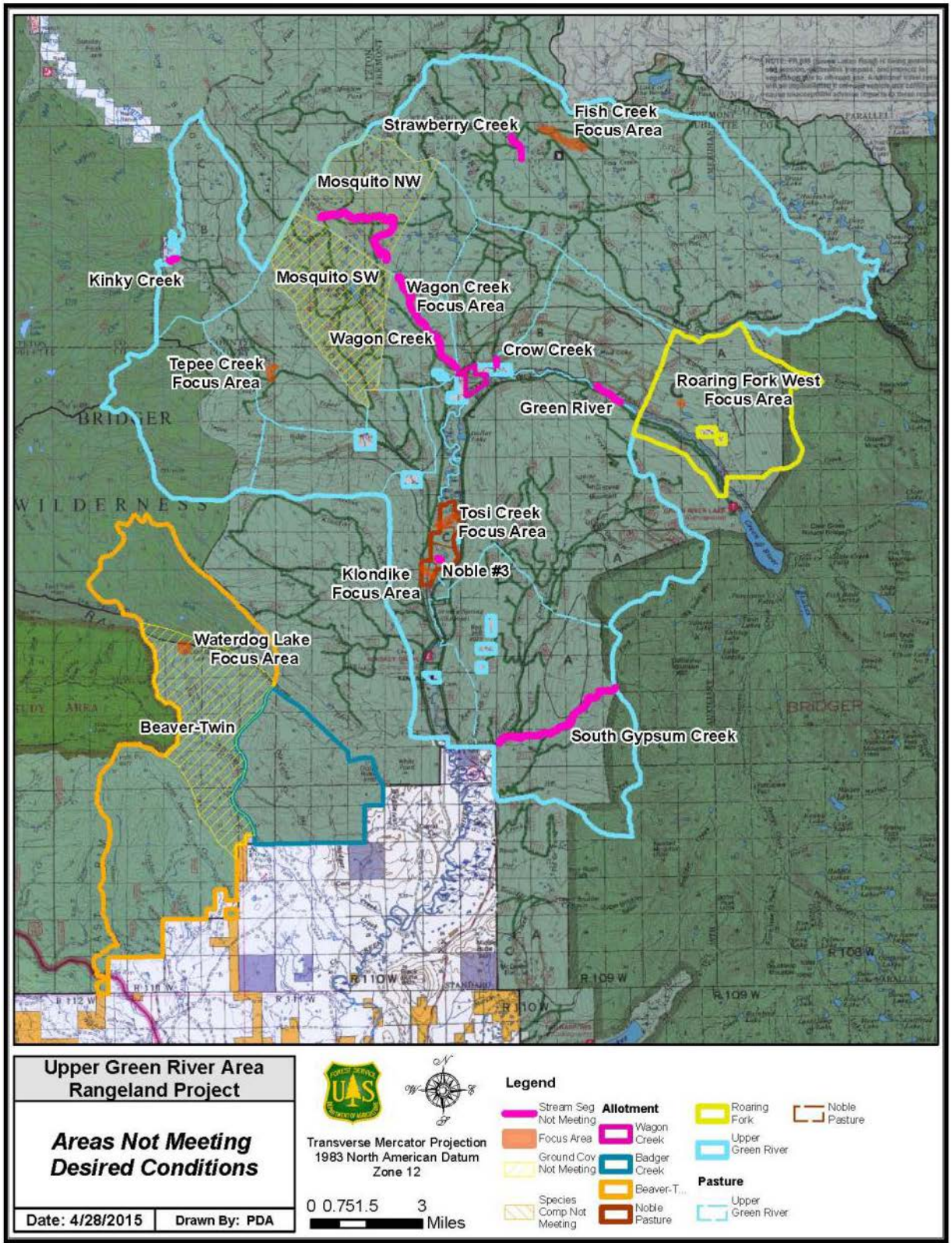

Figure 3. Map of areas not meeting resource objectives within the Upper Green River project area

Rangeland

The desired condition for rangeland vegetation in the Upper Green River area is described in the Forest Plan range prescription as "[r]ange is managed to maintain and enhance range and watershed condition while providing forage for livestock and wildlife" for Desired Future Condition (DFC) 10 and continues for DFC 12 "…, particularly big game" (Vegetation: Range Prescription, Forest Plan, U.S. Forest Service 1990 p. 236 and 244, respectively). These two DFCs comprise 84 percent of the project area. The desired condition for vegetation in the Upper Green River area is to [c]reate a species and age-class mix that is diverse and resilient to disturbance. Species mix and age class distribution will be within the historic range of variation, as defined in the Forest Proper Functioning Condition Assessment (U.S. Forest Service 1997).

Rangeland Indicators

Four rangeland indicators were selected to describe desired conditions in the Upper Green River project area. An objective for each indicator was determined based on direction from the Forest Plan (U.S. Forest Service 1990), the Forest Service Handbook Upland Rangeland Health Criteria (2209.21.22.1, U.S. Forest Service 2005a), information from the Indicators of Rangeland Health and Functionality in the Intermountain West - RMRS-GTR 104 (O'Brien et al. 2003), and in some cases refined for site-specificity at the project level by the interdisciplinary team. In general, the upland areas in the Upper Green River project area are in satisfactory condition with a few localized areas of concern described below which comprise a relatively small portion of the project area.

Ground Cover

Ground cover is an indicator used to describe desired conditions for rangelands. Percent ground cover is a percent measure of litter, basal vegetation, moss, and rocks greater than ¾ inch in diameter. This indicator is used to determine which areas are and which areas are not providing adequate cover to protect soil surfaces from excessive erosion. Minimum ground cover objectives were established by vegetation type and ranges from 80 to 95 percent for pastures in the project area.

Monitoring data (Booth and Hayward 2015, files in the project record) indicates that the majority of the pastures in the project area meet ground cover objectives and, therefore, based on this indicator, the rangeland health is generally in a functioning condition. Table 1 identifies two key sites in the Beaver-Twin Allotment with a gap between existing and desired conditions with respect to ground cover. Ground cover in the Beaver-Twin Allotment (specifically in the proposed Twin Creeks Pasture) is below the ground cover objectives (Figure 3). There is a need to address ground cover concerns in the Beaver-Twin Allotment.

Species Composition

Plant species composition is another rangeland indicator used to describe desired conditions. Species composition is a determination of which plant species, in relative abundance, occupy a site in comparison to a desired mix of species (range condition) or in comparison to the mix of species that would be expected without disturbances such as livestock grazing (ecological condition). Native herbaceous plant species (i.e., grasses and wildflowers) can be broadly grouped into one of two categories depending on how they respond to grazing pressure, decreaser and increaser plant species. Decreaser species tend to decrease in abundance under selective grazing pressure. Increaser species tend to increase in abundance under selective grazing pressure. In order to determine trends in plant species composition, monitoring data is compared across years to determine if there is a stable, upward or downward trend in decreaser and increaser plant species. Specifically, an upward trend in species composition refers to decline in the relative abundance of increaser species towards a greater relative abundance of decreaser plant species.

The species composition objective for the project area is plant communities in mid-seral or higher ecologic status with stable or upward ecologic trend in plant species composition. Mid-seral is defined as a 50 percent similarity in plant species to a potential natural community.

Monitoring data indicates that the majority of the pastures in the project area meet the species composition objectives and therefore, based on this indicator, the rangeland is generally at desired condition. Table 1 identifies one allotment (the Beaver-Twin Allotment), two pastures (the Mosquito NW and Mosquito SW pastures of the Upper Green River Allotment) and one focus area (Roaring Fork West focus area) with a gap between existing and desired conditions with respect to species composition.

A focus area is an area in need of special management consideration due to its unique characteristics or sensitivity to disturbance. Focus areas typically do not currently meet desired conditions for one or more resources and the causative factors vary. Focus areas do not represent the entire pasture or allotment. There are seven focus areas within the project area (Figure 3). The interdisciplinary team attributed the downward trend in plant species composition in the Roaring Fork West focus area primarily to wintering elk associated with the Upper Green River elk feedground rather than impacts attributed solely to livestock grazing. The Wyoming Game and Fish Department feed elk hay during the winter, which congregates high numbers of elk on the feedground and nearby areas. Therefore, a downward trend in species composition at the Roaring Fork West focus area warrants special management consideration with respect to livestock management. There is a need to address species composition concerns in Beaver-Twin Allotment (proposed Twin Creeks Pasture), Mosquito NW and Mosquito SW pastures, and in the Roaring Fork West focus area.

Invasive Plants

The third rangeland indicator used to describe desired rangeland conditions is invasive plant species. The desired condition is to control or reduce invasive plant species distribution and abundance as defined by the Management of Noxious Weeds on the Bridger-Teton National Forest Decision Notice (U.S. Forest Service 2005). Currently in the Upper Green River project area, Canada thistle is the most common invasive plant species and has been located on approximately 137 acres or less than 0.1 percent of the project area. Areas of known invasive plant infestations are primarily associated with recreation, elk feeding, and timber harvest activities and are located along the Green River Lakes Road, Green River Lakes Campground and Trailhead, the Upper Green River elk feedground, Whiskey Grove Campground, Beaver-Twin Creeks area, and along the Moose Creek-Gypsum Creek Road. Distribution and abundance of invasive plants are limited and stable within the project area and no invasive plants have been identified in key areas which are representative of effects of livestock grazing in pastures and allotments. The Forest Service will continue to manage invasive plant species using the Forest Integrated Invasive Species Management Strategy (U.S. Forest Service 2008a). The existing condition in the project area meets the invasive plant species objective for the project and is therefore at the desired condition with respect to this indicator. There is no need (gap between desired and existing condition) identified that this project should address in terms of invasive plant species.

Shrub Cover

Shrub cover is the fourth rangeland indicator used to describe desired rangeland conditions. Shrublands within the Bridger-Teton National Forest (Forest) are dominated by big sagebrush which typically covers large continuous areas. As a result of direct and indirect effects of fire suppression, the mix of structure and age classes of sagebrush across the Forest is outside the historic range of variation. Approximately 90 percent of the big sagebrush communities in the Forest have over 15 percent shrub canopy cover and approximately 40 percent have over 30 percent canopy cover (U.S. Forest Service 1997, p. 20). This indicates that there is an overabundance of sagebrush with high canopy cover on the Forest.

Shrub canopy cover was assessed at the landscape level within the project area rather than at the pasture or allotment level because the desired classes of canopy cover are expected to occur across larger areas than the

pasture or allotment scale. In general, the sagebrush communities within the Upper Green River project area are skewed toward mature stands with high canopy cover. The desired mix of canopy cover classes for sustainable and functional sagebrush ecosystems as identified in the Forest Service Handbook 2209. 21.22 .1 (U.S. Forest Service 2005a) is:

- 10 percent of the sagebrush area has 0-5 percent shrub canopy cover.
- 50 percent of the sagebrush area has 6-15 percent shrub canopy cover.
- 40 percent of the sagebrush area has greater than 15 percent shrub canopy cover.

The existing mix of cover classes for shrublands is approximately:

- 8 percent of sagebrush areas have less than 10 percent shrub canopy cover.
- 31 percent of sagebrush areas have 10-25 percent shrub canopy cover.
- 61 percent of sagebrush areas have greater than 25 percent shrub canopy cover.

Although the breakoff of shrub canopy cover classes differ slightly between the desired and existing condition data sets, the data indicates that there currently is an overabundance of sagebrush with high canopy cover in the Upper Green River project area compared to the desired condition. Of the 50,614 acres of sagebrush habitat within the project area, the majority of the sagebrush canopy cover (more than 61 percent) is in excess of 15 percent compared to the desired condition of 40 percent. Shrub cover also indicates a lower than desired percent of sagebrush in the moderate shrub canopy cover class. Sagebrush canopy cover in excess of 20 percent can contribute to reduced herbaceous productivity (Winward 1991).

Long-term increases in shrub canopy cover have been associated with livestock grazing and fire suppression. The shrub communities in the project area have likely responded to historical grazing by increasing in density and cover. This increase in shrub canopy cover may be brought on in two ways: first, by reducing competition from grasses and forbs (Whisenant 1990, Daddy 1988) and second, by reducing fine fuels and thereby reducing the spread of wildfires (Tart 1996). A history of fire suppression has also contributed substantially to the existing condition of high sagebrush canopy cover. Once canopy cover density exceeds 15 percent, reduction of sagebrush canopy cover to desired levels cannot be accomplished with changes in livestock grazing management (Blaisdell et al. 1982, Winward 1991). Rather, the reduction of shrub cover to a desired level would require re-introduction of fire or other mechanical treatment to reduce shrub cover. The need to address the imbalance in sagebrush cover greater than 15 percent within the project areas is recognized, but is outside the scope of this project because livestock grazing cannot effectively be managed to reduce shrub cover. Reduction of sagebrush cover in the Upper Green River project area is a need identified for a future project that would require additional planning and environmental analysis. However, in the Upper Green River Rangeland Area Project, there is a need to ensure that sagebrush communities with less than 25 percent shrub canopy do not increase in shrub canopy cover. This can be accomplished by maintaining or enhancing the grass and forb understory.

Riparian Indicators

Three riparian indicators were used to describe desired conditions in riparian areas, stream bank stability, stream temperature and riparian function. In general, desirable riparian vegetation binds soil in root mass, which in turn resists erosion and helps maintain stream channel form particularly in low-gradient alluvial valleys. Riparian vegetation also provides roughness, thereby reducing water flow velocities during high flow conditions and encourages sediment deposition on the banks. Shade provided by streamside vegetation buffers streams from solar heating and affects levels of stream primary production, macro-invertebrate community composition, and fisheries health.

Riparian indicators and objectives were based on the Stream Bank Stability Guideline in the Forest Plan (U.S. Forest Service 1990, p. 126), the Caribou National Forest Riparian Grazing Implementation Guide

Version 1-2 (Leffert 2005), Riparian Area Management: Multiple Indicator Monitoring (MIM) of Stream Channels and Streamside Vegetation (Burton et al. 2011), Wyoming Department of Environmental Quality water quality standards and Riparian Area Management: A User's Guide to Assessing Proper Functioning Condition and the Supporting Science for Lotic Areas (Bureau of Land Management 1998, GTR-1737-15).

Stream Bank Stability

Stream bank stability is a riparian indicator used to describe desired conditions. Stream bank stability incorporates bank vegetative cover and stability measurements to reflect long-term stream bank conditions. A stream bank exhibits features of instability if it lacks riparian vegetation and/or contains fractures, slumps or a steep bank that is actively eroding. Stream bank stability is the percent of the bank that can be susceptible to erosion but which has sufficient vegetation and structure to maintain stability (Burton et al. 2011).

The Forest Plan's Stream Bank Stability Guideline (U.S. Forest Service 1990) states that "[a]t least 90 percent of the natural bank stability of streams that support a fishery, particularly, threatened, endangered and sensitive species, and all trout species, should be maintained. Stream bank vegetation should be maintained at 80 percent of its potential natural condition. Stream bank stability, vegetation, and fish numbers and biomass should be managed by stream type." Stream bank stability objectives range from 75 to 85 percent depending on Rosgen channel type (Rosgen 1996) for streams found in the Upper Green River project area. Table 1 identifies creek segments that do not meet stream bank stability objectives including Klondike Creek focus area, Fish Creek focus area, and Tepee Creek focus area, Wagon Creek in the Mosquito NW Pasture and Strawberry Creek in the Fish Creek Pasture. Stream bank stability on South Gypsum Creek and Tosi Creek focus area are considered at objective because they are within the range of variability associated with sampling error (95 percent confidence interval), but these sites may warrant further management consideration to ensure that they remain at objective. There is a need to increase the stream bank stability of these streams within the project area (Figure 3).

Stream Temperature

Stream temperature is an indicator used to describe desired conditions. Stream temperature was selected as a riparian indicator because it can be sensitive to land use and watershed impacts. Land management actions that reduce riparian vegetation, increase stream channel width-depth ratio, reduce in-stream flows, or modify groundwater exchange are the principle causes for elevated stream temperatures. Excessive stream temperatures can reflect poor habitat conditions for native fish species and influence the metabolism, behavior, and survival of fish. The stream temperature objective is 68 degrees Fahrenheit or colder (measured as the warmest mean weekly maximum temperature) in the Upper Green River project area. This objective is based on the Wyoming State water quality standard for Class 1, 2AB, and 2A streams which requires that maximum stream temperatures exceeding the threshold of 68 degrees Fahrenheit are not caused by management activities. Some caution must be applied with this indicator as some stream temperatures can exceed the objective under natural conditions. Table 1 and Figure 3 identify Wagon Creek in the Mosquito Lake SE Pasture of the Upper Green River Allotment as not meeting the stream temperature objective. Further investigation would be necessary to determine if elevated stream temperatures in Wagon Creek is a natural condition or caused by management activities. However, further investigation into the causative factors is not warranted because: 1) there are no threatened, endangered or sensitive fish species found in Wagon Creek; 2) under the current conditions, the stream supports a productive brook trout fishery; and 3) the information needed to determine the causative factors is unavailable and prohibitively expensive.

Riparian Function

Riparian function is an indicator used to describe desired conditions in riparian and wetland areas. Desired conditions for the riparian function indicator in the Upper Green River project area are described as the following:

- Streams, riparian areas, and wetlands are in a healthy, functioning condition;
- Riparian areas, including floodplains and wetlands, store and release enough water to maintain natural conditions of groundwater and stream flow;
- Plant species composition approximates the historic (natural) species composition;
- Willow stands occupy the full extent of valley bottoms that they would occupy when riparian areas are at properly functioning condition, are actively replenishing and only a small minority of willows are hedged;
- Riparian vegetation cover and root-mass on banks, in wetland areas, and on floodplains is sufficient to catch sediment, dissipate stream energy during floods, stabilize stream banks to maintain channel form and reduce excessive bank erosion, and promote floodplain development; and
- Flood waters are able to access the active floodplain during normal high discharges (i.e., channels are not down-cut).

Riparian function is a qualitative assessment based on the desired conditions described above. The riparian function objective is to have a riparian system that captures sediment, maintains a high water table, and supports hydric vegetation that is capable of slowing high flows, and protects and stabilizes the stream banks. Riparian function was broadly evaluated using the Wyoming Habitat Assessment Methodology (WHAM, Burton et al. 2011), and a subset of locations were more thoroughly assessed during site visits conducted by the interdisciplinary team. In addition five sites on the Green River were evaluated using proper functioning condition (PFC, Bureau of Land Management 1998).

Monitoring data (Robertson 2016, Anderson 2015) indicates that the majority of the streams in the project area meet the riparian function objective and, therefore based on this indicator, the riparian existing condition is generally in a healthy, functioning condition. Table 1 and Figure 3 identify four creeks in focus areas (Tosi Creek focus area, Klondike Creek focus area, Wagon Creek focus area and Tepee Creek focus area) and a segment of the Kinky Creek, Crow Creek, and the Green River in the Mud Lake East Pasture of the Upper Green River Allotment that do not meet the riparian function objective. The Green River segment is located near the Upper Green River elk feedground. There is a need to improve riparian function on these streams within the project area.

Soils

Soil quality

Soil quality is an indicator used to describe and evaluate the desired and existing soil conditions in the project area. Soil quality is defined as the capacity of soil to function within natural or managed ecosystem boundaries, sustain plant and animal productivity, maintain or enhance the quality of water and air, and support human activities (Natural Resource Conservation Service 2001). Livestock grazing has the potential to degrade soil quality directly by trampling soils and indirectly by consuming or trampling vegetation that otherwise protects and helps form soils (Reid 1993, Natural Resource Conservation Service 2001). Soil compaction may reduce water infiltration and storage, physically restricts root growth, and reduces nutrient availability (Natural Resource Conservation Service 2001). The loss of vegetation results in bare ground, which is more susceptible to water and wind erosion, has increased precipitation runoff, and has less organic matter available for nutrient cycling (Natural Resource Conservation Service 2003).

A soil quality assessment was completed at sites within each pasture based on indicators of soil hydrologic and physical properties from site observations. Indicators included soil structure, compaction, active erosion including presence of rills and gullies, effective ground cover, soil displacement, and soil deposition. After

these indicators were assessed a soil health rating of satisfactory, impaired or unsatisfactory was determined. The soil quality objective is satisfactory.

The soil quality assessment indicated impaired soil quality for a small proportion (<1 percent) of the project area grazed by cattle (capable area). Soil displacement and compaction associated with cattle use were observed in isolated areas of concern including Noble Pasture 3 (3 acres) and Mud Lake East Pasture along a segment of Crow Creek (10 acres) and at the confluence of the Green River and Roaring Fork (4 acres). There is a need to improve soil quality in these areas.

Wildlife

The desired condition for wildlife is "[t]he Bridger-Teton National Forest provides habitat adequate to meet the needs of dependent fish and wildlife populations, including those threatened, endangered, and sensitive species" (U.S. Forest Service 1990, p. 123). The management emphasis for the Desired Future Condition (DFC) 10 is to provide long-term and short-term habitat to meet the needs of wildlife managed in balance with timber harvest, grazing, and minerals development (U.S. Forest Service 1990, p. 235). Sixty-six percent of the project area is designated as DFC 10. The management emphasis for the DFC 12 is providing such important habitat for big game as winter ranges, feedgrounds, calving areas, and security areas (U.S. Forest Service 1990, p. 235). Eighteen percent of the project area is designated as DFC 12.

Population and habitat conditions, and the effects of livestock grazing on threatened and endangered species, sensitive species, management indicator species, and migratory bird species were evaluated (Wildlife section, Murphy 2016, A. DeLong 2015, Roberts 2016, Wilmot 2015, Egan 2015, and D. DeLong 2016). Of these, grizzly bears, boreal toads/ Columbian spotted frogs, Greater Sage-grouse, and elk were identified as having the greatest potential to be affected by livestock grazing. A comparison of the desired and existing conditions for these species, and the indicators used to evaluate the effects of the alternatives are briefly summarized below. More detailed information can be found in Chapter 3 and in the specialist reports.

Grizzly Bears

The Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) requires that the Forest Service will seek to conserve endangered and threatened species. The Forest Service is directed to manage habitats for threatened and endangered species to achieve recovery objectives so that protection provided under the Endangered Species Act are no longer necessary (FSM 2670.21). Forest Plan Goal 3.1 is to achieve grizzly bear recovery (U.S. Forest Service, p. 116). The desired condition for grizzly bears in the Upper Green River Area Rangeland project area is to contribute to grizzly bear recovery by following the Grizzly Bear Recovery Plan and applying the Grizzly Bear Management Guidelines in a manner consistent with the standards, guidelines, management emphasis statements for DFC areas identified in the Forest Plan. This includes minimizing bear-livestock conflicts by implementing the conservation measures and terms and conditions included in the current U.S. Forest Service Biological Assessment and U.S. Fish and Wildlife Service Biological Opinion (2014). The conservation measures and limits on grizzly bear mortality identified in these documents provide for a balance between livestock grazing management and grizzly bear losses resulting from conflicts with livestock.

Mortalities Associated with Livestock Depredation

Livestock-related mortality of grizzly bears was used as an indicator to evaluate the ability of the alternatives to achieve the desired conditions. The grizzly bear objective for the project is to minimize the livestock related grizzly bear mortality.

The U.S. Fish and Wildlife Service authorized an incidental take of grizzly bears by the Forest Service for livestock grazing management on the northern portions of the Pinedale Ranger District. This area is comprised of the six cattle allotments in the project area and three adjacent sheep allotments. The U.S. Fish

and Wildlife Service (2014) anticipated a lethal removal of up to 11 grizzly bears within any consecutive 3-year period on the nine allotments, including the Upper Green River project area, to be in effect through the end of 2019. This is the threshold for significance.

Currently, desired conditions for grizzly bear management are being achieved in the project area. Although two to four grizzly bear deaths due to livestock management occur annually in the project area, losses are not impeding recovery of the species, as opined by the U.S. Fish and Wildlife Service (2014). A recovered grizzly bear population is one having a high probability of persistence into the foreseeable future (greater than 100 years), and for which the five factors in Section 4(a)(1) of the Endangered Species Act have been successfully addressed. The grizzly bear population currently is numerically stable to slowly increasing (0–2 percent annually) and consistently meets demographic criteria established for the population. Livestock management on the project area and in the Greater Yellowstone Ecosystem is not an important factor influencing grizzly bear population growth (Interagency Grizzly Bear Study Team 2013).

Amphibians

The desired conditions for amphibians (boreal toads, Columbian spotted frogs, and boreal chorus frogs) are to maintain or achieve properly functioning riparian communities, and to provide cover sufficient to prevent long-term declines in populations on the Forest and a trend toward federal listing. Two indicators of amphibian habitat were used to identify desired conditions in the project area: riparian function and herbaceous retention. Riparian function is described above as a riparian indicator. Herbaceous retention is the current year's production of all herbaceous vegetation on a given site that is not consumed or trampled by grazing animals. These indicators were used in the effects analysis for the three identified amphibian species. This approach was based on the best available science, including recommendations from the Boreal Toad Recovery Team and Technical Advisory Group (2001).

Riparian Function

Stable stream banks and riparian areas that function properly help provide suitable habitat for amphibians. The riparian function indicator and objective is identical to that established for riparian areas described previously. The riparian function objective is a riparian system that captures sediment, maintains a high water table, and supports hydric vegetation that is capable of slowing high flows and protecting and stabilizing the stream banks. Nearly all riparian habitats in the project area meet desired conditions, except Tosi Creek focus area, Klondike Creek, Fish Creek focus area, Tepee Creek focus area, Wagon Creek in the Mosquito NW Pasture and Strawberry Creek in the Fish Creek Pasture, Crow Creek and the segment of the Green River in the Mud Lake East Pasture of the Upper Green River Allotment.

Herbaceous Retention

Retention of herbaceous vegetation is the second amphibian habitat indicator used to describe desired conditions for amphibians. The herbaceous retention objective for the Upper Green River Area Rangeland project is greater than or equal to 70 percent retention of herbaceous vegetation in riparian areas. Based on monitoring during the 2013 and 2014 grazing seasons, the average retention of herbaceous cover in moist meadows was estimated at 62 percent. The sites were subjectively chosen within amphibian breeding areas, and were typically located in areas easily accessible to cattle. During 2011, livestock utilization of key forage in the combined Roaring Fork and Beaver Twin allotments, and Upper Green River Mud Lake East Pasture averaged 8 percent, 34 percent in Noble Pastures Allotment, and 65 percent in the Wagon Creek Allotment. Forage utilization calculated in terms of retention of herbaceous vegetation was then estimated as 92, 66, and 35 percent, respectively. Overall, these results suggested that the sampled allotments met, or nearly met, desired conditions for retention of herbaceous vegetation, except at the Wagon Creek Allotment.

Greater Sage-grouse

The Greater Sage-grouse Record of Decision for Northwest Colorado and Wyoming (U.S. Forest Service 2015) was signed in September of 2015. This Record of Decision approved the Greater Sage-grouse Wyoming Plan Amendment (U.S. Forest Service 2015 Attachment B), which defines the desired conditions for Greater Sage-grouse and provides the management direction on the Bridger-Teton National Forest. In Greater Sage-grouse habitat management areas, including all seasonal habitat, 70 percent or more of lands capable of producing sagebrush have from 10 to 30 percent sagebrush canopy cover and less than 10 percent conifer cover. In addition, within breeding and nesting habitat, sufficient herbaceous vegetation structure and height provides overhead and lateral concealment for nesting and early brood rearing life stages. Within brood rearing habitat, wet meadows and riparian areas sustain a rich diversity of perennial grass and forb species relative to site potential. Specific desired conditions for the Greater Sage-grouse based on seasonal habitat requirements are in Table 35 (U.S. Forest Service 2015 - Greater Sage-grouse Wyoming Plan Amendment, GRSG-GRSGH-DC-002). In priority and general habitat management areas, sagebrush focal areas, and within lek buffers, livestock grazing is managed to maintain or move towards desired habitat conditions in Table 35 (GRSG-LG-DC-036-Desired Condition). Greater than 80 of the project area meet the nesting habitat objectives and greater than 40 percent of the project area meets the summer habitat objectives.

Four habitat indicators identified in in Table 35 (herbaceous canopy cover, grass height, preferred forbs availability, and riparian function) were selected for this project to describe desired conditions, evaluate existing conditions, and evaluate the effects of the alternatives on Greater Sage-grouse and their habitat. These indicators were selected because they were the most likely to be affected by livestock management proposed in this project. The herbaceous canopy cover objective during the nesting season is grass canopy cover is greater than or equal to 15 percent in nesting habitat. In the summer habitat, herbaceous canopy cover is greater than or equal to 15 percent. In nesting habitat, the grass height objective is greater than or equal to 7 inches during the nesting season and greater than or equal to 4-inches post nesting season. A 4-inch or greater stubble height for herbaceous riparian and meadow vegetation is retained in all Greater Sage-grouse habitat. The preferred forb availability objective is preferred forbs are common with several species present. The riparian function objective is as previously stated.

Existing conditions for Greater Sage-grouse nesting and summer habitats meet the habitat objectives for these indicators across 80 percent of the nesting habitat and more than 40 percent of the summer habitat as directed in the Greater Sage-grouse Wyoming Plan Amendment (U.S. Forest Service 2015 Attachment B). Existing conditions for riparian function generally met the objective with exceptions in limited areas as described above for riparian areas.

Elk

The desired condition for elk is to provide sufficient habitat, or an adequate amount of suitable forage and cover, to maintain the desired populations and distribution of elk identified by the Wyoming Game and Fish Department. The desired condition was based on the Big-Game Habitat Guideline for DFC 10 and 12 in the Forest Plan (US Forest Service 1990, pp. 236, 244), and the Forest Plan Objective 4.7(d) (U.S. Forest Service 1990, p. 120) and other best available science cited in the wildlife report (Wilmot 2015).

The forage availability is the indicator selected to describe the desired condition, evaluate the existing condition, and compare alternatives. The forage availability objective is to provide 2.5 million pounds of forage per year for 1,089 elk or 6.8 million pounds of forage per year for elk, mule deer, moose and pronghorn (i.e., harvest management indicator species) combined. This assumes supplemental winter feeding continues. Approximately 1,089 elk is the estimated proportion of elk in the Upper Green River elk herd that are relevant to the project area, which includes those elk that winter at the Upper Green and Black Butte feedgrounds and those elk that winter on native range near both of those feedgrounds.

The desired condition for the Upper Green River elk herd is currently being met in the project area. Under existing conditions, there is approximately 104 million pounds of herbaceous vegetation produced annually on capable and suitable lands in the project area. A portion of this herbaceous vegetation is available as forage. Approximately 60 percent of herbaceous vegetation in uplands and 65 percent in riparian areas are available for livestock and elk, based on current permitted forage utilization levels or 63.4 million pounds of herbaceous vegetation available as forage within the project area. Currently permitted livestock (9,089 cow/calf pairs or yearlings and includes 47 horses) consume approximately 37 million pounds of forage during the permitted season of use. About 1,089 elk would consume 2.5 million pounds of forage and all harvest management indicator species combined would consume approximately 6.8 million pounds of forage. Livestock and harvest management indicator species would conservatively consume 43.7 million pounds of forage annually and there is 63.4 million available. Forty-three point seven million pounds would be on the high end (maximum) estimated consumed by livestock and all harvest management indicator species because moose and deer would browse and not solely forage on herbaceous material. Therefore, there is sufficient herbaceous forage available for livestock, elk, mule deer, moose, and pronghorn with approximately 19.7 million pounds of herbaceous vegetation remaining.

Recreation and Related Resources

The desired and existing conditions for recreation and related resources in the Upper Green River project area are summarized below by resource with detailed information provided in the Recreation and Related Resources Specialist Report (Stein 2016).

Visual Quality Objectives

The desired condition for visual quality is that the visual quality objectives, as defined in the Forest Plan (U.S. Forest Service 1990, pp. 10-11), are being met. Most of the Upper Green River and surrounding area is exceptionally scenic and wild, and human-caused impacts to the natural landscape are minor and few. The visual quality objective of retention is not being met at several sites along the Green River corridor, including the Forest boundary, Kendall Bridge, Dollar Lake and the Green River elk feedground. This is primarily a result of recreation use and elk feeding impacts rather than livestock use. Current livestock management practices are meeting desired conditions for visual quality.

Recreation

The desired condition for management of recreation and livestock use meets resource objectives while minimizing conflict between these uses. Several sites along the Green River corridor, including the Forest boundary, Kendall Bridge, Dollar Lake and Green River elk feedground, are negatively impacted primarily as a result of recreation use and elk feeding rather than livestock use. Although livestock and recreationists are attracted to the same areas (relatively flat areas near water), conflict between dispersed recreation users and livestock in the project area is rarely reported. Current livestock management practices are meeting desired conditions for developed and dispersed recreation.

Access (Roads & Trails)

The desired condition for management of roads and trails compliments livestock management objectives, including visitor safety and resource protection. Recreation impact to riparian areas and streams associated with dispersed camping and all-terrain-vehicle use off of designated open motorized roads is a concern within the project area particularly in the Green River corridor, Fish Creek focus area and Wagon Creek focus area, but is primarily related to recreation use rather than livestock grazing. Visitor safety is addressed during cattle drives in the livestock driveway by posting of warning signs along the road. Livestock carcasses are removed or treated within a half mile of Green River Lakes Road, Union Pass Road, Forest Service roads 605, 660, 663B and 663C, Green River Lakes and Whiskey campgrounds, private cabins, Kendall and Fish Creek guard stations, permitted cow camps, permitted outfitter camps, Lake of the Woods, Waterdog Lakes,

and North Beaver and Tosi trailheads to reduce human/ bear conflicts. Livestock carcasses posing a health or safety hazard are moved when within a quarter mile of live streams, springs, lakes, water, riparian areas, system roads and trails, developed recreation areas, dispersed camping and picnic sites to reduce human/ bear conflicts. Current livestock management practices are meeting desired conditions regarding management of roads and trails.

Wilderness and Wilderness Study Areas

Management emphasis is to provide for the protection and perpetuation of natural biophysical conditions and a high degree of solitude for visitors but with some perceptible evidence of past human use. Rangeland is managed to maintain and enhance range and watershed conditions while providing forage for livestock, recreational stock and wildlife. Current livestock management practices within the Bridger and Gros Ventre Wilderness are meeting desired conditions and are consistent with Forest Plan direction, Wilderness Action Plans, 1964 Wilderness Act and 1984 Wyoming Wilderness Act. No focus areas or site-specific livestock related resource concerns have been identified within these Wilderness Areas. Wilderness and Wilderness Study Areas meet the desired condition.

Wild and Scenic Rivers

The desired conditions are that all designated Wild and Scenic River segments will be managed to protect and enhance their outstandingly remarkable values, free-flowing condition, and water quality for future generations. In addition, river segments that have been determined eligible for potential addition to the National Wild and Scenic River system are protected from activities that could diminish or change the free-flowing characteristic, water quality, or the scenic, recreational, fish and wildlife, and other values which make the river eligible for designation.

Segments of Lower Tosi Creek, Klondike Creek, and Upper Green River at the confluence of Roaring Fork near the elk feedground, and a segment of Kinky Creek near Darwin Ranch are not meeting riparian function or stream bank stability objectives as described previously, and therefore are also not meeting Wild and Scenic Rivers' objective in these segments. The remainder of eligible and designated Wild and Scenic Rivers and streams are meeting the Wild and Scenic Rivers' direction.

Proposed Action

The Pinedale Ranger District proposes to authorize continued livestock grazing on the Badger Creek, Beaver-Twin, Noble Pastures, Roaring Fork, Wagon Creek, and the Upper Green River allotments in the Upper Green River project area using adaptive livestock management strategies designed to maintain resource conditions where desired conditions are being met and improve resource conditions where a gap between existing conditions and desired conditions has been identified. Under the proposed action, the Forest Service would initiate a rotational grazing system in the Badger Creek, Beaver-Twin Creeks, and Roaring Fork allotments to meet Forest Plan requirements and would modify the management system in the Noble Pastures and Upper Green River allotments. The modified proposed action (Alternative 3, the Preferred Alternative) would authorize 8,819 cow/calf pairs or yearlings and includes 47 horses on the six allotments, and would provide a maximum of 44,722 animal unit months. The permitted number of livestock under the modified proposed action is a 270 reduction from the currently permitted number of livestock. The permitted season of use varies by allotment but occurs from June 14th to October 15th annually across the project area.

The proposed livestock management would allow a maximum of 50 percent forage utilization on key forage species in the uplands and riparian areas and retain a 4-inch stubble height minimum along the greenline of streams for pastures and allotments currently meeting resource objectives and which are, therefore, at desired conditions. Adaptive management would be implemented if future monitoring indicated that conditions were not meeting resource objectives due to livestock impacts. Adaptive management would entail reducing the

maximum allowable use on key forage species in increments of 10 percent to a minimum of 30 percent forage utilization and/or increasing the minimum riparian stubble height remaining from 4-inches to 6 inches until such time as the resource objective(s) is reached.

More restrictive allowable use standards and/or other management strategies detailed in Chapter 2 would be implemented in focus areas, and pastures or allotments currently not meeting or moving towards desired conditions under existing conditions.

In addition, approximately seven miles of proposed fencing would be constructed including fences to divide the Beaver-Twin Allotment into three pastures, add the South Kinky Creek Pasture to the Upper Green River Allotment and improve resource conditions in focus areas. The modified proposed action also incorporates the implementation of grizzly bear conservation measures and terms and conditions designed to minimize grizzly bear/livestock and grizzly bear/human safety concerns. For a more detailed description of the proposed action, refer to Alternative 3 in Chapter 2, Items Common to Action Alternatives and Appendix C (Monitoring Plan).

Decision Framework

Given the purpose and need, the Responsible Official reviews the modified proposed action, the other alternatives, and the environmental consequences in order to make the following decisions:

Decisions:

- Whether livestock grazing should be authorized on all, part, or none of the project area;
- If the decision is to authorize some level of livestock grazing, then which livestock management strategy, including grazing system, allowable use standards, design features, structural range improvements, adaptive management, and monitoring requirements, would be applied to ensure that desired resource objectives are met or that movement towards those objectives would occur.

Permit Administration: This document focuses on managing livestock grazing in order that existing conditions would meet or move towards desired conditions using allowable use standards, design features, and structural improvements. The decision based on this analysis would establish the sideboards or limits within which subsequent administrative changes can be made. The decision would also identify maximum limits on livestock numbers and season of use. The actual amount of forage removed by permitted livestock in a given grazing season would also be constrained by allowable use standards (as described in FSH 2209.13-94; WO Amendment 2209.13-2005-10).

Vegetative Management Opportunities (e.g., prescribed fire, timber harvest, and wildlife habitat improvement projects) are outside the scope of this decision. The primary purpose of these types of projects is not related to the purpose and need stated for this analysis. Therefore, separate NEPA analyses would be required for vegetative treatment proposals.

Public Involvement

The Council on Environmental Quality (CEQ) defines scoping as "…an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action" (40 CFR 1501.7).

In January of 2000, the interdisciplinary team of Forest Service resource specialists was formed to work on the environmental analysis for the Upper Green River Area Rangeland Project. The following methods were used to invite the public to participate in this project.

Public Mailing

A scoping letter was mailed to those listed on the Bridger-Teton National Forest's general mailing list on February 10, 2000. The mailing list included private landowners, term grazing permit holders, special interest groups, interested members of the public, and local, state, and federal agencies. The letter described the proposed action, the purpose and need for the project, the process that would be followed for completing the environmental analysis, and the scope of the decision to be made. Additionally, the letter solicited public participation in the process, specifically the submission of comments, concerns, and recommendations regarding management of the six allotments in the project area.

Contacting Term Grazing Permit Holders

Term grazing permit holders, or their representatives, were contacted shortly after the project was initiated to solicit their input concerning management of the six allotments within the project area. Additional informal contacts, discussions, and updates have taken place throughout the analysis process.

Notice of Intent

On July 23, 2003, a notice of intent to publish an EIS was published in the Federal Register for this project. This notice opened a 30 day public comment period. Five comment letters were received. Using the comments from the public and other agencies, the interdisciplinary team developed a list of issues to address.

Environmental Impact Statement

A draft environmental impact statement (DEIS) was prepared and a notice of availability published in the Federal Register on March 12, 2004. Reviewers of the DEIS had 45 days to comment on the DEIS. Twenty-two comment letters with numerous comments were received. A notice of availability of a FEIS and record of decision was published on February 4, 2005. The comment letters to the DEIS and Forest Service responses were included in Appendix 2 of the record of decision (October 2004). The record of decision was later withdrawn and a decision was made to supplement the 2004 DEIS.

Draft Supplemental Environmental Impact Statement

The Bridger-Teton National Forest published a notice of intent to prepare a supplemental EIS (DSEIS) for the Upper Green River Area Rangeland Project on December 1, 2009. The DSEIS updated and supplemented the 2004 DEIS. This supplement analyzed the effects of domestic livestock grazing in the Upper Green River project area. The DSEIS was made available for public review and comment with a notice of availability published in the Federal Register on June 18, 2010. Reviewers had 45 days to comment on the DSEIS and five comment letters were received. Those who commented in response to the 2004 DEIS were not required to comment again in order to maintain eligibility to appeal the decision. Appendix B of this document contains a summary of comments on the 2010 DSEIS as well as the Forest Service's responses to comments.

Predecisional Administrative Review Process

A letter was mailed to the Upper Green River Rangeland Area Project mailing list on January 28, 2014 to notify interested parties that the project moved from the appeal process (36 CFR 215) to the Predecisional Administrative Review Process (36 CFR 218), also known as the objection process. The new regulations provide an opportunity for those who submitted specific written comments related to this project during the scoping period or during the comment period for the DSEIS to file an objection before the final decision is signed. When the draft Record of Decision is made available to the public, a 45-day objection filing period will begin.

Development of a Fourth Alternative

On February 12, 2015, the District Ranger sent a letter which provided a status update on the project. Stakeholders were informed that the interdisciplinary team was evaluating an array of four alternatives, including a newly developed alternative. A summary of each alternative was provided in the letter and tables further describing the action alternatives were posted to the Bridger-Teton National Forest website.

Decision to issue a 2016 DEIS

This current document is the third DEIS that has been issued since the Upper Green project began in 2000. A decision was made to issue this 2016 DEIS rather than a FEIS because of the time that has transpired since the 2010 DEIS. This would give our partners and publics an additional opportunity to weigh in on the most current assemblage of alternatives and the analysis that will ultimately support the record of decision. Of primary concern was the amount of time elapsed between the last comment period and the changed conditions that exist currently with and within the Upper Green project. Since the last comment period, a new alternative has been added (Alternative 4) and a new Forest Plan Amendment has been implemented (Greater Sage-grouse).

Significant Issues

Issues for the Upper Green River Area Rangeland Project analysis were identified through public and internal scoping. Twenty-seven individuals, agencies, and organizations submitted comments during the project's initial scoping period (January through April 2000). Five individuals, agencies, and organizations submitted comments during the second scoping period (July through August 2003). The comments were addressed on an individual basis and then categorized. The actual letters received during the comment period are filed in the project planning record at the Pinedale Ranger District.

The most common concerns identified during public scoping were related to watershed and riparian area health, the condition of vegetation, and the effects of the project on wildlife and their habitat (particularly threatened and endangered species). Based on both internal and public scoping, the Responsible Official determined that the following four issues were within the scope of the project and these issues are addressed through the proposed action and alternatives. Similar or closely related issues were combined into one statement where appropriate and may be discussed under more than one resource. Specific indicators used to evaluate each issue are also identified below.

Issue 1: Effects on Threatened, Endangered, and Sensitive Species (TES), as well as Other Species of Interest

The concern is that livestock grazing may affect the recovery of threatened, endangered, proposed, candidate and sensitive species, in addition to viability and habitat objectives for other species in the project area. The Forest Plan provides direction for threatened, endangered, sensitive species and management indicator species. Species conservation is directed by laws, regulations, and policies.

Indicators: Compliance with federal law and policy and condition of habitat for threatened and endangered species, sensitive species and management indicator species that are affected by livestock grazing. Specific indicators used for the analysis are provided below by wildlife species that are of particular interest because of their potential to be affected by livestock grazing.

- Grizzly bear – number of grizzly bear mortalities due to livestock related control actions
- Amphibians - riparian function and herbaceous retention
- Greater Sage-grouse – herbaceous canopy cover, grass height, preferred forb availability, and riparian function
- Elk – forage availability

- Colorado River cutthroat trout – riparian function, bank stability, and stream temperature

Issue 2: Riparian and Aquatic Conditions

The concern is that livestock grazing may affect riparian areas, riparian vegetation, fisheries and overall stream function and health.

Indicators: Stream bank stability, stream temperature, and riparian function

Issue 3: Social and Economic Impacts

Permitted livestock grazing contributes to the economic wellbeing of local communities. Continuing to authorize livestock grazing in the project area would support the custom and culture in surrounding communities and contribute to the achievement of Forest Plan goals.

Indicators: Whether livestock grazing is authorized and animal unit months permitted, relative feasibility for permittee implementation of design features, employment and income information at the county level, and traditional uses

Issue 4: Rangeland Function

Livestock grazing may affect vegetation and soils, which are the components of overall rangeland function. Vegetation communities and watersheds that are not functioning properly provide less than optimum conditions for wildlife, rangeland health and productivity and soil stability.

Indicators: Percent ground cover and change in plant species composition (ecological status and/or trend); relative abundance of invasive plants; and potential change in shrub canopy cover. Indicators for soils include soil quality assessment, effective ground cover, detrimental soil disturbance, erosion and compaction potential.

Relationship to the Forest Plan Direction

The Bridger-Teton National Forest Land and Resource Management Plan (Forest Plan, U.S. Forest Service 1990) implements the provisions of the National Forest Management Act, its regulations, and other guiding documents. The Forest Plan sets forth general direction for managing the land and resources of the Bridger-Teton National Forest. The Upper Green River Area Rangeland Project implements direction set forth in the Forest Plan, specifically Forest Plan Goals 1.1 and 4.7 described in the Purpose and Need for the project. The Upper Green River project area lies within portions of Management Areas 71 (Union Pass), 72 (Upper Green River), 46, 92, 96, and 97. As directed by the Forest Plan, these Management Areas are managed according to prescriptions, standards and guidelines for the following desired future conditions (DFCs): 2A, 3, 6B, 9A, 10, and 12. Chapter 4 of the Forest Plan (U.S. Forest Service 1990, pp. 249-319) contains a more detailed description of each Management Area.

Desired Future Conditions at the Forest Plan Level

The Forest Plan desired future conditions (DFCs) describe land management direction intended to accomplish Forest Plan goals and objectives. The Forest Plan recognizes that not all the Forest Plan goals and objectives can be achieved at the same time from the same land areas. The DFCs divide the Forest into management emphasis areas and provide respective themes, management emphases, prescriptions, and standards and guidelines. Table 2 provides descriptions of the DFCs that apply to the Upper Green River project area. Complete descriptions for all the DFCs for the Bridger-Teton National Forest may be found in the Forest Plan (U.S. Forest Service 1990, pp. 145-248).

The Forest Plan authorizes livestock grazing as a valid use in the Upper Green River project area based on DFC direction. When livestock use is permitted, some negative environmental effects are expected in confined areas, such as compaction of soil and removal of vegetation at stream crossings, along fence lines, around water developments, and in salting areas. However, Forest Plan direction on rangelands for most DFCs is that "Range is managed to maintain and enhance range and watershed condition while providing forage for livestock and wildlife." The majority of the project area is in DFC 10 (approximately 66 percent). The area theme is an area managed to allow for some resource development and roads while having no adverse, and some beneficial effects on wildlife." The management emphasis is to "[p]rovide long-term and short-term habitat to meet the needs of wildlife managed in balance with timber harvest, grazing, and minerals development." The vegetation-range prescription is "[r]ange is managed to maintain and enhance range and watershed condition while providing forage for livestock and wildlife."

Approximately 18 percent of the project area is in DFC 12. The area theme is an area managed for high-quality wildlife habitat and escape cover, big-game hunting opportunities and dispersed recreation activities. The management emphasis is on "[p]roviding such important habitat for big-game as winter ranges, feedgrounds, calving areas, and security areas. Management provides for habitat capability and escape cover and maintained semi-primitive, non-motorized opportunities that emphasize big-game hunting activities." The vegetation-range prescription is "[r]ange is managed to maintain and enhance range and watershed condition while providing forage for livestock and wildlife, particularly big-game."

Standards and Guidelines

The area theme and management emphasis provides the general direction for each desired future condition (DFC) and experience describes what to expect when in a particular DFC. The management emphasis is realized through the implementation of Forest Plan standards and guidelines. Forest-wide standards and guidelines apply to all areas of the Bridger-Teton National Forest outside of congressionally designated Wilderness. Each DFC has specific standards and guidelines which pertain to the designated area. Standards are intended to be adhered to during project implementation, while the guidelines are intended to be more flexible, establishing parameters rather than rigid requirements.

Rangeland standards and guidelines have been designed to protect upland and riparian vegetation, as well as other resources that could be adversely affected by livestock grazing activities. Management direction for other resources, such as soil, water, fish and wildlife, recreation and cultural resources provides additional guidance and resource protection in the form of standards and guidelines. The Forest Plan standards and guidelines for all resources are described in detail in the Forest Plan (U.S. Forest Service 1990, pp.121-246) and a more comprehensive analysis of compliance with Forest Plan standards and guidelines for alternatives considered in this analysis is discussed in the specialist reports.

Table 2 Description of Desired Future Conditions (DFCs) in the Upper Green River project area.

Desired Future Condition	Area Theme	Management Emphasis/Experience	Vegetation: Range Prescription
DFC 2A **Non-motorized Recreation Areas** Applies to approximately 5% of the project area.	An unroaded area managed to provide a quiet, almost primitive, recreation experience.	Maintain or enhance primitive and semi-primitive, non-motorized dispersed recreation opportunities. You may find some sheep, cattle, and pack animals throughout the area. Recent livestock grazing is evident in some areas but not in others. You may see range improvements such as fencing and stock tanks.	Range is managed to maintain and enhance range and watershed condition while providing forage for livestock and wildlife.
DFC 3 **River Recreation** Applies to approximately 1% of the project area.	An area managed to provide river and scenic recreation experiences.	Protect river segments outside of Wilderness that have been determined eligible for potential addition to the National Wild and Scenic River system from activities that could diminish or change the free-flowing characteristic, water quality, or the scenic, recreational, fish and wildlife, and other values which make the river eligible for designation. You may find some sheep, cattle, and pack animals throughout the area. Recent livestock grazing is evident in some areas but not in others.	Range is managed to maintain and enhance range and watershed condition while providing forage for livestock and wildlife.
DFC 6A/B* **Wilderness** Applies to approximately 10% of the project area.	A mostly pristine area where the presence of people is rarely or never noticed.	Provide for the protection and perpetuation of natural biophysical conditions and a high degree of solitude for visitors, but with some perceptible evidence of past human use. You may find some sheep, cattle in some areas, and pack animals throughout the Wilderness. Recent livestock grazing is evident in some areas but not in others.	Range is managed to maintain and enhance range and watershed condition while providing forage for livestock and wildlife.
DFC 9A **Developed and Administrative Sites** – Applies to less than 1% of the project area.	An area managed for campgrounds, other non-commercial areas, and Forest Service administrative sites, including related roads.	Emphasize existing and proposed developed recreation sites and Forest Service administrative sites: campgrounds, picnic grounds, trailheads, visitor information centers, water-related recreation facilities and concentrated use areas in Roaded Natural Areas. You will not find cattle within the campgrounds, but they may be visible nearby.	Grazing is allowed seasonally for vegetative management purposes.
DFC 10 **Simultaneous Development of Resources, Opportunities for Human Experiences**	An area managed to allow for some resource development and roads while having no adverse, and some beneficial, effects on wildlife.	Provide long-term and short-term habitat to meet the needs of wildlife managed in balance with timber harvest, grazing, and minerals development. All surface-disturbing activities are designed to have no effect, or beneficial effects, on wildlife. If any portion of this area contains grizzly bear habitat, no surface-disturbing activities can occur there until	Range is managed to maintain and enhance range and watershed condition while providing forage for livestock and wildlife.

Desired Future Condition	Area Theme	Management Emphasis/Experience	Vegetation: Range Prescription
and Support for Big-game and a Wide Variety of Wildlife Species Applies to approximately 66% of the project area.		the grizzly bear cumulative effects model can be run to help determine potential effects on grizzly bears. You may find some sheep, cattle, and pack animals throughout the area. Recent livestock grazing is evident in some areas but not in others. You may encounter traffic delays while livestock are being moved.	
DFC 12 **Backcountry Big-Game Hunting, Dispersed Recreation and Wildlife Security Areas** Applies to approximately 18% of the project area.	An area managed for high-quality wildlife habitat and escape cover, big-game hunting opportunities and dispersed recreation activities.	Management emphasis is on providing such important habitat for big-game as winter ranges, feedgrounds, calving areas, and security areas. Management provides for habitat capability and escape cover and maintained Semi-primitive, Non-motorized opportunities that emphasize big-game hunting activities. If any portion of this area contains grizzly bear habitat, no surface-disturbing activities can occur there until the grizzly bear cumulative effects model can be run to help determine potential effects on grizzly bears. You may find some sheep, cattle, and pack animals throughout the area. Livestock are not permitted on crucial big-game winter ranges closed to grazing. Livestock grazing is permitted on other big-game ranges if it does not conflict with wildlife needs. You can see evidence of recent livestock grazing in some areas, but not in others.	Range is managed to maintain and enhance range and watershed condition while providing forage for livestock and wildlife, particularly big -game.

*Area for DFC 6A is included in DFC 6B based on1995 Bridger Wilderness Action Plan and a letter signed by Forest Supervisor Hamilton (March 24, 2004) which identified this DFC 6A area as a mapping error which should be managed as DFC 6B.

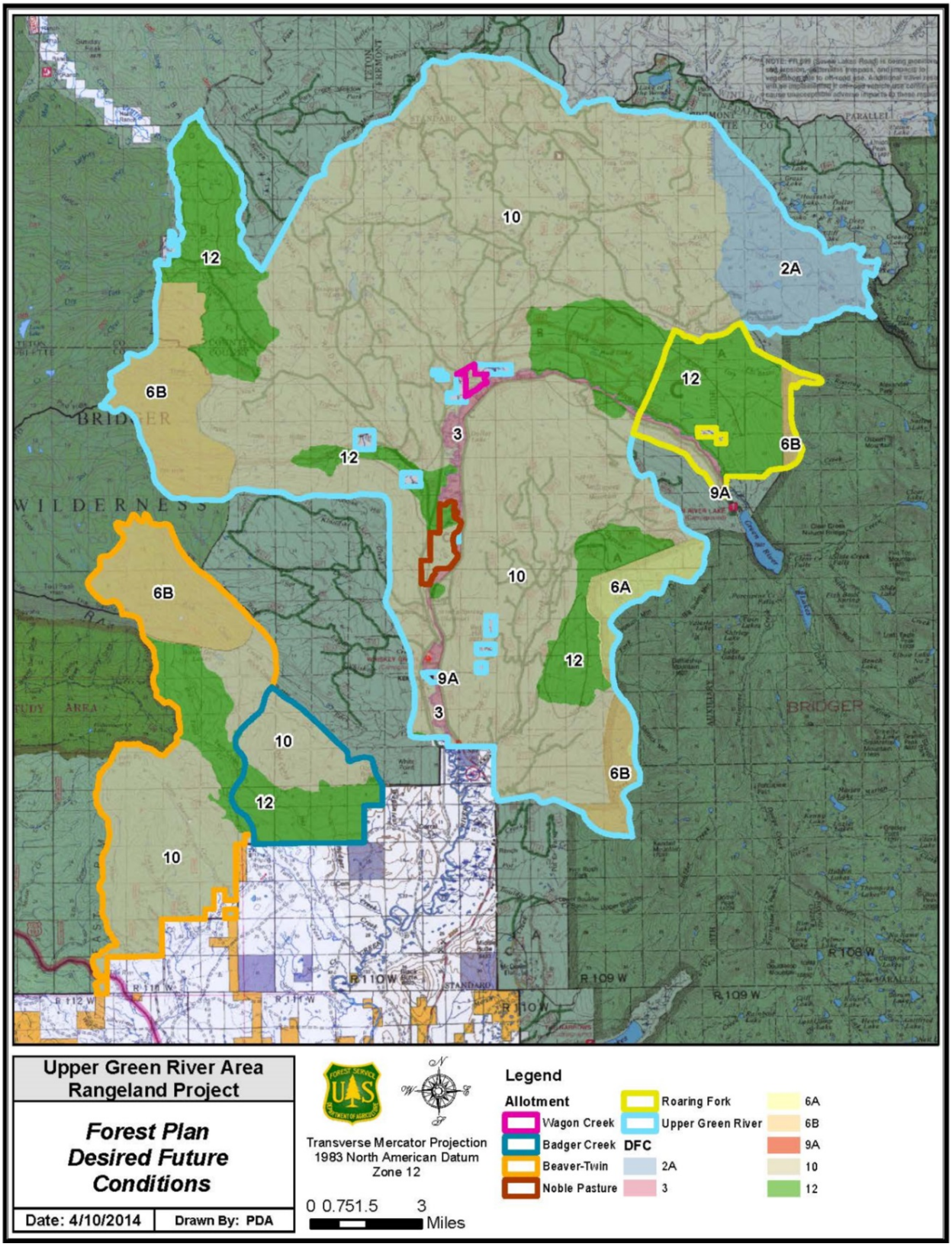

Figure 4. Desired Future Condition classification from the Forest Plan (U.S. Forest Service 1990)

Chapter 2. Alternatives, Including the Proposed Action

Introduction

This chapter describes and compares alternatives considered for the Upper Green River Area Rangeland Project. It is intended to present the alternatives in comparative form, sharply defining the issues and providing a clear basis for the decision maker to make a choice. Each alternative either wholly or partially fulfills the purpose and need (described in Chapter 1) for this project. This chapter describes the alternatives, design features and monitoring, and provides a table summarizing and comparing the effects of each alternative. Some of the information used to compare the alternatives is based upon the design of the alternative (e.g. season-long grazing versus rest rotation grazing, or different thresholds of allowable use) and some of the information is based upon the environmental and economic effects of implementing each alternative (information summarized from Chapter 3).

The interdisciplinary team made use of topographic maps and aerial photos, and a large quantity of resource data available in geographic information system (GIS) format. Acres displayed throughout this document were derived using GIS technology and may vary slightly from other sources. Acreage figures and some other resource data may be rounded.

Alternatives Considered in Detail

The Forest Service developed four alternatives, including the No Action (Alternative 1- No Livestock Grazing), Grazing as Currently Permitted and Current Management (Alternative 2), Modified Grazing Management (Alternative 3- Modified Proposed Action), and Modified Grazing Management with Riparian Emphasis (Alternative 4). The alternatives were developed to address issues and were refined by the interdisciplinary team based on comments to the DSEIS, management direction, data analysis and resource needs.

Alternative 1 – No Livestock Grazing (No Action Alternative)

The “no action” alternative is included to meet requirements of the National Environmental Policy Act [40 CFR 1502.14 (d)] and the Grazing Permit Administration Handbook, FSH 2209.13, Chapter 90, Section 92.31 which stipulates that “in addition to the proposed action, the no action alternative shall always be fully developed and analyzed in detail.” “No action” is synonymous with “no grazing” and means that livestock grazing would not be authorized within the project area.

Permitted Livestock Numbers, Season of Use and Management System

Under Alternative 1, livestock would no longer be permitted to graze on the six allotments in the Upper Green River project area (i.e. livestock grazing would not be permitted on Badger, Beaver-Twin, Noble Pastures, Roaring Fork, Wagon Creek and the Upper Green River allotments). Livestock grazing would be eliminated and current term grazing permits would be cancelled. In accordance with agency regulations (36 CFR §222.4), livestock grazing would cease two years after notice of cancellation. Allotment management would likely not change during this two-year interval from the current management. Under this alternative, livestock grazing would not be authorized after a two year notification to the permittee from the date the decision is made. Incidental recreational horse use would still occur. Selection of Alternative 1 would eliminate the number of animal unit months (AUMs) allocated to permitted livestock in the project area by approximately 46,148 AUMs.

Allowable Use

Forage utilization on key forage species would be a maximum of 60 percent in the uplands and 65 percent in the riparian areas. Livestock grazing would not occur on the project area once grazing permits are cancelled. Forage utilization by wildlife and recreational stock would continue to occur and would contribute to the maximums allowed. Key forage species are Idaho fescue (*Festuca idahoensis*) in uplands, sedges (*Carex* species) in riparian areas and other species as appropriate for the site.

Focus Area Prescription

A focus area is an area in need of special management consideration due to its unique characteristics or sensitivity to disturbance. Focus areas typically do not currently meet desired conditions for one or more resource and the causative factors vary. Focus areas do not represent the entire pasture or allotment. There are seven focus areas within the project area (Figure 3).

Waterdog Lake Focus Area: Located in the southwestern portion of the project area in the Beaver-Twin Allotment (T38N, R111W, Section 15). Livestock would no longer be permitted to graze in the Waterdog Lake focus area under Alternative 1.

Tosi Creek Focus Area: Located on a 0.5 mile section of Tosi Creek in the central portion of the project area in Pasture #1 of the Noble Pastures Allotment (T39N, R110W, Section 26). Under Alternative 1, livestock grazing would not occur in the focus area once grazing permits are cancelled. Water diversion from Tosi Creek and flood irrigation would continue to maintain hydric vegetation and maintain water rights.

Klondike Creek Focus Area: Located on a 0.4 mile section of Klondike Creek in the south-central portion of the project area in Pasture 4 of the Noble Pastures Allotment (T38N R110W, Section 2, T39N, R110W, Section 35). Under Alternative 1, livestock grazing would not occur in the focus area once grazing permits are cancelled. Water diversion from Klondike Creek and flood irrigation would continue to maintain hydric vegetation and maintain water rights.

Roaring Fork Focus Area: Located north of the Green River in the eastern portion of the project area in the Roaring Fork Allotment, near the Upper Green River elk feedground (T39N, R109W, Section 11 and 12). Under Alternative 1, livestock grazing would not occur in the focus area once grazing permits are cancelled. This focus area would continue to be grazed by elk.

Fish Creek Focus Area: Located in the northern portion of the project area in the Fish Creek Pasture (T40N, R109W, Section 4 and 5). Under Alternative 1, livestock grazing would not occur in the focus area once grazing permits are cancelled.

Wagon Creek Focus Area: Located in the central portion of the project area in the Mosquito SE Pasture (T40N, R110W, Section 27). Under Alternative 1, livestock grazing would not occur in the focus area once grazing permits are cancelled.

Tepee Creek Focus Area: Located in the central portion of the project area (T39N R111W, Section 1, T39N, R110W, Section 6) in the Lower Tepee Creek Pasture on Tepee Creek downstream of the bridge crossing Forest Road 620. Under Alternative 1, livestock grazing would not occur in the focus area once grazing permits are cancelled. The existing log structures and cabling on Tepee Creek would remain.

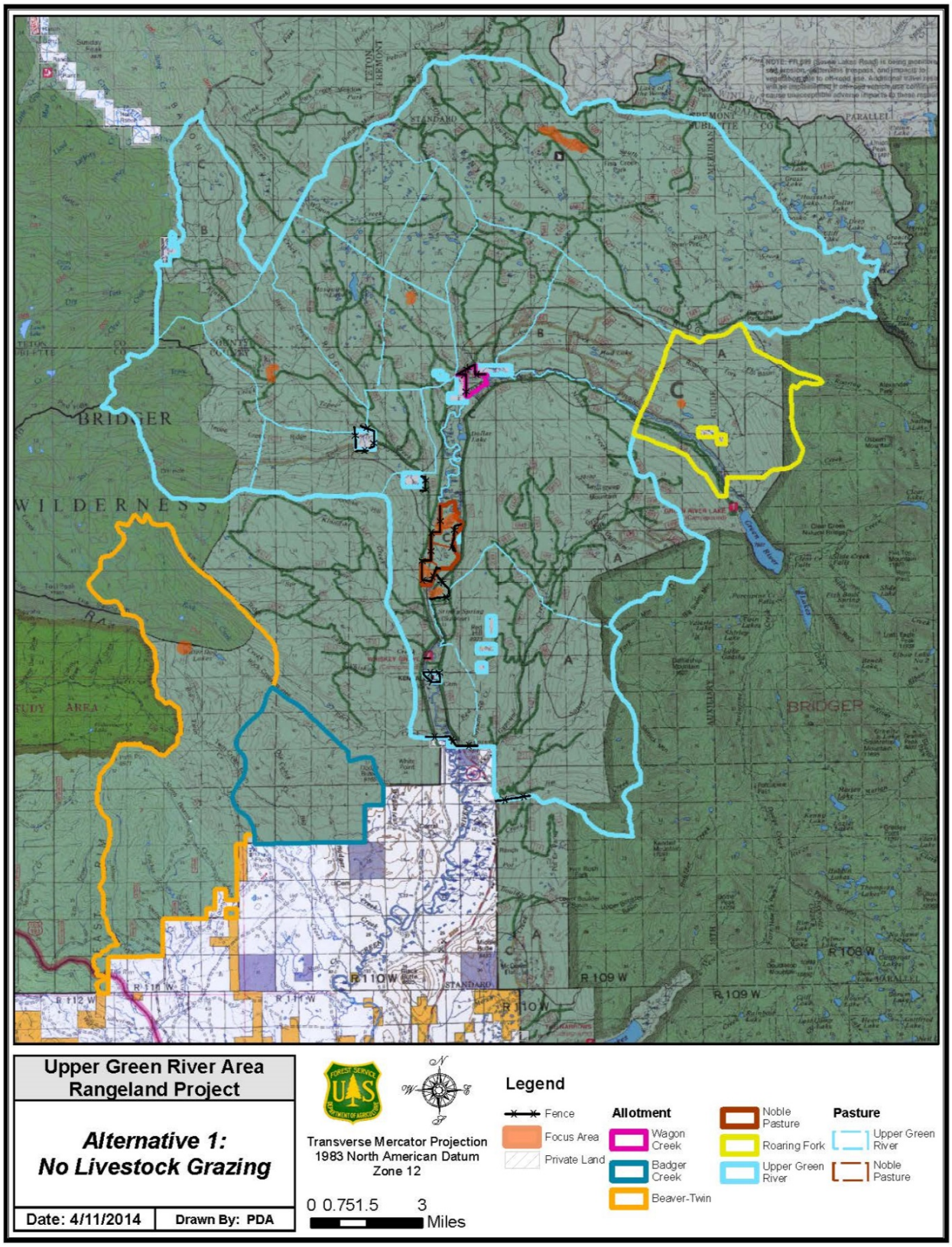

Figure 5. Structural improvements maintained under Alternative 1

Structural Improvements

Under Alternative 1, approximately 62 miles of existing interior fence, four water developments, four rider cabins/facilities, and nine water crossings (e.g., culverts and bridges) would be considered for removal, as they would no longer be needed for livestock management but may be retained to serve other purposes. The Green River Forest boundary fences, Noble Pasture boundary fences, Kendall Warm Springs' fence, Whiskey Grove Campground fence, and fences along private inholdings would be maintained (Figure 5). Range structural improvements would be removed over a 10 year period, as budget allows. Motorized vehicles would be used along the fence line outside of Wilderness areas to remove fence material. Approximately 14 miles of fence along the Forest and allotment boundaries, campgrounds, administrative sites and inholdings would remain in place, and the responsibility for maintaining it would revert to the permittees on adjacent grazing allotments, private landowners, or the Forest Service, as applicable. These numbers reflect only range improvements maintained by the permittees for the six allotments in the project area. Improvements that are maintained by the Forest Service for uses other than livestock grazing, such as the protection fence around Kendall Warm Springs, would continue to be maintained. Trucks and all-terrain vehicles would be used on open roads, roads closed to the public, and/or off-road to remove or maintain structural improvements, as necessary. No new roads are proposed and none will be removed under this alternative.

Alternative 2 - Grazing as Currently Permitted and Current Management

According to direction found in FSH 2209.13 Chapter 90, "this alternative shall be based on the current management actions being implemented, specifically, current management over the last three to five years. Current management direction may be contained in an allotment management plan, annual operating instructions, or a combination thereof." Under Alternative 2, livestock grazing would continue to be authorized on the six allotments as currently permitted in the term grazing permits. Grazing as currently permitted provides the sideboards or maximum allowed grazing use in terms of the kind and class of livestock, livestock numbers, grazing season, and allowable use of forage. This alternative also describes the current management or the actual livestock use over the five year period from 2009 to 2013. Current management includes actions that are authorized under permit and adjusted through routine permit administration and, reflect permittee livestock management adjustments in cooperation with the Forest Service to address resource concerns in the project area. Actual livestock use under current management has been at a reduced level compared to the permitted use allowed under the term grazing permits. It is possible, however, that the current or future permittees would propose or elect to manage their livestock at the maximum permitted use specified on the term grazing permit. Therefore, livestock as authorized on the grazing permit and as it occurs under present management are described as part of Alternative 2 as the different levels of grazing intensity and management have different effects to resources.

Under Alternative 2, allotment management plans would be prepared for the Badger, Beaver-Twin Creeks, Noble Pastures, and Wagon Creek allotments and updated for Upper Green River and Roaring Fork allotments. The grazing management practices specified for the allotments with existing allotment management plans would not be changed; the Upper Green River and Roaring Fork allotments would continue to operate under the guidelines specified in allotment management plans. Season-long grazing (which does not comply with Forest Plan rotational grazing requirements specified in the Forage Utilization Standard) would continue in the Badger Creek, Beaver-Twin Creeks, Roaring Fork, and Wagon Creek allotments. The Forest Plan forage utilization standards for wildlife, livestock, and recreational stock (U.S. Forest Service 1990, p. 128) would remain in effect under Alternative 2.

Alternative 2 – Current Management describes current management over a five year period (2009 to 2013). Grazing guidance provided in the Greater Sage-grouse Forest Plan Amendment decision (2015) is expected to be implemented in a phased-in approach within 18 to 24 months after the decision date (p. 65 of the

Greater Sage-grouse Record of Decision). If Alternative 2 is selected, overall grazing management would be guided by both this alternative and by the prior decision on the Greater Sage-Grouse Amendment.

Alternative 2 includes items common to the action alternatives. These items include design features and monitoring common to Alternative 2, 3 and 4.

Permitted Livestock Numbers, Season of Use, and Grazing Management System

Collectively, the six allotments subject to this analysis contain approximately 170,643 acres and accommodate up to 9,089 livestock including 9,042 cow/calf pairs or yearlings and 47 horses. In any given year during the term of the permit, these livestock would be permitted to graze a maximum of 46,148 animal unit months of forage. An animal unit month is the amount of forage consumed by one mature cow or equivalent for one month based upon an average daily forage consumption of 26 pounds of dry matter per day. One head month of occupancy is assumed to result in the consumption of 1.32 animal unit months of forage for a cow/calf pair and 0.7 animal unit months of forage for a yearling. The permitted season of use varies by allotment but generally occurs from June 14th to October 15th. A shift of one week to the season of use could be authorized by the District Ranger in any given year as described in the Design Features Common to the Action Alternatives (Livestock Distribution, Range Improvements, and Best Management Practices for any of the six allotments.

Season-long grazing would continue to be permitted in the Badger Creek, Beaver-Twin Creeks, Roaring Fork and Wagon Creek allotments. A rotational grazing system would be maintained in the Noble Pastures, Wagon Creek, and Upper Green River allotments. In a rotational grazing system, the time period in which pastures are grazed would be rotated periodically so that plants are not grazed at the same time every year.

Definitions of Livestock Grazing Management Systems	
Season-long grazing	Season-long grazing involves livestock use of a pasture or allotment for an entire season of use.
Rotational Grazing	Rotational grazing involves the movement of livestock from one pasture to another on a scheduled basis. There are two types of rotational grazing systems proposed deferred rotation and rest rotation
Deferred Rotation	The order in which pastures are grazed would be rotated annually so that plants are not grazed at the same time each year. Or deferred rotation could involve the delay of grazing in a pasture to promote seed maturity of key forage species.
Rest Rotation	One pasture in the pasture rotation would not be grazed by livestock for a full season, allowing vegetation in the rested pasture a full season to develop. The remaining pastures would be grazed in a deferred rotation. In the second year, another pasture would be rested, and the remaining pastures grazed in a deferred rotation. This pattern would continue until all pastures have been rested

Table 3 summarizes permitted livestock numbers, kind and class of livestock, animal unit months, season of use, forage utilization level and management system by allotment under Alternative 2. A decision to implement Alternative 2 would not change the number of permitted livestock or the permitted season of use from that authorized under the current term grazing permits. Actual livestock numbers and/or season of use could be administratively adjusted within the established permitted use in any given year in order to meet allowable use standards and/or resource objectives under this alternative. Table 3 also provides the number of acres identified as capable and suitable for livestock grazing. Incidental livestock grazing is expected to occur in places outside of areas identified as capable.

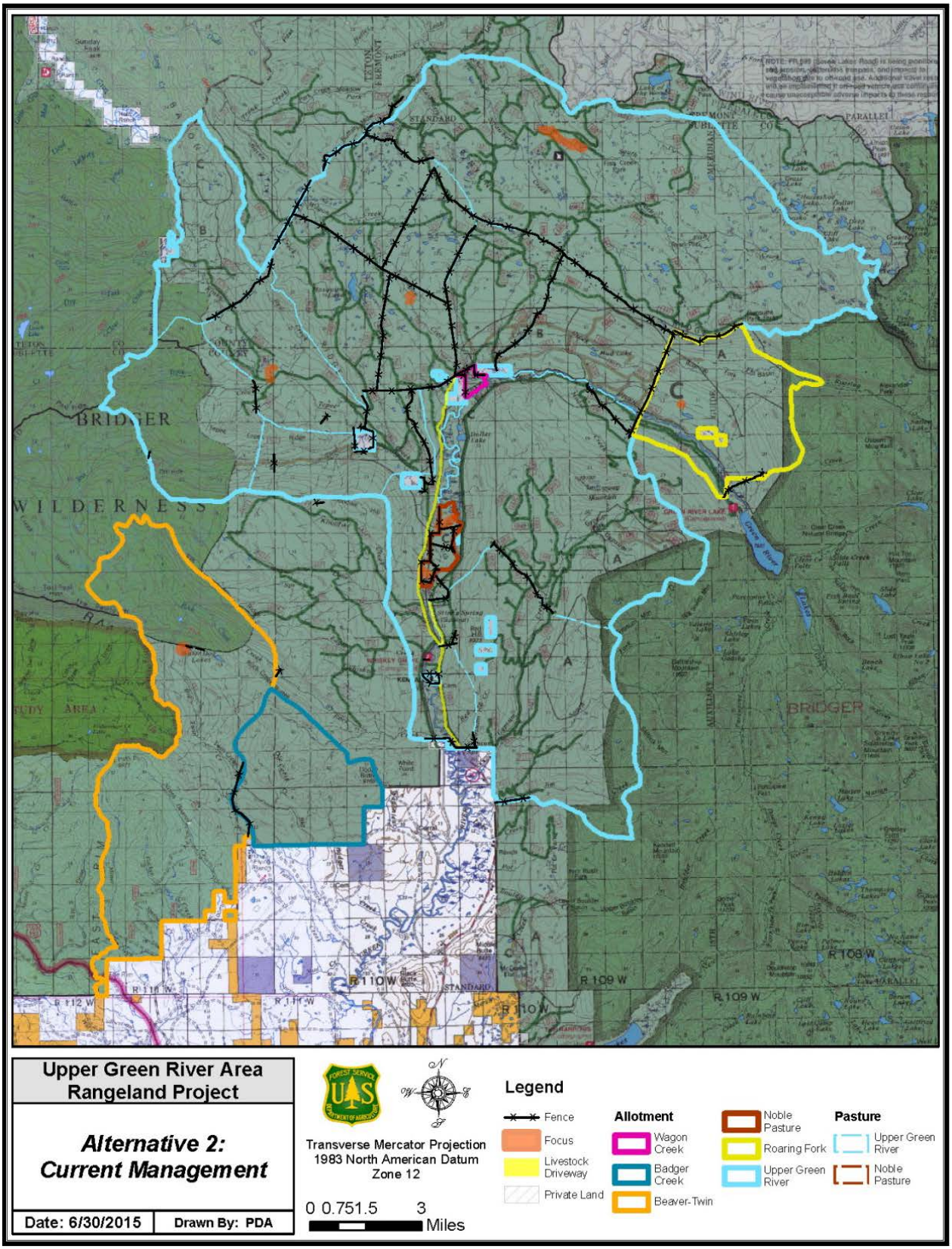

Figure 6. Map of the six allotments, pastures and existing structural improvements in the Upper Green River project area under Alternative 2

Table 3. Permitted livestock grazing and actual use within the Upper Green River project area under Alternative 2

Allotment	Capable & Suitable / Total Acres (%)	Permitted Number of Livestock	No. of Livestock under Current Management: Range, Avg. from 2009 to 2013 excluding non-use years (% of permitted)	Kind	Class	Permitted Season of Use*	Allowable Use: Permitted maximum forage utilization on key forage species	Actual Use: Actual forage utilization on key forage species & Min. stubble height	Permitted animal unit months (AUMs)	Management System
Badger Creek	1,217 / 7,254 (17%)	157	60– 157 & two years of non-use 106 Avg. (68%)	cattle	Cow/calf or yearling	07/01-09/30	50% Upland 55% Riparian	30%	622	1 pasture season long
Beaver-Twin Creeks	6,337 / 22,079 (29%)	700	4 years non-use 496 Avg. (71%)	cattle	Cow/calf or yearling	07/15-10/15	50% Upland 55% Riparian	30%	2,772	1 pasture season-long
Noble Pastures	743 / 762 (98%)	314 110 4	342 – 350 347 Avg. (82%) 4 horses (100%)	cattle cattle horse	Cow/calf or yearling horse	06/14-09/20	60% Upland 65% Riparian	50%	1,605	2 herds, 4 pasture rotation, pastures grazed 2-3 times over. Season-long in Pasture 4. Livestock enter and exit allotment in Pasture 3
Roaring Fork	4,449 / 8,416 (53%)	170	No years of non-use 170 Avg. (100%)	cattle	Cow/calf or yearling	06/16-10/15 Out of south pasture by 7/1 under current management	Roaring Fork south of river 50% Upland 55% Riparian Roaring Fork north of river 60% Upland 65% Riparian	30%	898	1 pasture season-long
Wagon Creek	186 / 186 (100%)	26	No years of non-use 26 Avg. (100%)	cattle	Cow/calf or yearling	07/15-10/15 Current Mgt not to exceed 45 days	60% Upland 65% Riparian	50%	103	Season-long

Allotment	Capable & Suitable / Total Acres (%)	Permitted Number of Livestock	No. of Livestock under Current Management: Range, Avg. from 2009 to 2013 excluding non-use years (% of permitted)	Kind	Class	Permitted Season of Use*	Allowable Use: Permitted maximum forage utilization on key forage species	Actual Use: Actual forage utilization on key forage species & Min. stubble height	Permitted animal unit months (AUMs)	Management System
Upper Green River –Mud Lake/Fish Creek rotation	23,834 / 44,527 (54%)	2,780	1878 – 2100 1996 Avg. (72%)	cattle	Cow/calf or yearling	06/16-10/15	60% Upland 65% Riparian	30%	14,678	three pasture deferred rotation
Upper Green River – Mosquito Lake rotation	11,634/ 17,181 (68 %)	1,800	1127 – 1250 1196 Avg. (66%)	cattle	Cow/calf or yearling	06/16-10/15	60% Upland 65% Riparian	30% (Wagon Creek Focus Area excluded from livestock grazing)	9,504	Pastures four pasture rest rotation
Upper Green River – Tosi Creek/ Tepee Creek rotation	8,580/ 20,662 (42%)	1,000	657 – 757 703 Avg. (70%)	cattle	Cow/calf or yearling	06/16-10/15	60% Upland 65% Riparian	30% (Tepee Creek Focus Area 6 inch stubble height & 30 % utilization)	5,280	three pasture deferred rotation
Upper Green River – Kinky Creek pasture	2,596/ 8,747 (30%)	27	27 (100%)	horse	horse	06/16-10/15	60% Upland 65% Riparian	pasture ungrazed except the 57-acre pasture under special use permit was grazed by 27 horses	130	

Allotment	Capable & Suitable / Total Acres (%)	Permitted Number of Livestock	No. of Livestock under Current Management: Range, Avg. from 2009 to 2013 excluding non-use years (% of permitted)	Kind	Class	Permitted Season of Use*	Allowable Use: Permitted maximum forage utilization on key forage species	Actual Use: Actual forage utilization on key forage species & Min. stubble height	Permitted animal unit months (AUMs)	Management System
Upper Green River – Gypsum Creek rotation	9,852 / 36,173 (27%)	1,985	1033 – 1188 1105 Avg. (56%)	cattle	Cow/calf or yearling	06/16-10/15	60% Upland 65% Riparian	30% (6 inch stubble height on S. Gypsum Creek)	10,480	2 pasture deferred rotation
Upper Green River Distributed among pastures		16	16 (100%)	horse	horse	06/16-10/15	60% Upland 65% Riparian		76	rotated with cattle
Upper Green River – River Bottom Pasture and Livestock Driveway	4,973 / 7,131 (70%)	# 8,171 (livestock driveway) 6,016 (River Bottom Pasture) 20		cattle cattle horse	Cow/calf or yearling	06/12-10/15	River Bottom Pasture: 60% Upland 65% Riparian Livestock driveway: ≥60% ground cover	20%	AUMs included in the allotment calculation	Herded in along the livestock driveway in the spring, and drift out on the River Bottom Pasture during the fall
Total	74,263/ 170,643 (44%)	9,089	6,192 avg. excluding non-use years (68%)						46,148	

*The District Ranger could approve a one week shift to the season of use by adding one week prior to or one week following the permitted season of use. The season of use would remain the same length (equivalent number of days) but could occur one week earlier or one week later than indicated in the permitted season of use.

These numbers are not included in the total permitted number of livestock because livestock use the River Bottom Pasture and the livestock driveway to enter and exit allotments, The permitted number of livestock in the River Bottom Pasture and the livestock driveway is already calculated in the permitted numbers for the applicable allotments.

Allowable Use in Allotments/Pastures: Forage Utilization

Under Alternative 2, allowable use is based on the Forest Plan Forage Utilization Standards (U.S. Forest Service 1990, pp. 127-128) which establishes the permitted allowable use levels within the project area. Forage utilization is the proportion of the current year's production of herbaceous vegetation or key forage species (if designated) that is consumed by grazing animals. The maximum forage utilization on key forage species in Badger Creek Allotment, Beaver-Twin Allotment, and the South Pasture of the Roaring Fork Allotment would continue at 50 percent in the uplands and 55 percent in the riparian areas under Alternative 2. The Roaring Fork East and West pastures and Noble Pastures Allotment, Wagon Creek Allotment, Upper Green River Allotment, and the River Bottom Pasture would continue at a maximum forage utilization of 60 percent in the uplands and 65 percent in the riparian areas on key forage species. Key forage species are primarily Idaho fescue (*Festuca idahoensis*) in the uplands and sedges (*Carex* species) or tufted hairgrass (*Deschampsia*) in riparian/meadow areas. Other key species may be identified on a site specific basis. Key forage utilization would be measured at the end of the grazing season.

Under current management, permittees are working cooperatively with the Forest Service to manage their livestock in a proactive manner to addresses resource concerns. Actual livestock use in terms of forage utilization (30 percent to 50 percent) is less than the maximum permitted (50 percent to 65 percent), and actual use would likely continue under this alternative. However, it is possible that these permittees, or their future counterparts, would manage their livestock in such a way that they reach the maximum permitted allowable use. Therefore, the permitted allowable use is the maximum that would occur under Alternative 2 and is the level of livestock use analyzed in this document. Table 3 summarizes permitted and actual use by allotment and pasture.

Focus Area Prescription

Under Alternative 2 - Grazing as Currently Permitted, there are no specific grazing prescriptions in the focus areas. Under Alternative 2 - Current Management, Waterdog Lake, Wagon Creek, and Tepee Creek focus areas have been managed to reduce impacts of livestock use. This management is reflected in prescriptions for the Waterdog Lake focus area as described under the Beaver-Twin Allotment, Wagon Creek focus area as described under the Mosquito Lake rotation and Tepee Creek focus area as described under the Tosi Creek/Tepee Creek rotation of the Upper Green River Allotment. Under this alternative, no focus area prescriptions would be implemented on the remaining four focus areas (Tosi Creek focus area in Pasture 1 and Klondike Creek focus area in Pasture 4 of the Noble Pastures Allotment; Roaring Fork focus area in Roaring Fork West Pasture in Roaring Fork Allotment; and Fish Creek focus area in Fish Creek Pasture of the Upper Green River Allotment (Figure 6).

Structural Improvements

Structural improvements, such as fences, hardened water crossings, spring developments, water troughs and cattle guards, have been constructed to facilitate improved distribution of livestock and forage use, reduce livestock impacts in sensitive areas, and/or improve resource conditions. In general, allotment boundaries are located on ridge tops that provide natural barriers to livestock travel. Further, these boundaries are typically buffered by forested vegetation or steep terrain that provides little forage and limited accessibility to livestock. Where boundaries are located on gentler or more open terrain, they are often fenced.

Fences would be maintained by the permittees and reconstruction would be the responsibility of the permittees and the Forest Service. Typically, the Forest Service purchases the fencing materials and the permittees provide the labor for fence reconstruction. Under Alternative 2, existing structural improvements on the six allotments, including approximately 76 miles of existing fence and four water developments, would continue to be maintained or reconstructed by the permittees as needed. Vehicles could be used along fence line to maintain or reconstruct fence. This includes approximately 0.7 miles of electric fence at the

Wagon Creek focus area. Trucks and all-terrain vehicles would be used on open roads, roads closed to the public, and/or off-road to maintain/reconstruct structural improvements, as necessary. Existing structural improvements are shown on Figure 6 and listed in Table 4. There are no proposed structural improvements under Alternative 2. No new roads are proposed and none will be removed under this alternative.

No changes in motorized use of roads by livestock permittees, the public, or the Forest Service (administrative use) are proposed under this alternative. Occasional use of motorized vehicles to access and maintain existing fences and other improvements outside of Wilderness areas, on a case-by-case basis, could be authorized (operating plan required) under the existing travel management plan for the Pinedale Ranger District (effects previously disclosed in the travel planning process) or under this alternative. Overland routes would be used to access fences.

Vehicles would be used by herders living in five herder camps across the project area, but herders would typically leave and return to the camps primarily via horseback, with the exception of several work days each month when they would drive to join other personnel originating from outside the project area to move cattle between pastures. Herders also use vehicles one to two days per week when they leave the project area for their days off of work

Reconstructed fences would conform to the Forest Plan Fencing Riparian Area Guideline and the Structural Improvement Standard (U.S. Forest Service 1990, pp. 125 and 129) and the Wyoming Game and Fish Department's wildlife friendly fencing standards (Paige 2012). Reconstructed fences would be of either three or four strand wire construction with wood or metal posts. The bottom wire would be smooth and 16 to 18 inches off the ground. The top wire would be barbed, a maximum height of 42 inches off the ground and approximately12 inches above the second wire. When necessary, the top wire would be smooth and/or placed 40 inches off the ground. Permanent fences across riparian areas or upland areas adjacent to riparian areas would be built using a wooden top pole or other state-of-the-art marking technique to increase visibility of the fence and reduce possible collision of swans, cranes, waterfowl, and Greater Sage-grouse. Proposed fences may tie into topographic features and forested vegetation cover types that naturally deter cattle movement. Temporary electric fences will be a maximum height of 42 inches. Electric tape would be used across riparian areas, instead of electric wire, to increase visibility by wildlife. Electric wire/tape would be removed within two weeks of livestock departure from the pasture.

Range improvement construction / reconstruction activities anticipated within occupied habitat for Columbia spotted frog, western boreal toad, and boreal chorus frog would not occur until the breeding seasons for these species has passed.

Table 4. Existing range structural improvements in the six allotments of the Upper Green River project area

Description	Pasture	Location	Comments
Badger Creek Allotment			
Beaver-Twin/Badger Creek Allotment Boundary Fence		Township (T) 37N,Range (R) 111W, Sections 1,12 Township 38N,Range 111W, Section 36	~2 miles of 3-wire, let down
Beaver-Twin Allotment			
Beaver-Twin/Badger Creek Allotment Boundary Fence		T37N,R111W, Sections 1,12 T38N,R111W, Section 36	~2 miles of 3-wire, let down
Rock Creek Fence		T38N,R110W, Sections 18,19	~0.25 mile 3-wire with top pole

Description	Pasture	Location	Comments
Waterdog Fence		T38N, R111W, Sections 14, 15	~0.25 mile 3-wire, let down
Noble Pastures Allotment			
Allotment Boundary Fence		T37N,R110W, Sections 7,8,17,18	~2.5 miles of post/wire
Allotment Interior Fence		T37N,R110W,769001, Sections 19,20	~1.5 miles of post/wire
Corral		T37N, R110W, Section 2	Post/wire
Roaring Fork Allotment			
Roaring Fork/Upper Green River Fence		T39N,R109W Sections 2,10,11,15	~3 miles of 3-wire, 1 mile of buck & pole, maintenance shared with Upper Green River Allotment
Gunsight Pass Fence		T40N,R109W, Section 36 T39N,R108W, Section 6	~2 miles of buck & pole, and .5 mile 3-wire with top rail
Roaring Fork Allotment Boundary Fence		T39N,R108W Section 30	~.75 mile buck & pole, .25 mile 3-wire, adjacent to the Green River Administrative Site
Roaring Fork Stock Bridge		T39N,R109W, Section 11	Treated timber with concrete foundation, permittee maintains deck and side rails only
Wagon Creek Allotment			
Wagon Creek Boundary Fence	Wagon Creek	T39N, R110W, Section 11	1.5 miles of barbed-wire
Upper Green River Allotment – Mud Lake/Fish Creek Rotation			
Mud Lake Fence	Mud Lake West	T40N,R109W, Sections 20,29, 31,32; T39N,R109W, Section 6	4 miles barbed-wire let-down, built in 2003
Pinyon Ridge Management Fence	Mud Lake West	T40N,R109W, Sections 27,28,34,35	3.5 miles barbed-wire let-down, built in 2006
Cow Pie #1 Waterline	Mud Lake East	T40N,R109W, Sections 34,35	1.5 miles spring/ line/ trough, built in 1983
Strawberry Creek Cow Camp and 40-acre Horse Pasture	Fish Creek	T41N,R110W, Section 36	1 cabin, built in 1975
Upper Green River Allotment – Mosquito Lake Rotation			
Mosquito Lake Unit Fences		T39N,R110W, Sections 2-4,9-11; T40N,R110W, Sections 2,11-13,15,22-24,26,27,34,35; T40N,R110W, Sections 17,18,20-22	21 miles barbed-wire, built in 1964
Mosquito Lake Extension Fence		T40N,R110W, Sections 2-4	1 mile barbed-wire, built in 1982
Mosquito Lake Boundary Fence		T40N,R110W, Section 24; T40N,R110W, Sections 7,8,18,19	3 miles log & block, built in 1961
Raspberry Creek Boundary Fence	Mosquito SW	T40N,R110W, Sections 4,5; T40N,R110W, Section 4;	3 miles barbed wire, built in 2001

Description	Pasture	Location	Comments
		T41N,R110W, Sections 26,34,35	
Pinyon Ridge Fence	Mosquito SE	T40N,R109W, Sections 17,18,20,21; T40N,R110W, Section 13	3 mile barbed-wire let-down, built in 2003
Tepee Ridge Water	Mosquito SE	T39N,R111W, Section 13	Development troughs, built in 1984
Mosquito Lake Cow Camp and 40-acre Horse Pasture	Mosquito NW	T40N,R110W, Section 22	1 cabin, built in 1964
Upper Green River Allotment – Tosi Creek / Teepee Creek Rotation			
Klondike-Rock Creek Fence	Upper Tepee Creek	T39N, R110W, Sections 20,29	.7 mile, built in 1961
Tosi Creek Boundary Fence	Tosi Creek	T39N,R111W, Section 16	.5 mile barbed-wire, built in 1955
Bacon Ridge Fence	Kinky Creek	T40N,R111W, Section 24	1 mile buck & pole, built in 1990
Tepee Creek Drift Fence	Upper Tepee Creek	T39N,R110W, Sections 9,16	1 mile buck & pole, built in 1983
Tepee Creek Cow Camp	Lower Tepee Creek	T38N,R110W, Section 26	1 cabin, built in 1977
Tosi Creek Stock Bridge-#1	Tosi Creek	T39N,R110W, Section 15	1 bridge, built in 1980
Tosi Creek Stock Bridge-#2	Tosi Creek	T39N,R110W, Section 17	1 bridge, built in 1980
Tepee Cattle guard		T39N,R111W, Section 1	1 cattle guard, built in 1982
Upper Green River Allotment – Gypsum Creek Rotation			
Little Sheep Mountain Boundary Fence	Upper Gypsum	T39N,R109W, Sections 15,22	.5 mile buck & pole, built in 1964
Gypsum Creek Cow Camp and 40-acre Horse Pasture	Upper Gypsum	T39N,R109W, Section 32	1 cabin, built in 1977
Gypsum Creek Division Fence	Upper and Lower Gypsum	T39N,R109W, Section 31; T39N,R110W, Section 36; T38N,R110W, Section 1	2.7 miles barbed-wire, rebuilt in 2001
Gypsum Creek Stock Bridges	Lower Gypsum	T38N,R109W, Sections 31,32	2 bridges, built in 1981
Jim Creek Boundary Fence	Lower Gypsum	T37N,R109W, Sections 5,6	2 miles 4-strand barbed-wire built in 1934
Gypsum Creek Boundary Fence	Lower Gypsum	T38N,R109W, Section 31 T37N,R109W, Section 6	2 miles barbed-wire, built in 1947
Gypsum Hill Fence	Lower Gypsum	T38N,R110W, Section 25	0.7 mile buck & pole, built in 1947
Livestock Driveway and River Bottom Pasture			
Pot Creek Driveway Fence	Out of project area/ driveway	T37N,R109W, Sections 7,18,19	2.5 miles barbed-wire, built in 1938
Kendall Drift Fence	River Bottom	T38N,R110W, Section 14	.5 mile buck & pole, built in 1982

Description	Pasture	Location	Comments
Kendall Drift Extension	River Bottom	T38N,R110W, Sections 11,14	.1 mile barbed-wire, built in 1986
Kendall Warm Springs Protection Fence	River Bottom/ Livestock Driveway	T38N,R110W, Section 2	1.5 miles barbed-wire and buck & pole, rebuilt 2008-2009
Kendall Administrative Site Fence	River Bottom/ livestock driveway	T38N,R110W, Sections 14,23	2 miles buck & pole and barbed-wire, built in 1930, Maintained by FS
Kendall Cattleguard-#1 Maintained by FS	River Bottom/ livestock driveway	T38N,R110W, northeast part of Section 14	1 cattleguard, built in 1982
Kendall Cattleguard-#2 Maintained by FS	River Bottom/ livestock driveway	T38N,R110W, northeast part of Section 14	1 cattleguard, built in 1982
Green River Boundary Fence	River Bottom Pasture/livestock driveway	T38N,R110W, Sections 25,26	1.5 miles barbed-wire, built in 1940, reconstructed to facilitate antelope migration in 2005
Whiskey Grove Campground Fence Maintained by FS	River Bottom /livestock driveway	T38N,R110W, Section 14	.3 barbed wire, rebuilt in 2002

Detailed Descriptions by Allotment under Alternative 2

This section provides a detailed description of the livestock grazing management by allotment and rotation as proposed under Alternative 2.

Badger Creek Allotment

Permitted Livestock Numbers, Season of Use and Management System

The Badger Creek Allotment is a single 7,254-acre pasture located in the southwestern portion of the project area. The area determined to be capable and suitable for livestock grazing is 1,217 acres or 17 percent of the allotment. Under Alternative 2, 157 cow/calf pairs or yearlings would continue to be authorized season-long from July 1st to September 30th for a maximum of 622 animal unit months.

Under current management, actual livestock numbers have ranged from 60 to 157 cow/calf pairs with a mean of 106 averaged over three years. There were two years of non-use in the last five years. Actual livestock numbers (average) have been 68 percent of the permitted number of livestock.

Allowable Use

Forage utilization on key forage species would allow a maximum of 50 percent in the uplands and 55 percent in the riparian areas. Key forage species are primarily Idaho fescue (*Festuca idahoensis*) in uplands and sedges (*Carex* species) or tufted hairgrass (*Deschampsia*) in riparian/meadow areas. Other key species may be identified as appropriate on a site specific basis. Actual use under current management is approximately 30 percent. Allowable use and long-term monitoring would occur at one key area (Figure 7). A key area is a relatively small portion of rangeland which serves as a representative monitoring site and evaluation site for the pasture and/or allotment.

Focus Area Prescription

There are no focus areas in the Badger Allotment.

Structural Improvements

Existing Structural Improvements: Figure 7 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Badger Creek Allotment and Beaver-Twin Allotment boundary fence is located at Township 37N, Range 111W, Sections 1, 12 and Township 38N, Range 111W, Section 36. The fence is a three-wire, let down fence approximately two miles in length. The southern ½ of the fence would be maintained by the Badger and Beaver-Twin Allotment permittees.

Proposed Structural Improvement: There are no proposed structural improvements.

Beaver-Twin Allotment

Permitted Livestock Numbers, Season of Use and Management System

The Beaver-Twin Allotment is a single 22,079-acre pasture located in the southwestern portion of the project area. The area determined to be capable and suitable for livestock grazing is 6,337 acres or 29 percent of the allotment. Under Alternative 2, 700 cow/calf pairs or yearlings would be authorized season-long from July 15th to October 15th for a maximum of 2,772 animal unit months.

Under current management, the actual number of livestock in the allotment in 2012 was 496 cow/calf pairs or 71 percent of the permitted number. The Beaver-Twin Allotment was rested from livestock grazing in four of five years.

Allowable Use

Forage utilization on key forage species would allow a maximum of 50 percent in the uplands and 55 percent in the riparian areas. Key forage species are Idaho fescue (*Festuca idahoensis*) in uplands and sedges (*Carex* species) or tufted hairgrass (*Deschampsia*) in riparian/meadow areas. Other key species may be identified as appropriate on a site specific basis. Actual use under current management is approximately 30 percent. Allowable use and long-term monitoring would be conducted at three key areas (Figure 7).

Focus Area Prescription

Waterdog Lake Focus Area: Cattle grazing would continue to be limited to a maximum forage utilization of 20 percent key forage species and outfitters would continue to not be allowed to graze their stock in the Waterdog Lake focus area.

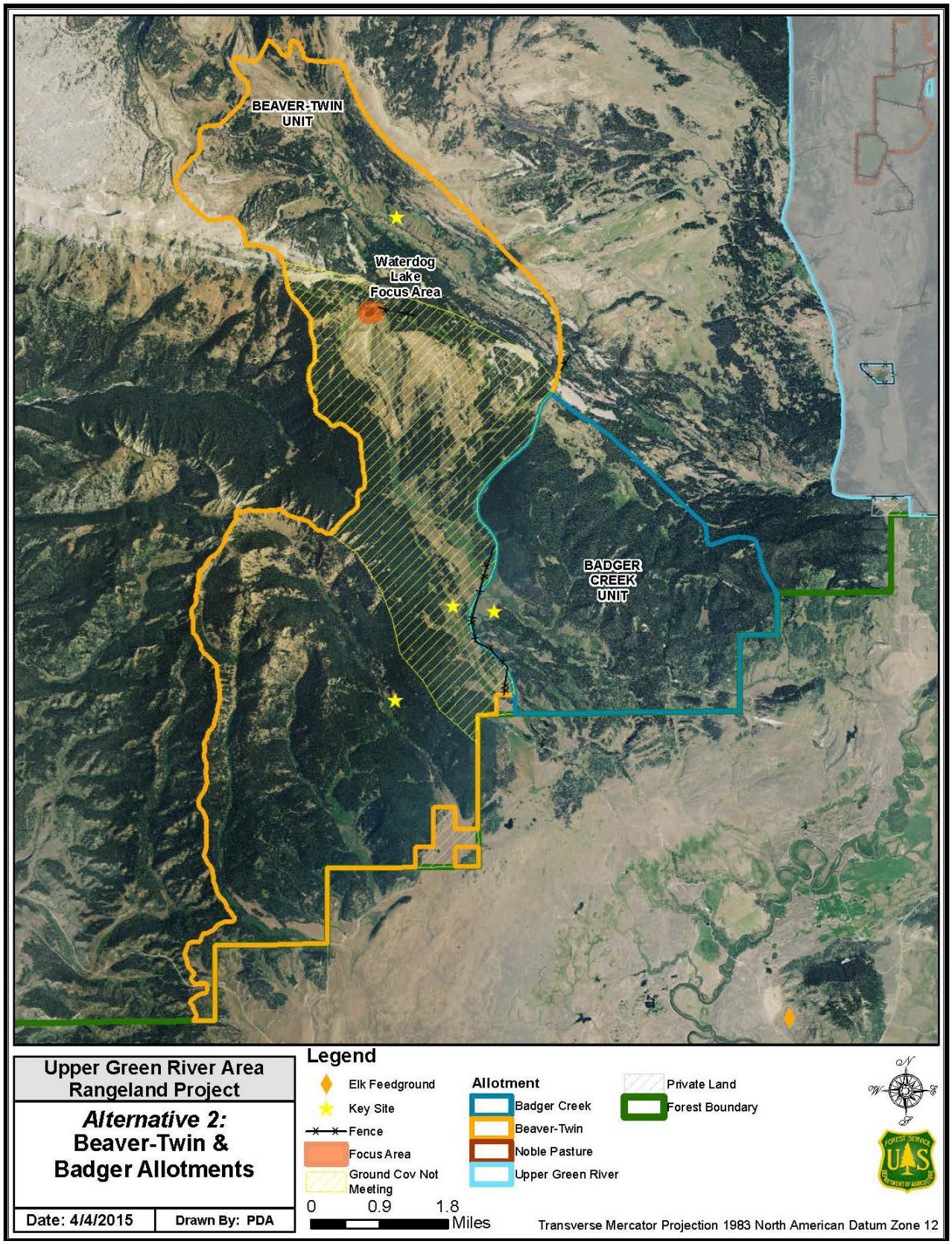

Figure 7. Badger and Beaver-Twin allotments under Alternative 2

Structural Improvements

Existing Structural Improvements: Figure 7 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvements: There are no proposed structural improvements.

Noble Pastures Allotment

Permitted Livestock Numbers, Season of Use and Management System

The Noble Pastures Allotment is a 762-acre irrigated four pasture allotment located in the center of the project area within the boundaries of the Upper Green River Allotment. The area determined to be capable and suitable for livestock grazing is 743 acres or 98 percent of the allotment. Under Alternative 2, the allotment would be permitted for 314 cow/calf pairs, 110 yearlings, and four horses from June 14th to September 20th for a maximum of 1,605 animal unit months.

Under Alternative 2, livestock would enter and exit the allotment from Pasture 3 and would be managed as two herds. One herd would graze season-long in Pasture 4 and the other herd would rotate through the four pastures. Pastures 1, 2, and 3 would be grazed twice to three times during the grazing season for a total of approximately one month each. Trailing through pastures may also occur.

Under current management, actual livestock numbers have ranged from 342 to 350 cow/calf pairs and yearlings plus four horses with a mean of 347 averaged over five years. Actual livestock numbers (average) is 82 percent of the permitted number of livestock.

Allowable Use

Forage utilization on key forage species would allow a maximum of 60 percent in the uplands and 65 percent in the riparian areas. Key forage species are Idaho fescue (*Festuca idahoensis*) in uplands and sedges (*Carex* species) or tufted hairgrass (*Deschampsia*) in riparian/meadow areas. Other key species may be identified as appropriate on a site specific basis. Actual use under current management is 50 percent. Allowable use and long-term monitoring will occur at four key areas (Figure 8).

Focus Area Prescription

Tosi Creek Focus Area is located along the entire length of Tosi Creek within Pasture #1. Under Alternative 2 there is no specific focus area prescription. The allowable use for riparian areas (65 percent forage utilization) would apply.

Klondike Creek Focus Area is located along Klondike Creek within Pasture #4. Under Alternative 2 there is no specific focus area prescription. The allowable use for riparian areas (65 percent forage utilization) would apply.

Structural Improvements

Existing Structural Improvements: Water from Tosi and Klondike Creeks would continue to be diverted into irrigation ditches to irrigate the four pastures and provide off-creek water for livestock. Irrigation ditches and existing fences would continue to be maintained by the permittee. Figure 8 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: There are no proposed structural improvements.

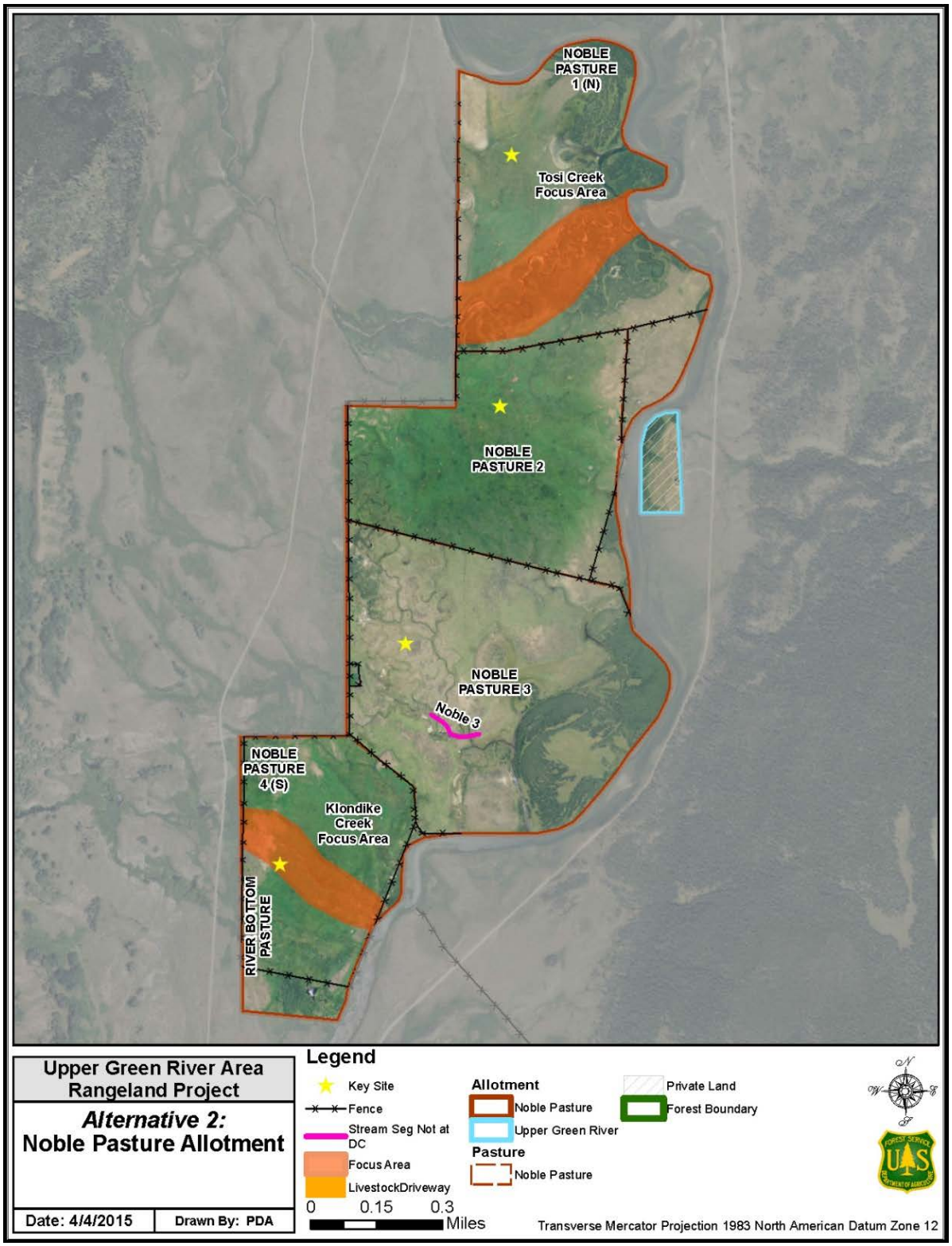

Figure 8. Noble Pastures Allotment under Alternative 2

Roaring Fork Allotment

Permitted Livestock Numbers, Season of Use and Management System

The Roaring Fork Allotment is a single 8,416-acre pasture located in the northwestern portion of the project area, although this allotment is effectively managed as three pastures under current management because of the Upper Green River and use of herding. The area determined to be capable and suitable for livestock grazing is 4,449 acres or 53 percent of the allotment. Under Alternative 2, the Roaring Fork Allotment would be permitted for 170 cow/calf pairs or 170 yearlings season-long from June 16th to October 15th for a maximum of 898 animal unit months.

Under current management, actual livestock numbers have remained constant at 170 cow/calf pairs over five years. The actual livestock numbers are 100 percent of the permitted number of livestock. Livestock graze in the area south of the Upper Green River from June 16th to June 30th in years that the stream flow in the Upper Green River is low enough for the cattle to cross. Use of this area has occurred approximately every second or third year. Livestock then graze north of the Upper Green River starting on the east side of the allotment moving westward as the grazing season progresses, and in the opposite direction the next year.

Allowable Use

Forage utilization on key forage species would allow a maximum of 60 percent in the uplands and 65 percent in the riparian areas to the north of the Green River and 50 percent in the uplands and 55 percent in the riparian areas to the south of the Green River. Key forage species are Idaho fescue (*Festuca idahoensis*) in uplands and sedges (*Carex* species) or tufted hairgrass (*Deschampsia*) in riparian/meadow areas. Other key species may be identified as appropriate on a site specific basis. Actual use under current management is 30 percent. Allowable use and long-term monitoring would be conducted at one key area (Figure 9).

Salting would not be allowed in the elk feedground and livestock would not be intentionally placed at the feedground. Any stray cattle in the elk feedground would be actively herded away.

Focus Area Prescription

Roaring Fork Focus Area is located north of the Green River and is impacted by the congregation of elk associated with the Upper Green River elk feedground. Under Alternative 2 there is no specific focus area prescription. The allowable use for upland areas to the north of the Green River (60 percent forage utilization) would apply.

Structural Improvements

Existing Structural Improvements: Figure 9 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: There are no proposed structural improvements.

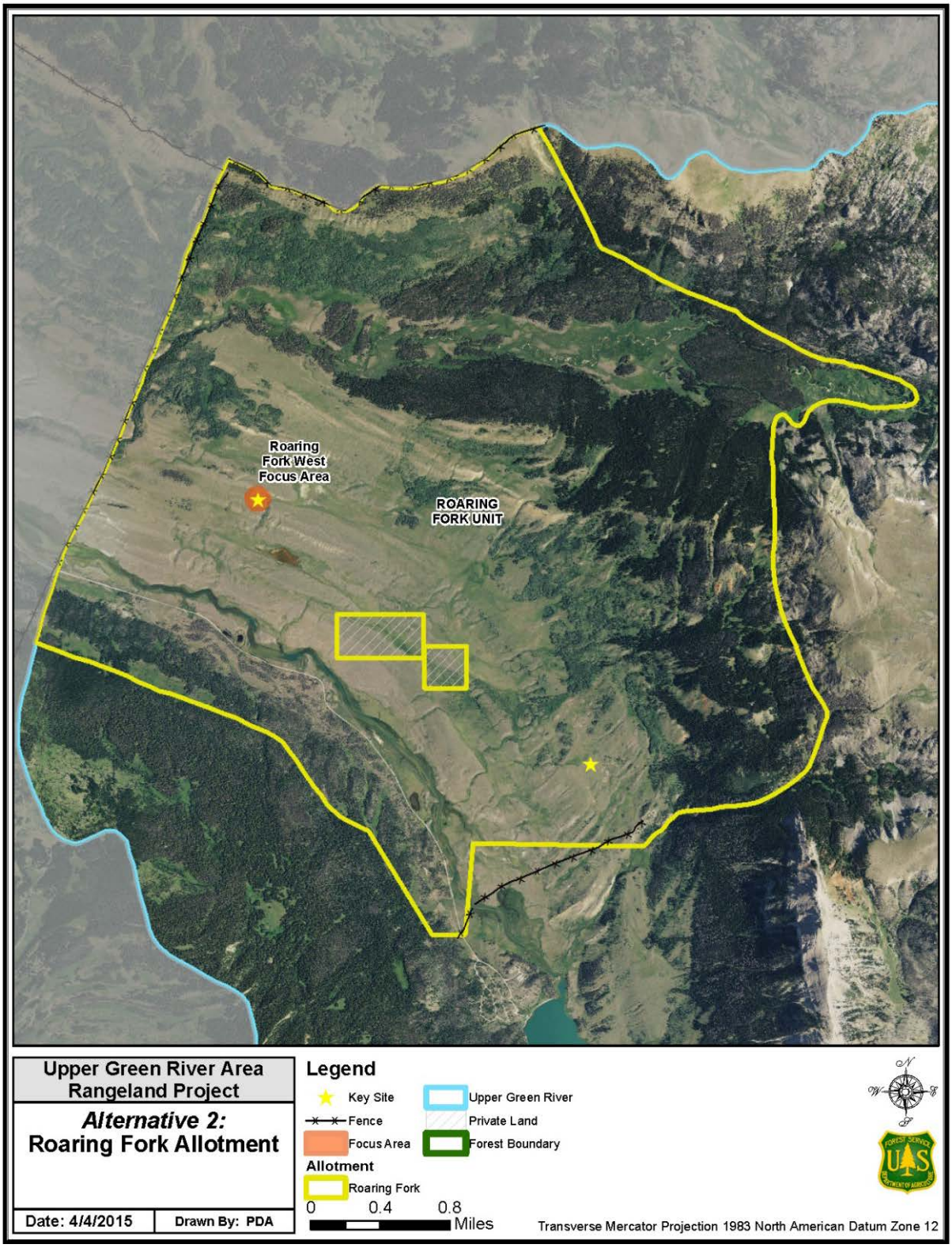

Figure 9. Roaring Fork Allotment under Alternative 2

Wagon Creek Allotment

Permitted Livestock Numbers, Season of Use and Management System

The Wagon Creek Allotment is a 186-acre single pasture located in the central portion of the project area and adjacent to private land. The area determined to be capable and suitable for livestock grazing is 186 acres or 100 percent of the allotment. Under Alternative 2, the Forest Service would continue to authorize 26 cow/calf pairs or 26 yearlings to graze the allotment for a maximum of 103 animal unit months. Under current management, actual livestock numbers have remained constant at 26 cow/calf pairs over five years. The actual livestock numbers is 100 percent of the permitted number of livestock.

The Wagon Creek Pasture is managed in conjunction with the adjacent private land. Under current management, livestock grazing would be authorized for a 45-day period with a variable entry date within the July 15th to October 15th permitted season of use. This means that the 45-day period of livestock use does not take place during the same exact calendar dates in the subsequent year. Under Alternative 2- Grazing as Currently Permitted, the allotment could be grazed for 90 days or the entire length of the season of use.

Pasture rotation schedule for Wagon Creek Allotment under Alternative 2-Current Management.*

Pasture	Permitted Livestock Numbers	Year 1 Date Cattle Enter Unit	Year 1 Date Cattle Leave Unit	Year 2 Date Cattle Enter Unit	Year 2 Date Cattle Leave Unit
Wagon Creek	26	7/15	9/1	9/1	10/15

* Actual dates may vary (within the maximum permitted occupancy stipulated on the permit face) and depend on resource conditions and actual use.

Allowable Use

Forage utilization on key forage species would allow a maximum of 60 percent in the uplands and 65 percent in the riparian areas. Key forage species are Idaho fescue (*Festuca idahoensis*) in uplands and sedges (*Carex* species) or tufted hairgrass (*Deschampsia*) in riparian/meadow areas. Other key species may be identified as appropriate on a site specific basis. Actual use under current management is approximately 50 percent. Allowable use and long-term monitoring would be conducted at one key area (Figure 10).

Focus Area Prescription

There are no focus areas in the Wagon Creek Allotment.

Structural Improvements

Existing Structural Improvements: Existing fences would be maintained as needed by the permittees. Figure 10 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: There are no proposed structural improvements.

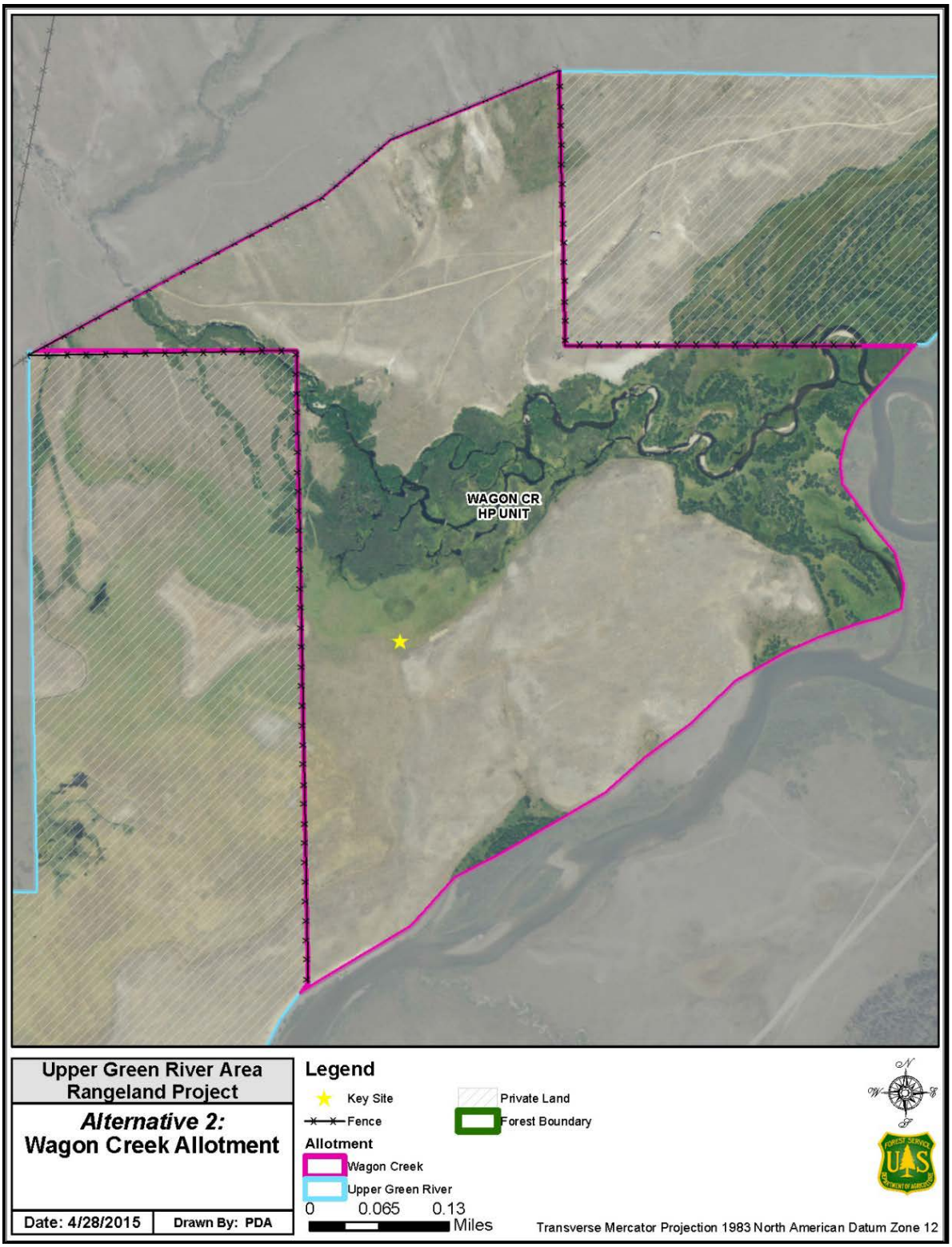

Figure 10. Wagon Creek Allotment under Alternative 2

Upper Green River Allotment

Permitted Livestock Numbers, Season of Use and Management System

The Upper Green River Allotment is a 131,944-acre allotment that encompasses the majority of the project area and contains four pasture rotations: the Mud Lake/Fish Creek rotation, Mosquito Lake rotation, Tosi Creek/Tepee Creek rotation, and Gypsum Creek rotation (Figure 11). In addition, the allotment contains the Kinky Creek Pasture, River Bottom Pasture and a livestock driveway. The area determined to be capable and suitable for livestock grazing is 61,331 acres or 46 percent of the allotment.

Under Alternative 2, 7,565 cow/calf pairs or yearlings and 43 horses would be authorized to graze in the Upper Green Allotment from June 16th to October 15th (the permitted season of use) for a maximum of 40,148 animal unit months. Of the 43 horses authorized in the allotment, 16 horses would be distributed throughout the allotment and 27 horses would be authorized in the Tosi Creek/ Tepee Creek rotation and Kinky Creek Pasture. Permittees of the Upper Green River, Wagon Creek, Roaring Fork and Noble Pastures allotments, move their livestock through the livestock driveway and the River Bottom Pasture to access their allotment and/or exit the Forest. Detailed information is presented below by pasture rotation, Kinky Creek Pasture, and the River Bottom Pasture and the livestock driveway. Table 3 summarizes the grazing system and allowable use by rotation.

Under current management, actual cattle numbers have ranged from 4,695 to 5,292 cow/calf pairs with a mean of 5,000 averaged over five years. Actual cattle numbers (average) 66 percent of the permitted number of livestock. Actual horse numbers have remained constant at 43, or 100 percent of the permitted number of horses.

Allowable Use

Forage utilization on key forage species would allow a maximum of 60 percent in the uplands and 65 percent in the riparian areas. Key forage species are Idaho fescue (*Festuca idahoensis*) in uplands and sedges (*Carex* species) or tufted hairgrass (*Deschampsia*) in riparian/meadow areas. Other key species may be identified as appropriate on a site specific basis. Actual use under current management is approximately 30 percent.

Actual use: The Upper Green River Cattle Association actively monitors utilization on the allotment in cooperation with the Forest Service. The utilization measurements are taken to determine compliance with the permittees' annual operating instructions and determine condition and trends in vegetation. Utilization measurements on pastures of the Upper Green River grazing allotment have not exceeded 35 percent on any of the upland monitoring sites measured in the last 11 years, nor has the average stubble height on the greenline been less than 4.4-inches. (Maximum allowable utilization during the monitoring period was 65 percent in the riparian areas and 60 percent in the upland.)

Focus Area Prescription

There are three focus areas in the Upper Green River Allotment: the Fish Creek focus area in the Mud Lake/Fish Creek rotation, Wagon Creek focus area in the Mosquito Lake rotation, and the Tepee Creek focus area in the Tosi Creek/Tepee Creek rotation. Under Alternative 2, the permitted allowable use for these three riparian focus areas is 65 percent forage utilization.

Under current management, permittees maintain an existing electric fence exclosure (0.7 miles) in the Wagon Creek focus area when the cattle are present in the pasture. At Tepee Creek focus area, the permittees have limited livestock forage utilization to 30 percent and a 6-inch stubble height under current management. There are no specific focus area prescriptions for Fish Creek focus area.

Structural Improvements

Existing Structural Improvements: Figure 11 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: There are no proposed structural improvements.

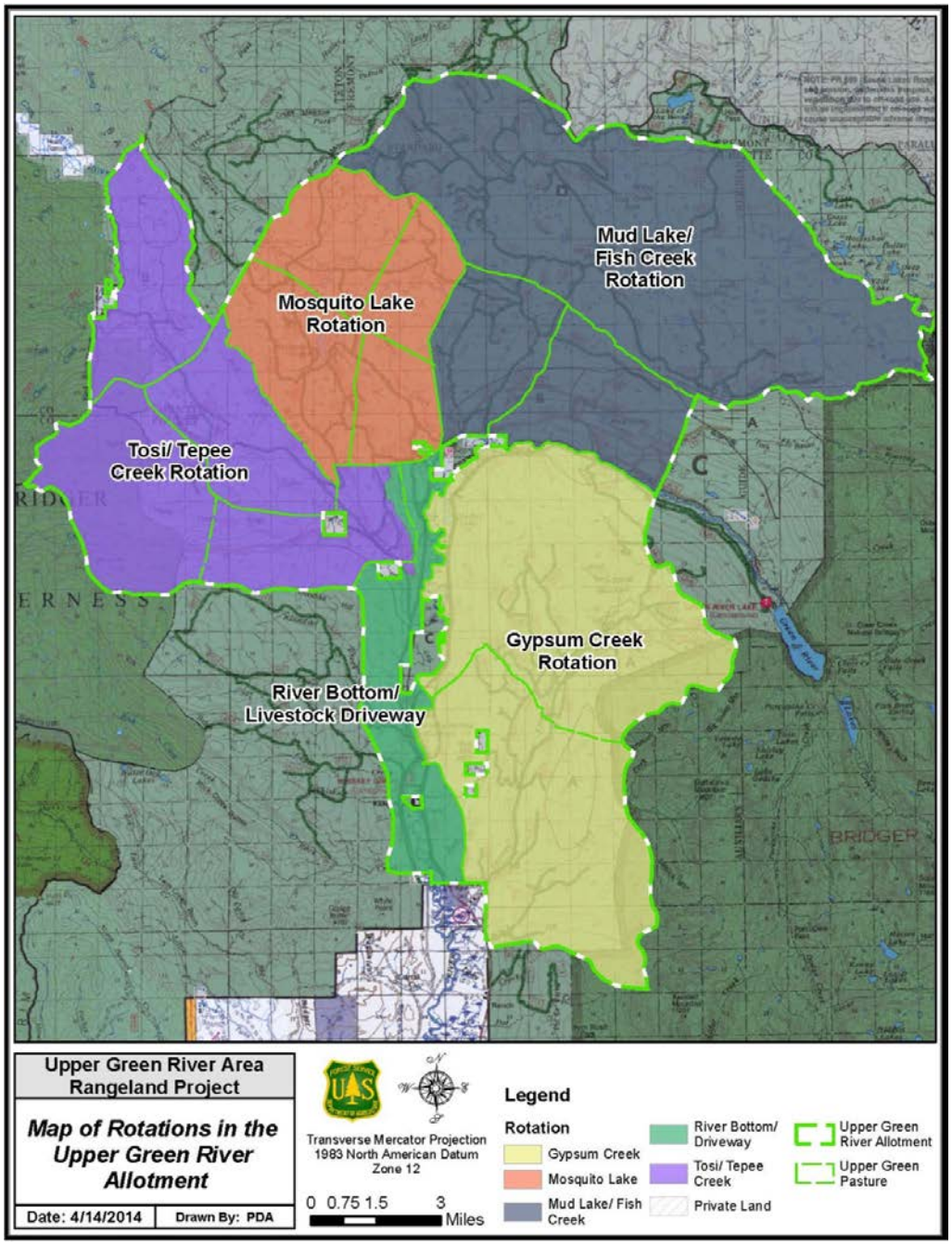

Figure 11. Upper Green River Allotment contains four pasture rotations.

Mud Lake/Fish Creek Rotation

Permitted Livestock Numbers, Season of Use and Management System

Mud Lake/Fish Creek area is a 44,527-acre three pasture system allotment containing Mud Lake East (6,297 acres), Mud Lake West (5,422 acres), and Fish Creek pastures (32,808 acres). The area determined to be capable and suitable for livestock grazing is 23,834 acres or 54 percent of the rotation. Under Alternative 2, 2,780 cow/calf pairs or 2,780 yearlings would be authorized to graze in a deferred rotation grazing system from June 16th to October 15th (the permitted season of use) for a maximum of 14,678 animal unit months.

Under current management, actual cattle numbers have ranged from 1,878 to 2,100 cow/calf pairs with a mean of 1,196 averaged over five years. Actual cattle numbers (average) is 72 percent of the permitted number of livestock.

Pasture rotation schedule for the Mud Lake/Fish Creek rotation in the Upper Green River Allotment under Alternative 2*

Pasture	Permitted Livestock Numbers	Year 1 Date Cattle Enter Unit	Year 1 Date Cattle Leave Unit	Year 2 Date Cattle Enter Unit	Year 2 Date Cattle Leave Unit
Mud Lake West	2,780	6/16	7/15	9/15	10/15
Fish Creek	2,780	7/15	9/15	7/15	9/15
Mud Lake East	2,780	9/15	10/15	6/16	7/15

* Actual dates may vary (within the maximum permitted occupancy stipulated on the permit face) and depend on resource conditions and actual use.

Allowable Use

Forage utilization on key forage species would allow a maximum of 60 percent in the uplands and 65 percent in the riparian areas. Key forage species are Idaho fescue (*Festuca idahoensis*) in uplands and sedges (*Carex* species) or tufted hairgrass (*Deschampsia*) in riparian/meadow areas. Other key species may be identified as appropriate on a site specific basis. Actual use under current management is approximately 30 percent. Allowable use and long-term monitoring would be conducted at three key areas (Figure 12).

The Upper Green River elk feedground, located in the Mud Lake East and Upper Gypsum pastures, would be managed for wintering elk and to minimize livestock use of the area. No salting would be allowed in the feedground and livestock would not intentionally be placed in this area. Any stray cattle would be actively herded away from the feedground.

Focus Area Prescription

Fish Creek Focus Area is located within the Fish Creek Pasture. Under Alternative2, there is no specific focus area prescription for Fish Creek focus area. The allowable use for riparian areas (65 percent forage utilization) would apply.

Structural Improvements

Existing Structural Improvements: Figure 12 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: There are no proposed structural improvements.

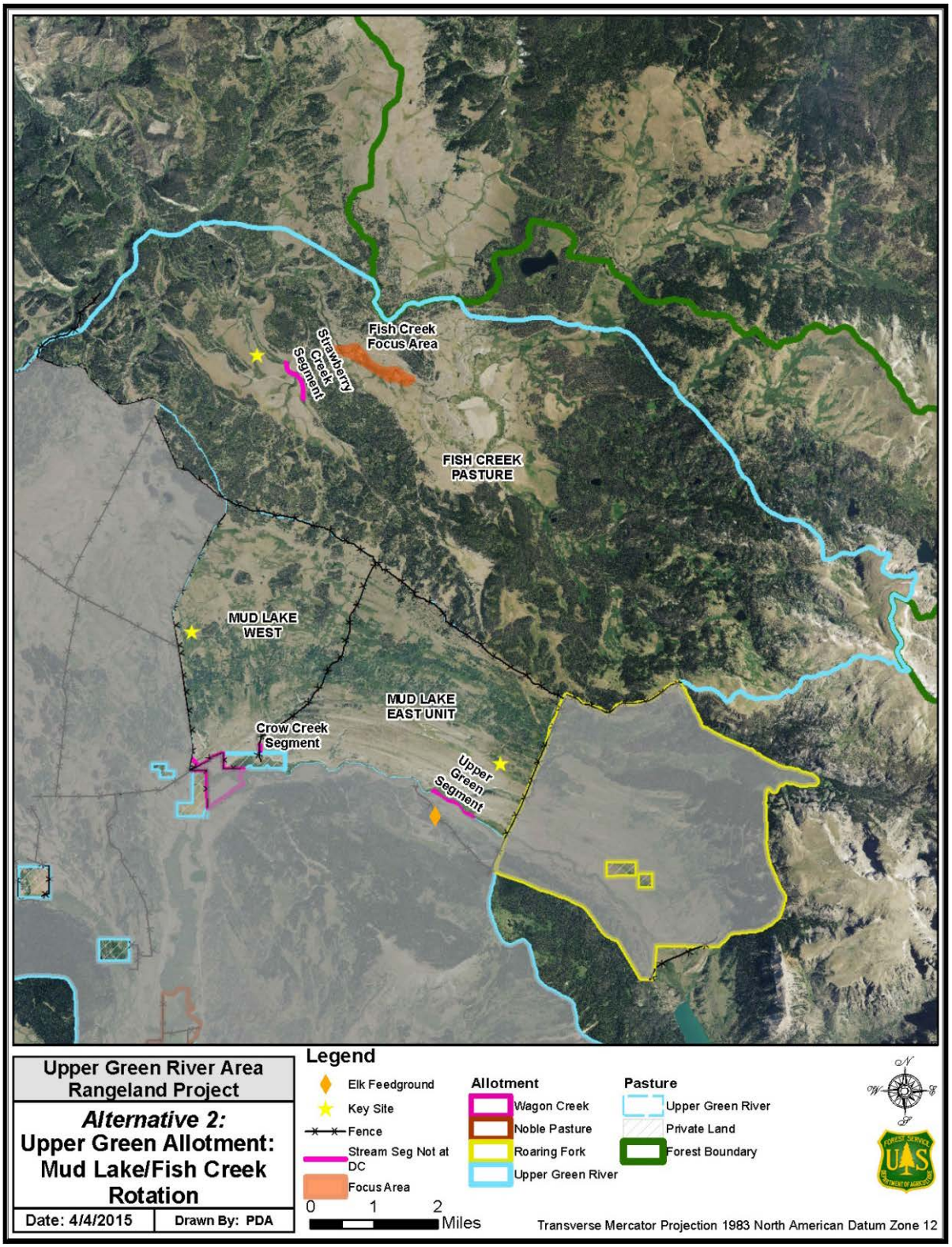

Figure 12. Mud Lake/Fish Creek Rotation in the Upper Green River Allotment under Alternative 2

Mosquito Lake Rotation

Permitted Livestock Numbers, Season of Use and Management System

Mosquito Lake rotation is a 17,181-acre four pasture unit located in the northwestern portion of the project area. The four pastures are Mosquito NE (3,126 acres), Mosquito SE (3,826 acres), Mosquito SW (5,990 acres), and Mosquito NW (4,839 acres). The area determined to be capable and suitable for livestock grazing is 11,634 acres or 68 percent of the pasture area. Under Alternative 2, 1,800 cow/calf pairs or 1,800 yearlings would be authorized to graze in a rest rotation grazing system from June 16th to October 15th (the permitted season of use) for a maximum of 9,504 animal unit months.

Under current management, actual cattle numbers have ranged from 1,127 to 1,250 cow/calf pairs with a mean of 1,196 averaged over five years. Actual cattle numbers (average) is 66 percent of the permitted number of livestock.

Pasture rotation schedule for the Mosquito Lake rotation in the Upper Green River Allotment under Alternative 2*

Pasture	Permitted Livestock Numbers	Year 1 Date Enter Unit	Year 1 Date Leave Unit	Year 2 Date Enter Unit	Year 2 Date Leave Unit	Year 3 Date Enter Unit	Year 3 Date Leave Unit	Year 4 Date Enter Unit	Year 4 Date Leave Unit
Mosquito Lake NE	1,800	6/15	7/25	rest	rest	9/5	10/15	7/25	9/5
Mosquito Lake SE	1,800	7/25	9/5	6/15	7/25	rest	rest	9/5	10/15
Mosquito Lake SW	1,800	9/5	10/15	7/25	9/5	6/15	7/25	rest	rest
Mosquito Lake NW	1,800	rest	rest	9/5	10/15	7/25	9/5	6/15	7/25

* Actual dates may vary (within the maximum permitted occupancy stipulated on the permit face) and depend on resource conditions and actual use.

Allowable Use

Forage utilization on key forage species would allow a maximum of 60 percent in the uplands and 65 percent in the riparian areas. Key forage species are Idaho fescue (*Festuca idahoensis*) in uplands and sedges (*Carex* species) or tufted hairgrass (*Deschampsia*) in riparian/meadow areas. Other key species may be identified as appropriate on a site specific basis. Actual use under current management is approximately 30 percent. Allowable use and long-term monitoring would be conducted at four key areas (Figure 13).

Focus Area Prescription

Wagon Creek Focus Area is located in the Mosquito SE Pasture in the Upper Green River Allotment (T40N, R110W, Section 27). Under current management, the permittees have maintained an existing electric fence exclosure (0.7 miles) when the cattle are using the pasture. See Structural Improvements for additional information on electric fences. Under Alternative 2 – Grazing as Permitted there is no specific focus area prescription. The Forest Plan allowable use for riparian areas (65 percent forage utilization) would therefore apply.

Structural Improvements

Existing Structural Improvements: Figure 13 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: There are no proposed structural improvements.

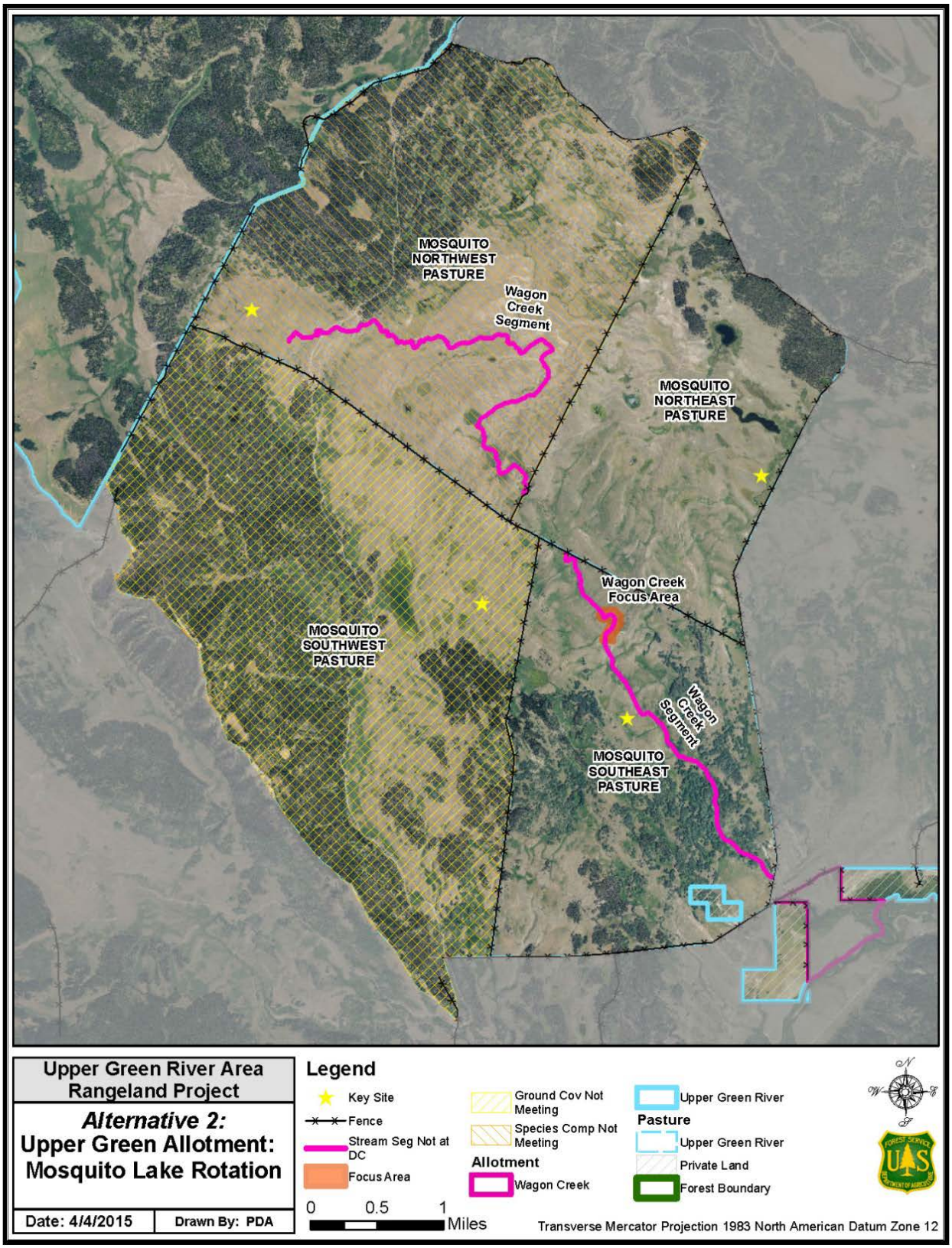

Figure 13. Mosquito Lake Rotation in the Upper Green River Allotment under Alternative 2

Tosi Creek/Tepee Creek Rotation

Permitted Livestock Numbers, Season of Use and Management System

Tosi Creek/Tepee Creek area is a 20,656-acre three pasture unit located in the western portion of the project area. The three pastures are Tosi Creek Pasture (5,828 acres), Upper Tepee Creek Pasture (8,747 acres), and Lower Tepee Creek Pasture (6,081 acres). The area determined to be capable and suitable for livestock grazing is 8,580 acres or 42 percent of the pasture rotation. The Forest Service would continue to authorize 1,000 cow/calf pairs or 1,000 yearlings to graze in a deferred rotation grazing system from June 16th to October 15th (the permitted season of use) for a maximum of 5,280 animal unit months.

Under current management, actual cattle numbers have ranged from 657 to 757 cow/calf pairs with a mean of 703 averaged over five years. Actual cattle numbers (average) is 70 percent of the permitted number of livestock.

Pasture rotation schedule for the Tosi Creek/ Teepee Creek rotation in the Upper Green River Allotment under Alternative 2*

Pasture	Permitted Livestock Numbers	Year 1 Date Cattle Enter Unit	Year 1 Date Cattle Leave Unit	Year 2 Date Cattle Enter Unit	Year 2 Date Cattle Leave Unit
Lower Tepee Creek	1,000 cattle 27 horses#	06/16	07/30	09/16	10/15
Upper Tepee Creek	1,000 cattle 27 horses#	08/01	09/15	08/01	09/15
Tosi Creek	1,000 cattle 27 horses#	09/16	10/15	06/16	07/30

* Actual dates may vary (within the maximum permitted occupancy stipulated on the permit face) and depend on resource conditions and actual use.

Permitted 27 horses are discussed under Kinky Creek Pasture.

Allowable Use

Forage utilization on key forage species would allow a maximum of 60 percent in the uplands and 65 percent in the riparian areas. Key forage species are Idaho fescue (*Festuca idahoensis*) in uplands and sedges (*Carex* species) or tufted hairgrass (*Deschampsia*) in riparian/meadow areas. Other key species may be identified as appropriate on a site specific basis. Actual use under current management is approximately 30 percent. Allowable use and long-term monitoring would be conducted at two key areas (Figure 14).

Focus Area Prescription

The Tepee Creek Focus Area is located in the Lower Tepee Creek Pasture (T39N R111W Section1, T39N R110W, Section 6) along Tepee Creek downstream of the bridge crossing Forest Road 620 (Figure 14). Under Alternative 2 – Grazing as Permitted, there is no specific focus area prescription for Tepee Creek focus area. The permitted allowable use for riparian areas (65 percent forage utilization) would apply. Under current management, the permittees have herded livestock out of the focus area and actual livestock use has been managed at a lower level than the maximum allowable use permitted. Under current management, forage utilization is approximately 30 percent with a 6-inch stubble height.

Structural Improvements

Existing Structural Improvements: Figure 14 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: There are no proposed structural improvements.

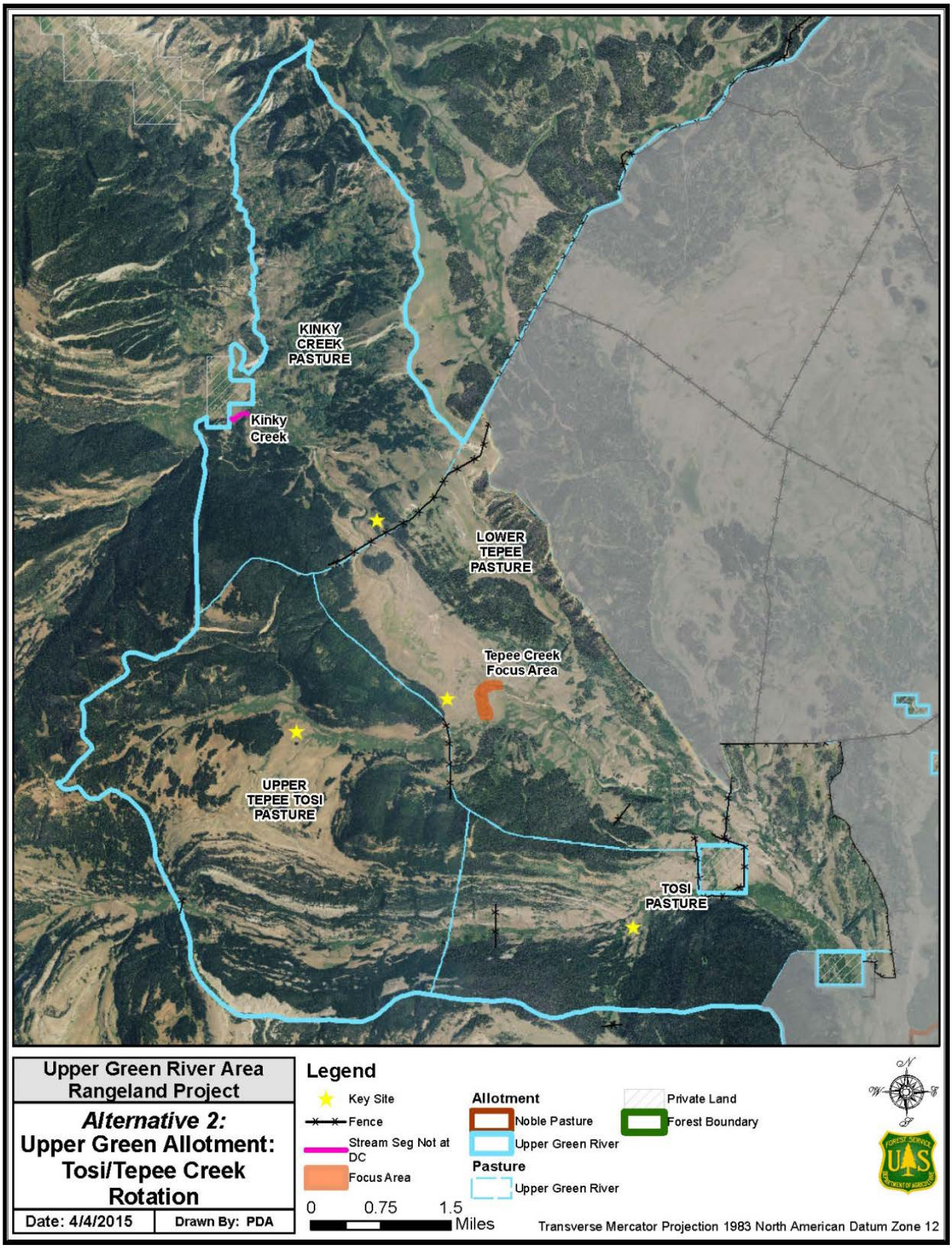

Figure 14. Tosi Creek/ Tepee Creek Rotation, Kinky Creek Pasture in the UG River Allotment under Alternative 2

Kinky Creek Pasture

Permitted Livestock Numbers, Season of Use and Management System

The Kinky Creek Pasture is an 8,747-acre single pasture located in the northwestern portion of the project area. The area determined to be capable and suitable for livestock grazing is 2,596 acres or 30 percent of the allotment. The Kinky Creek Pasture is included in the Upper Green River Allotment and under Alternative 2 it would be managed in a rotation with the Tosi Creek/ Tepee Creek rotation (Tosi Creek Pasture, Upper Tepee Creek Pasture, and Lower Tepee Creek Pasture). The Forest Service would authorize 27 horses in a deferred rotation grazing system from June 16th to October 15th (the permitted season of use) for a maximum of 130 animal unit months. The horses would move in the same type of pasture rotation as scheduled for the Tosi Creek/ Tepee Creek using the Kinky Creek Pasture at the same time as livestock are in the Lower Tepee Creek Pasture. No cattle would be authorized in the Kinky Creek Pasture under Alternative 2.

Pasture rotation schedule for the Kinky Pasture and Tosi Creek/ Teepee Creek rotation in the Upper Green River Allotment under Alternative 2*

Pasture	Permitted Livestock Numbers	Year 1 Date Cattle Enter Unit	Year 1 Date Cattle Leave Unit	Year 2 Date Cattle Enter Unit	Year 2 Date Cattle Leave Unit
Lower Tepee Creek & Kinky Creek	27 horses	06/16	07/30	09/16	10/15
Upper Tepee Creek	27 horses	08/01	09/15	08/01	09/15
Tosi Creek	27 horses	09/16	10/15	06/16	07/30

* Actual dates may vary (within the maximum permitted occupancy stipulated on the permit face) and depend on resource conditions and actual use.

Under current management, the actual number of horses using the pasture remained constant at 27 horses (100 percent of permitted), however, the area grazed was only a small portion of the Kinky Creek Pasture, located adjacent to Darwin Ranch. This small pasture (approximately 57 acres) was managed under a special use permit, but beginning in 2014, the special use permit was not renewed. The 27 horses will be managed under a term grazing permit and would be required to move through the pastures in a deferred rotation. The permittee may choose to use the Kinky Creek Pasture only when the pasture is scheduled for livestock grazing.

Background: Historically the Kinky Creek Allotment was administered by the Jackson Ranger District and used by 213 cow/calf pairs for the established season of June 11th to October 15th. The allotment was managed under a four pasture deferred rotation grazing system and has been vacant (ungrazed by livestock) for several years. In 2003, the Upper Green River Allotment boundary was moved to include the portion of the Kinky Creek Allotment located on the Pinedale Ranger District. This portion of the old Kinky Creek Allotment is referred to as the Kinky Creek Pasture. It will be analyzed as part of the Upper Green River Allotment in this document. A small portion of the Kinky Creek Pasture (approximately 57 acres within the 6,278-acre pasture) was grazed by 27 horses under a special use permit and term grazing permit. Under Alternative 2, the 27 horses would be permitted to graze Kinky Creek Pasture and the Tosi Creek/Tepee Creek rotation in a three pasture rotation.

Allowable Use

Forage utilization on key forage species would allow for a maximum of 60 percent in the uplands and 65 percent in the riparian areas. Key forage species are Idaho fescue (*Festuca idahoensis*) in uplands and sedges (*Carex* species) or tufted hairgrass (*Deschampsia*) in riparian/meadow areas. Other key species may be

identified as appropriate on a site specific basis. Allowable use and long-term monitoring would be conducted at one key area (Figure 14).

Focus Area Prescription

There are no focus areas in the Kinky Creek Pasture.

Structural Improvements

Existing Structural Improvements: Figure 14 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: There are no proposed structural improvements.

Gypsum Creek Rotation

Permitted Livestock Numbers, Season of Use and Management System

Gypsum Creek pastures encompass 36,173 acres in a two pasture rotation located in the eastern portion of the project area (Figure 15). The two pastures are the Upper Gyp Pasture (20,391 acres) and Lower Gyp Pasture (15,782 acres). The area determined to be capable and suitable for livestock grazing is 9,852 acres or 27 percent of the pastures combined. Under Alternative 2, 1,985 cow/calf pairs or 1,985 yearlings would be authorized to graze in a deferred rotation grazing system from June 16th to October 15th (the permitted season of use) for a maximum of 10,480 animal unit months.

Under current management, actual cattle numbers have ranged from 1,033 to 1,188 cow/calf pairs with a mean of 1,105 averaged over five years. Actual cattle numbers have averaged approximately 56 percent of the permitted number of livestock.

Pasture rotation schedule for the Gypsum Creek rotation in the Upper Green River Allotment under Alternative 2*

Pasture	Permitted Livestock Numbers	Year 1 Date Cattle Enter Unit	Year 1 Date Cattle Leave Unit	Year 2 Date Cattle Enter Unit	Year 2 Date Cattle Leave Unit
Upper Gyp	1,985	6/16	8/15	8/15	10/15
Lower Gyp	1,985	8/15	10/15	6/16	8/15

* Actual dates may vary (within the maximum permitted occupancy stipulated on the permit face) and depend on resource conditions and actual use.

Allowable Use

Forage utilization on key forage species would allow a maximum of 60 percent in the uplands and 65 percent in the riparian areas. Key forage species are Idaho fescue (*Festuca idahoensis*) in uplands and sedges (*Carex* species) or tufted hairgrass (*Deschampsia*) in riparian/meadow areas. Other key species may be identified as appropriate on a site specific basis. Actual use under current management is approximately 30 percent forage utilization with a 6-inch stubble height retained on South Gypsum Creek. Allowable use and long-term monitoring would be conducted at two key areas (Figure 15).

The Upper Green River elk feedground, located in the Upper Gyp and Mud Lake East pastures, would be managed for wintering elk and to minimize livestock use of the area. No salting would be allowed in the feedground and livestock would not intentionally be placed in this area. Any stray cattle would be actively herded away from the feedground.

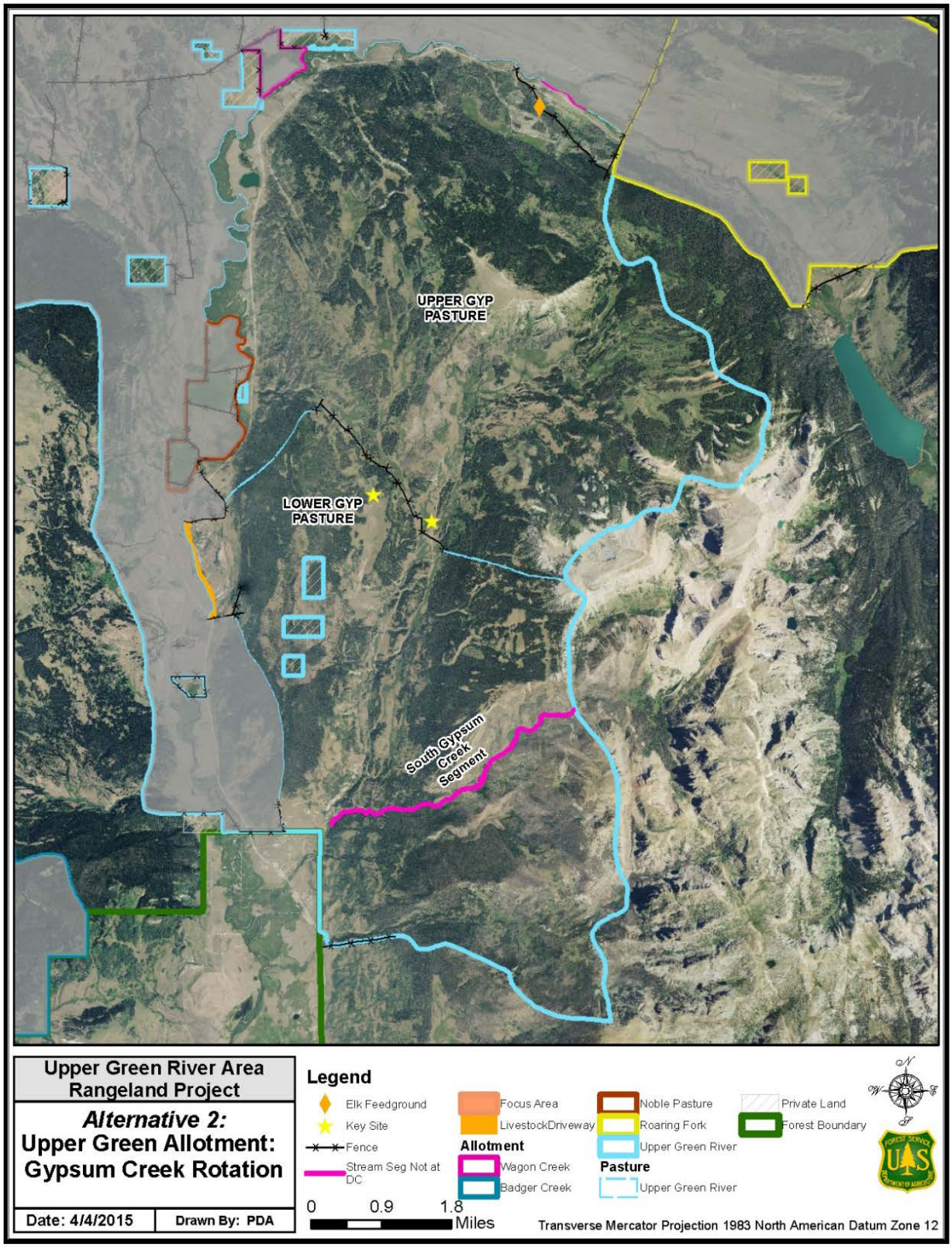

Figure 15. Gypsum Creek Rotation in the Upper Green River Allotment under Alternative 2

Focus Area Prescription

There are no focus areas in the Gypsum Creek rotation.

Structural Improvements

Existing Structural Improvements: Figure 15 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: There are no proposed structural improvements.

River Bottom Pasture and Livestock Driveway

Permitted Livestock Numbers, Season of Use and Management System

River Bottom Pasture and the livestock driveway (also known as the Green River Drift Trail) are located within the south-central portion of the Upper Green River Allotment (Figure 16) and are used jointly by livestock in the Upper Green River, Wagon Creek, Roaring Fork, and Noble Pastures allotments to access the allotments in the spring and exit the Forest in the fall each year. The River Bottom Pasture is approximately 7,131 acres of which 4,973 (70 percent) is capable and suitable for livestock grazing. Under Alternative 2, 8,171 cow/calf pairs or yearlings and 20 horses would be authorized to use the livestock driveway and 6,016 cow/calf pairs or yearlings and 20 horses would be authorized to use the River Bottom Pasture from June 12th to October 15th (the permitted season of use). Fewer cattle use the River Bottom Pasture than the livestock driveway because cattle permitted for the Gypsum Creek rotation of the Upper Green River Allotment and the Roaring Fork Allotment do not travel through the River Bottom Pasture to exit the Forest.

The livestock driveway is located within the River Bottom Pasture and begins at the Forest southern boundary heading north primarily along Forest Road 650 (Green River Lakes Road) as well as Forest Road 600 and 660 for approximately 12.5 miles to the bend in the Green River. The stock driveway in the Upper Green River Allotment is divided into two main sections: the Marsh Creek-Boulder Creek Driveway and the Green River Bottom Stock Driveway. Marsh Creek-Boulder Creek Driveway begins on Marsh Creek at the Forest boundary near McDowell Flats. With the exception of some cattle that are trucked to the permit area, and the cattle in Beaver-twin and Badger allotments, the remaining cattle permitted with the project area use this driveway on their way to and from the Upper Green River Allotment each year. The driveway parallels the Green River Lakes Road (#650) in some locations. The stock driveway follows near the Green River from the Bend to the southern boundary of the project area. Maps and text within this document do not include the entire driveway within National Forest System Lands. That is because the portion of the livestock driveway that begins at Marsh Creek and continues to the Forest boundary near the end of County Road #352, is outside the “project area”.

The livestock driveway was enrolled on the National Register of Historic Places in 2013. It is generally considered to extend 200 feet on either side of the road; however, in some cases it is narrower when confined by fences or the Green River and adjacent riparian vegetation. The livestock driveway would be used primarily in the spring by the Wagon Creek Allotment, Roaring Fork Allotment, Noble Pastures Allotment and the Upper Green River Allotment permittees to herd their cattle into the allotments. Livestock primarily travel on the roadway and the area immediately adjacent to the roadway with limited grazing. Cattle would be confined to the roadway when they are actively herded through the Kendal Warm Springs exclosure.

The River Bottom Pasture would be used primarily in the fall by cattle in the Wagon Creek Allotment, Noble Allotment and the Upper Green River Allotment except for livestock from the Gypsum Creek rotation. Livestock would be allowed to drift through the pasture heading south to the Forest boundary, where they would be gathered and moved off the Forest.

Allowable Use

Forage utilization on key forage species would allow a maximum of 60 percent in the uplands and 65 percent in the riparian areas for the River Bottom Pasture. Key forage species are Idaho fescue (*Festuca idahoensis*) in uplands and sedges (*Carex* species) or tufted hairgrass (*Deschampsia*) in riparian/meadow areas. Other key species may be identified as appropriate on a site specific basis. Actual use under current management is approximately 20 percent. Allowable use and long-term monitoring would be conducted at one key area (Figure 16). Allowable use in the livestock driveway would maintain a minimum of 60 percent ground cover to protect soils from erosion.

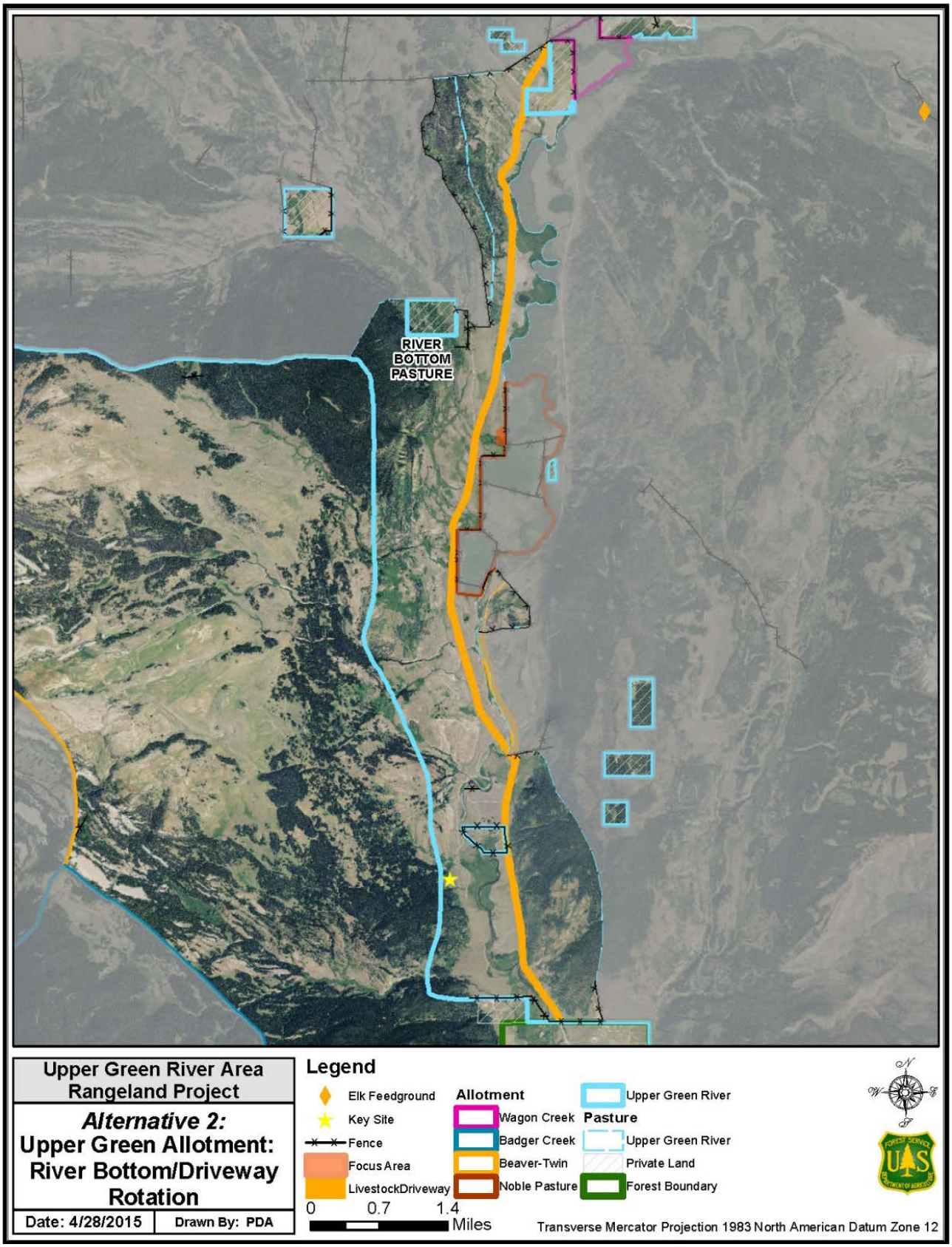

Figure 16. River Bottom Pasture and livestock driveway, also known as the Green River Drift Trail

Focus Area Prescription

There are no focus areas in the River Bottom Pasture and the livestock driveway.

Structural Improvements

Existing Structural Improvements: Figure 16 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: There are no proposed structural improvements.

Alternative 3 - Modified Grazing Management (Modified Proposed Action and Preferred Alternative)

Alternative 3 is a modification of Alternative B: Modified Grazing Management (Proposed Action) presented in the DSEIS (U.S. Forest Service 2010). Adjustments resulting in Alternative 3 were incorporated in response to public comments on the DSEIS, permittee comments, refinement of rangeland and riparian desired conditions and objectives, additional data collection on existing conditions and updated identification of the areas of concern. Alternative 3 is a livestock grazing strategy designed to maintain existing rangeland and riparian conditions where they meet desired conditions and improve rangeland and riparian conditions in areas of concern.

Under Alternative 3, livestock grazing would continue to be authorized on the Badger Creek, Beaver-Twin, Noble Pastures, Roaring Fork, Wagon Creek, and the Upper Green River allotments (Figure 17), using livestock management strategies designed to sustain resource conditions where desired conditions are being met and improve resource conditions where a gap between existing conditions and desired conditions has been identified (Table 1). This alternative implements a livestock grazing management strategy that includes site specific allowable use standards (i.e., maximum forage utilization and minimum stubble height standards), focus area prescriptions, structural improvements, and adaptive management to meet or move conditions towards resource objectives. The livestock grazing management strategy is described in detail below and summarized in Table 5 and Table 6.

Allotment management plans would be prepared or updated for each of the six allotments. Allotment management plans for the Upper Green River and Roaring Fork allotments would be revised and new allotment management plans would be completed for the Badger Creek, Beaver-Twin Creeks, Noble Pastures, and Wagon Creek allotments. The allotment management plans would contain the resource objectives and livestock management strategy described under this alternative.

The Forest Service would initiate a deferred or rotational grazing system in the Badger Creek, Beaver-Twin Creeks, Roaring Fork and Wagon Creek allotments to meet Forest Plan requirements to eliminate season-long grazing and would modify the management system in the Noble Pastures and Upper Green River allotments. The alternative would authorize 8,819 cow/calf pairs or yearlings including 47 horses and would allocate a maximum of 44,722 animal unit months of forage to permitted livestock. Alternative 3 reduces the number of livestock by 270 from the currently permitted number of livestock in the Upper Green River Allotment under Alternative 2.

The proposed management for rangelands meeting desired conditions would allow a maximum of 50 percent forage utilization on key forage species in the uplands, riparian, and meadow areas and retain a 4-inch stubble height minimum along the greenline of streams. The greenline is a linear grouping of live perennial plants, embedded rock or anchored wood above the waterline on or near the water’s edge; it often forms a relatively continuous line of perennial vegetation adjacent to the stream (Burton et al. 2011). More restrictive allowable use standards and/or other management strategies would be implemented in focus areas, and

pastures or allotments not meeting or moving towards desired conditions under existing conditions. Proposed structural improvements include fences to divide the Beaver-Twin Allotment into three pastures, and fences to add the South Kinky Creek Pasture to the Upper Green River Allotment and to improve resource conditions in focus areas.

Adaptive management would be implemented when livestock grazing has been determined to be a causative factor and established allowable use levels, design features, and structural improvements do not result in improved resource conditions.

Items Common to Action Alternatives which include design features, grizzly bear conservation measures, terms and conditions, and monitoring would be part of Alternative 3.

Permitted Livestock Numbers, Season of Use, and Grazing Management System

Collectively, the six allotments comprise approximately 170,643 acres. Under Alternative 3, 8,772 cow/calf pairs or yearlings and 47 horses, would be permitted on the Upper Green River project area and would consume no more than 44,722 animal unit months of forage. The permitted season of use varies by allotment but the season of use generally occurs from June 14th to October 15th annually across the project area. Under Alternative 3, actual livestock numbers and/or actual season of use could be administratively adjusted within those permitted in any given year in order to meet allowable use standards and/or resource objectives.

A shift of one week maximum to the season of use could be authorized by the District Ranger in any given year as described in this paragraph and in the Items Common to the Action Alternatives. Alternative 3 would include the potential for up to seven days shift to the beginning or the end of the permitted season to be decided on an annual basis by the District Ranger. A shift to the season of use would occur at most on an infrequent basis (approximately two out of ten years) by either adding up to one week prior to or one week following the permitted season of use. The season of use would remain the same length (equivalent number of days), but could occur a maximum of one week earlier or one week later than indicated in the permitted season of use. The potential of a one week shift prior to the season of use would apply to the Badger, Beaver-Twin, Noble Pastures and Roaring Fork allotments as well as the Gypsum Creek rotation of the Upper Green River Allotment, but would not be an option for the Wagon Creek Allotment and the Mud Lake/Fish Creek, Mosquito Lake, and the Tosi Creek/Tepee Creek/Kinky Creek rotations of the Upper Green River Allotment because these areas have Greater Sage-grouse nesting and early brood rearing habitat considerations. No week shift prior to the season of use would be allowed in the Badger Allotment in one in four years when the season of use is from July 15th to October 14th to allow for seed set. A maximum of a one week shift following the season of use could apply to all six allotments. Any shift in the season of use is subject to the District Ranger’s approval.

A decision to implement Alternative 3 would change the number of cattle by decreasing the number permitted in Mosquito Lake rotation in the Upper Green River Allotment by 15 percent to a maximum of 1,530 cow/calf pairs or yearlings compared with Alternative 2. Actual livestock numbers and/or season of use could be administratively adjusted within the established permitted use in any given year in order to meet allowable use standards, design features, and/or resource objectives under this alternative.

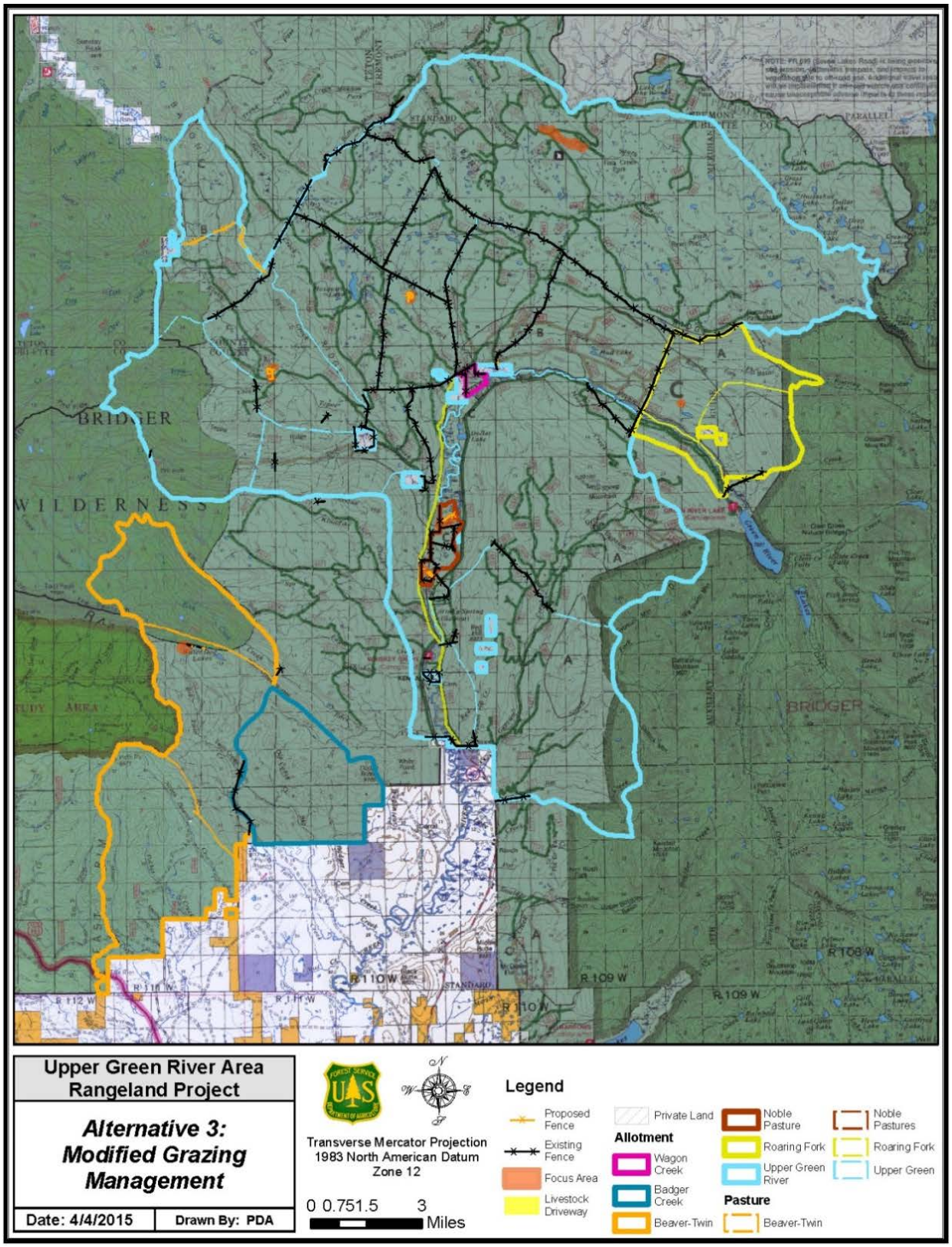

Figure 17. Map of the six allotments, pastures and structural improvements in the Upper Green River project area under Alternative 3

Table 5. Permitted livestock grazing within Upper Green River project area under Alternative 3

Allotment	Capable & Suitable Acres / Total Acres (percent)	Permitted Number of Livestock	Kind	Class	Permitted Season of Use *	Permit animal unit months (AUMs)	Management System
Badger Creek	1,217 / 7,254 (17%)	157	cattle	cow/calf or yearling	07/01-09/30 (3 of 4 yrs.) or 07/15-10/14 (1 of 4 yrs.)#	622	one pasture deferred
Beaver-Twin Creeks	6,337 / 22,079 (29%)	700	cattle	cow/calf or yearling	07/15-10/15	2,772	three pasture deferred rotation
Noble Pastures	743 / 762 (98%)	314 110 4	cattle cattle horse	cow/calf &yearling & horse	06/14-09/20	1,605	four pasture deferred rotation Grazed twice over. Livestock enter and exit rotation in Pasture 1 or 4. There is an infrequent option for grazing three times over (1 year in 4)
Roaring Fork	4,449 / 8,416 (53%)	170	cattle	cow/calf or yearling	06/16-10/15	898	three pasture deferred rotation
Wagon Creek	186 / 186 (100%)	26	cattle	cow/calf or yearling	07/15-10/15 not to exceed 45 days	103	one pasture with variable entry date
Upper Green River –Mud Lake/Fish Creek rotation	23,834 / 44,527 (54%)	2,780	cattle	cow/calf or yearling	06/16-10/15	14,678	three pasture deferred rotation
Upper Green River – Mosquito Lake rotation	11,634 17,181 (68 %)	1,530	cattle	cow/calf yearling	06/16-10/15	8,078	four pasture deferred rotation
Upper Green River –Tosi Creek /Tepee Creek / S. Kinky Creek rotation	9,738/ 23,983 (41%)	1,000 27	cattle horse	cow/calf or yearling & horse	06/16-10/15	5,280 130	four pasture deferred rotation (South Kinky Creek added to rotation)
N. Kinky Creek Pasture	1,300 / 2,951 (44%)	0	cattle	-	06/16-10/15	0	-

Allotment	Capable & Suitable Acres / Total Acres (percent)	Permitted Number of Livestock	Kind	Class	Permitted Season of Use *	Permit animal unit months (AUMs)	Management System
Upper Green River – Gypsum Creek rotation	9,852 / 36,173 (27%)	1,985	cattle	cow/calf or yearling	06/16-10/15	10,480	two pasture deferred rotation
Upper Green River – Distributed among pastures		16	horse	horse	06/16-10/15	76	
River Bottom Pasture and livestock driveway+	4,973 / 7,131 (70%)	7,901 (livestock driveway) 5,746 (River Bottom Pasture) 20	cattle horse	cow/calf or yearling & horse	06/12-10/15	AUMs included in the allotment calculations	Herded in along the livestock driveway in the spring, and drift out on the River Bottom Pasture during the fall
Total	74,263/ 170,643 (44%)	8,819				44,722	

*Alternative 3 would also include the potential for up to seven days shift to the beginning or the end of the permitted season to be decided on an annual basis by the District Ranger. The season of use would remain the same length (equivalent number of days) but could occur one week earlier or one week later than indicated in the permitted season of use. The one week shift prior to the season of use could apply to the Badger, Beaver-Twin, Noble Pastures, and Roaring Fork Allotments as well as the Gypsum Creek rotation of the Upper Green River Allotment. The one week shift following the season of use could apply to all six allotments.

No week shift prior to the season of use would be allowed in years when the season of use is 07/15-10/14.

+ River Bottom Pasture and livestock driveway is used to access Upper Green River, Wagon Creek, Roaring Fork, and Noble Pasture allotments

Rotational or deferred grazing systems would be implemented in the Badger Creek, Beaver-Twin Creeks, Roaring Fork and Wagon Creek allotments that are currently permitted for season-long grazing. Season-long grazing would also not occur in Noble Pasture 4. All allotments would be managed under a deferred rotation system with the option of implementing a rest rotation with the exception of Badger Creek and Wagon Creek allotments which have one-pasture. Badger Creek Allotment would be managed for a deferred entry date in one out of four years to allow seed set prior to livestock grazing. Wagon Creek Allotment is one pasture managed in conjunction with adjacent pastures on private land. Wagon Creek Allotment would be managed with a variable entry date to allow seed set and livestock use would not exceed 45 days. The South Kinky Creek Pasture would be added to the Tosi/Tepee Creek rotation in the Upper Green River Allotment. **Table 5** summarizes the permitted livestock grazing under Alternative 3 for the six allotments and details are provided below by allotment. **Table 5** also provides the number of acres identified as capable and suitable for livestock grazing. Incidental livestock grazing is expected to occur in places outside of areas identified as capable.

Allowable Use in Allotments/Pastures: Forage Utilization and Stubble Height

Under Alternative 3, the permitted allowable use standards in the six allotments would be more conservative than allowable use standards in Alternative 2- Grazing as Currently Permitted. Alternative 3 would establish

maximum allowable use with site specific prescriptions and/or structural improvements tailored to address areas of concern including focus areas needs and improve areas currently not meeting resource objectives.

Generally, a maximum of 50 percent forage utilization on key forage species would be allowed in the upland, riparian, and wetland areas and irrigated pastures across the six allotments. Additionally, a 4-inch stubble height minimum would be retained at the greenline of streams for each pasture in all six allotments with the exception of South Gypsum Creek in Lower Gypsum Pasture and Strawberry Creek in the Fish Creek Pasture of the Upper Green River Allotment. These areas would have a 6-inch stubble height minimum along the greenline. Key forage species are primarily Idaho fescue (*Festuca idahoensis)* in the uplands and sedges (*Carex* species) or tufted hairgrass (*Deschampsia*) in riparian and meadow areas. Other key species may be identified as appropriate on a site specific basis. Key forage utilization would be measured at the end of the grazing season. The allowable use in the livestock driveway would be to maintain greater than or equal to 60 percent ground cover. Allowable use thresholds in focus areas differ from those stipulated for allotments and pastures and are described below.

Adaptive management, which is progressively more restrictive allowable use standards, would be implemented when changes in the livestock grazing management is necessary to move an area towards resource objectives. Adaptive management is described below.

The exceptions to these general allowable use levels are: Noble Pasture 1 in the Noble Pastures Allotment would have a maximum forage utilization of 40 percent on key forage species in the pasture with a more restrictive focus area prescription on Tosi Creek; and Mosquito NW and SW in the Upper Green River Allotment would have an average forage utilization of 30 percent in the upland and riparian areas over a five year period with a maximum forage utilization of 50 percent in any given year.

Focus Area Prescription

Under Alternative 3, livestock grazing prescriptions would be implemented for each of the seven focus areas in order to move existing resource conditions towards resource objectives and desired conditions. The seven focus areas are: Waterdog Lake focus area in North Beaver Pasture of Beaver-Twin Creeks Allotment; Tosi Creek focus area in Pasture 1 of the Noble Pastures Allotment; Klondike Creek focus area in Pasture 4 of the Noble Pastures Allotment; Roaring Fork focus area in Roaring Fork West Pasture in Roaring Fork Allotment; Fish Creek focus area in Fish Creek Pasture; Wagon Creek focus area in the Mosquito SE Pasture; and Tepee Creek focus area in the Lower Tepee Pasture of the Upper Green River Allotment. Prescriptions for focus areas include retaining 6-inch stubble height along the greenline, stream bank alternation limits, willow plantings, and/or fencing. Each focus area prescription is described in detail by allotment and is summarized in Table 6.

Adaptive Management

Adaptive management would be implemented when livestock grazing is determined to be a causative factor and established allowable use levels, design features, and structural improvements do not result in improved resource conditions. More stringent allowable use standards, including a reduction in forage utilization to 30 percent and/or increases to a 6-inch stubble height along the greenline of streams, would be implemented under Alternative 3 to improve resource conditions if satisfactory progress toward meeting upland and riparian (including wetland) desired conditions were not achieved. Adaptive management was referred to as “progressive design features” in the specialist reports (Anderson 2015, Booth 2015, Booth and Hayward 2015, DeLong A. 2015, DeLong D. 2015, Eagan 2015, Johnson 2014, Murphy 2016, Roberts 2016, Robertson 2016, Schoen 2015, Stein 2016, Wilmot 2015, Winthers 2015). The term “progressive design features” is synonymous with “adaptive management.”

Desired conditions are expressed in terms of ground cover, species composition, riparian function, stream bank stability, and stream temperature objectives for rangeland and/or riparian areas. Adaptive management would be incorporated into allotment management plans for each allotment. This process provides for timely adjustments to management under existing administrative authority. Adaptive management would not be implemented in response to wildlife objectives, rather adjustments to livestock management would be implemented through administrative action or mitigation measure to address wildlife objectives and desired conditions.

Studies show that 6-inch stubble height measurement on key species in riparian areas, and 30-percent forage utilization on key forage species in upland and riparian areas result in rapid improvement of vegetation that is affected by livestock grazing (Meyers 1989, Holecheck 2004).

If existing conditions are not meeting or are not moving towards long term objectives, causative factors would be reviewed by the interdisciplinary team, permittees and District Ranger. If the undesirable condition is determined to be unrelated to any livestock grazing parameters (e.g. timing, intensity, frequency or duration) by the District Ranger, livestock grazing management would not be altered. If grazing intensity is determined to be a substantial causative factor, the decision to reduce forage utilization standard by10 percent increments to 30 percent forage utilization of key forage species, and/or to implement a minimum 6-inch stubble height standard along the greenline would be determined by the District Ranger with advice from the interdisciplinary team and the permittees regarding which would be most applicable and effective.

Adaptive Management Monitoring Parameters

If ground cover values on any key area fall below fully functional level or decline from known groundcover capability in some instances (this level is site specific), then the next incrementally lower allowable use value will be implemented, 40 percent or 30 percent or 6-inch stubble height.

If species composition falls below mid-seral ecological status or exhibits a statistically significant declining trend (this level is site-specific and will be described for each site during development of the Allotment Management Plan), then the next incrementally lower allowable use value will be implemented, 40 percent or 30 percent.

Adjust Forage Utilization: If rangeland and riparian objectives are not met, the maximum allowable use on key forage species would be reduced in increments of 10 percent in subsequent years to a minimum of 30 percent forage utilization until such time as the long-term monitoring data for ground cover and/or species composition demonstrates an upward trend toward the resource objective. The more restrictive forage utilization would be implemented for at least five years, allowing time for recovery. Annual monitoring of long-term trend indicators would be deferred during this period to allow an adequate period for any new trend to become measureable.

For example, if the ground cover objective for a pasture was 80 percent and the existing ground cover was measured at 75 percent and livestock grazing was determined to be a contributing reason for not meeting the objective, then adaptive management would be implemented. If the current forage utilization was 50 percent, allowable use in the pasture would decrease to 40 percent allowable use on key forage species and remain at that level for a minimum of five years. If, at the end of five years, the ground cover was still measured at 75 percent, a 30 percent forage utilization standard would then be applied until 80 percent ground cover was measured in the key area. Under this example, livestock management would not return to either the 50 percent or 40 percent forage utilization standard after recovery, but would stay with 30 percent forage utilization until resource objectives were met, assuming that 30 percent resulted in a change toward desired condition. However if the 40 percent use standard resulted in an apparent trend towards desired ground cover (76 percent or more), the 40 percent use standard would be appropriate as long as the trend continued or resulted in meeting desired condition.

Adjust Stubble Height: If riparian condition and/or stream bank stability are not meeting nor moving towards resource objective(s) and livestock grazing is determined to be a causative factor, the minimum riparian stubble height threshold would increase from 4-inches to 6 inches until such time as the resource objective(s) is reached. The more restrictive stubble height would be implemented for at least five years, allowing time for recovery. Monitoring of long-term trend indicators would be deferred during this period to allow an adequate period for any new trend to become measureable. Increasing stubble height from 4-inches to 6 inches along the greenline would be an option to address upland rangeland conditions that are not meeting or moving towards desired conditions.

Under Alternative 3, other design features are described for areas of concern including focus areas and include construction of fences and implementation of a 20 percent stream bank alteration standard to improve riparian conditions currently not meeting desired conditions.

Other Adjustments: If a 30 percent forage utilization and/or 6-inch stubble height does not result in existing conditions meeting or moving towards resource objectives at monitoring sites (i.e., key areas) described in Appendix C: Monitoring Plan, then selection of additional or alternate management actions would be determined by the District Ranger using the best available information from the interdisciplinary team, permittees, and/or other agencies. If, however, the timing, frequency, or duration of livestock grazing is determined to be a primary causative factor, the applicable parameter (e.g. shorten season of use by at least 10 percent [example: 12 days in a 120 day season]) would be altered to reduce the effects of livestock grazing.

Structural Improvements

Structural improvements, such as fences, hardened water crossings and cattle guards, have been constructed and will be constructed to improve the distribution of livestock and forage use, reduce livestock impacts in sensitive areas, and/or improve resource conditions. Fences would be maintained by the permittees and fence construction and reconstruction would be the responsibility of the permittees and the Forest Service. Typically, the Forest Service purchases the fencing materials and the permittees provide the labor for fence construction/reconstruction. Under Alternative 3, existing structural improvements identified under Alternative 2, Figure 6 and Table 4, including approximately 76 miles of existing fence would be maintained and reconstructed by the permittees as needed. The exception to fence maintenance and reconstruction is the Klondike Creek exclosure in Noble Pasture #4 which would be the sole responsibility of the Forest Service. Vehicles could be used along fenceline to maintain, reconstruct, or construct fences. Trucks and all-terrain vehicles would be used on open roads, roads closed to the public, and/or off-road to maintain/reconstruct structural improvements, as necessary.

Approximately 1.2 miles of electric fence and 6.0 miles of permanent fence would be erected under Alternative 3 over a five year period. Proposed structural improvements in the project area are shown on Figure 17, listed in Table 6, and are described in more detail by allotment. Overland routes would be used to access fences. Occasional use of motorized vehicles to access, maintain, and construct existing fences, proposed fences and other improvements in the project area, on a case-by-case basis, is authorized under the Travel Management Plan for the Pinedale Ranger District (U.S. Forest Service 1995) and would continue under this alternative.

New fences and reconstructed fences would conform to the Forest Plan Fencing Riparian Area Guideline and the Structural Improvement Standard (U.S. Forest Service 1990, p. 125 and 129) and the Wyoming Game and Fish Department’s wildlife friendly fencing standards (Paige 2012). New permanent fences would be either a three or four strand wire fence with wood or metal posts. The bottom wire would be smooth and 16 to 18 inches off the ground. The top wire would be barbed, a maximum height of 42 inches off the ground and approximately12 inches above the second wire. When practicable, the top wire would be smooth and/or

placed 40 inches off the ground. Proposed fences may tie into topographic features and forested vegetation cover types that naturally deter cattle movement.

Permanent fences across riparian areas or upland areas adjacent to riparian areas would be built using a wooden top pole or other state-of–the-art marking technique to increase visibility of the fence and reduce possible collision of swans, cranes, waterfowl, and Greater Sage-grouse. Temporary electric fences will be a maximum height of 42 inches. Electric tape would be used across riparian areas, instead of electric wire, to increase visibility. Electric wire/tape would be removed within two weeks of livestock departure from the pasture.

Construction and reconstruction of fences within 4 miles of occupied Greater Sage-grouse leks would be designed to minimize the risk of Greater Sage-grouse collision with fences. Design features may include marking fences, laydown fences, and considerations regarding location of fences. Range improvement construction and reconstruction activities within amphibian breeding zone for Columbia spotted frog, western boreal toad, and boreal chorus frog would not occur until the breeding seasons has passed. No driving of motorized vehicles would occur in Wilderness areas.

Vehicles would be used on open roads by herders living in five herder camps in the project area. Herders typically leave and return to their camps primarily on horseback, with the exception of several work days each month when they would drive to join other personnel driving onto the project area to move cattle between pastures. Herders also use vehicles one-two days per week when they leave the project area for their days off of work.

No new roads are proposed and none would be removed under Alternative 3. Two management actions would be taken to enforce existing designations. A new gate would be installed off of Forest Service Road 662 on a closed road to the Wagon Creek focus area. The gate would be closed to preclude motorized access by the general public; administrative use of the road would remain the same as described in the Travel Management Plan (U.S. Forest Service 1995). An unauthorized two-track route that leads to the Fish Creek focus area would be ripped and seeded to eliminate all motorized access for all users. This unauthorized route is 875-foot in length and is a spur route off of Forest Service Road 691 to Fish Creek.

Table 6. Alternative 3 – Modified Grazing Management: Livestock Grazing Strategy

Allotment	**Pasture**	**Grazing System**	**Allowable Use:** **<u>Upland</u> - Max. forage utilization (%) on key forage species** **<u>Riparian/Meadow -</u> Min. stubble height (inches) and max. forage utilization (%)** **<u>Adaptive management-</u> applicable to all allotments#**	**Proposed Structures, Improvements, and select maintenance requirements**	**Focus Area Prescription**
Badger Creek	Badger	Deferred 1 pasture	• 50% forage utilization in uplands • 4" stubble height on greenline and 50% forage utilization in riparian/ meadow areas • Adaptive management • Permitted season of use is July 1 to Sept. 30; • At least 1 year in 4, defer use until after seed-set, July 15 to Oct 14.	N/A	N/A
Beaver - Twin Creeks	Rock Creek	Deferred rotation: 3 pastures	50% forage utilization in uplands 4" stubble height on greenline and 50% forage utilization in riparian/meadow areas Adaptive management	Reconstruct fence along Rock Creek Buttes	N/A
	Twin Creeks		50% forage utilization in uplands 4" stubble height on greenline and 50% forage utilization in riparian/meadow areas Adaptive management	Construct approximately. 3 miles of pasture fence between North Beaver and Twin Creeks Pastures within three full field seasons of project implementation	Waterdog Lake Focus Area: 20% cattle allowable use
	North Beaver		50% forage utilization in uplands 4" stubble height on greenline and 50% forage utilization in riparian/meadow areas Adaptive management	Construct 0.4 mile drift fence, T37N, R111W, Sec. 10&11	N/A
Noble Pastures	Pasture 1 (northern)	Deferred rotation: 4 pastures	40% forage utilization in uplands and riparian/meadow areas Adaptive management See also focus area prescription	Option to install a temporary electric fence to achieve focus area prescription.	Tosi Creek Focus Area: maximum 20% stream bank alteration and 6" stubble height.

Allotment	Pasture	Grazing System	Allowable Use: Upland - Max. forage utilization (%) on key forage species Riparian/Meadow - Min. stubble height (inches) and max. forage utilization (%) Adaptive management- applicable to all allotments#	Proposed Structures, Improvements, and select maintenance requirements	Focus Area Prescription
		2-3 times over grazing		Maintain irrigation ditches to provide off-stream livestock water and maintain hydric vegetation.	Option to install a temporary electric fence
	Pasture 2		50% forage utilization in uplands and riparian/meadow areas (no creek in this pasture) Adaptive management	Maintain irrigation ditches to provide off-stream livestock water and maintain hydric vegetation	N/A
	Pasture 3		50% forage utilization in uplands and riparian/meadow areas (no creek in this pasture) Adaptive management	Install culvert and add fill Maintain irrigation ditches to provide off-stream livestock water and maintain hydric vegetation	N/A
	Pasture 4 (southern)		50% forage utilization in uplands and riparian/meadow areas Adaptive management See also focus area prescription	Rebuild fence entire length of creek w/ two hardened crossings. Construct holding area in unfenced portion of pasture Maintain irrigation ditches to provide off-stream livestock water and maintain hydric vegetation	Klondike Focus Area: Rebuild and slightly expand the riparian fence with a top rail fence, & two harden crossings. Plant live-stake willows. Manage as a riparian pasture with brief grazing to stimulate willow establishment. The area would be grazed at a maximum forage utilization of 0.5

Allotment	**Pasture**	**Grazing System**	**Allowable Use:** **<u>Upland</u> - Max. forage utilization (%) on key forage species** **<u>Riparian/Meadow -</u> Min. stubble height (inches) and max. forage utilization (%)** **<u>Adaptive management-</u> applicable to all allotments#**	**Proposed Structures, Improvements, and select maintenance requirements**	**Focus Area Prescription**
					AUMs per acre per year and would likely not be grazed some years.
Roaring Fork	Roaring Fork South	Deferred rotation: three pastures	Graze only in June, out before July 1 50% forage utilization in uplands 4" stubble height and 50% forage utilization in riparian/meadow areas Adaptive management	N/A	N/A
	Roaring Fork East		50% forage utilization in uplands 4" stubble height and 50% forage utilization in riparian/meadow areas Adaptive management	N/A	N/A
	Roaring Fork West		50% forage utilization in uplands 4" stubble height and 50% forage utilization in riparian/meadow areas Adaptive management	N/A	Roaring Fork West Focus Area: Cattle would be herded to avoid the focus area when forage utilization by elk is ≥50% prior to the "on date" for livestock. Cattle would not be placed (herded) to the focus area and salting would not be allowed in the focus area. If forage utilization in the focus area exceeds 50% and herding proves ineffective to keep livestock out of the focus area, livestock would be moved to the Roaring Fork East pasture or off the allotment when Roaring Fork East pasture has already been used by livestock for the grazing season.
Wagon Creek	Wagon Creek	Deferred rotation: one pasture	50% forage utilization in the uplands 4" stubble height and 50% forage utilization in riparian/meadow areas Adaptive management	N/A	N/A

Allotment	**Pasture**	**Grazing System**	**Allowable Use:** **<u>Upland</u> - Max. forage utilization (%) on key forage species** **<u>Riparian/Meadow -</u> Min. stubble height (inches) and max. forage utilization (%)** **<u>Adaptive management-</u> applicable to all allotments#**	**Proposed Structures, Improvements, and select maintenance requirements**	**Focus Area Prescription**
Upper Green River - Gypsum rotation	Upper Gypsum	Deferred rotation: two pastures	50% forage utilization in the uplands 4" stubble height and 50% forage utilization in riparian/meadow areas Adaptive management	N/A	N/A
	Lower Gypsum		50% forage utilization in the uplands 6" stubble height on South Gypsum Creek until meeting stream bank stability objective for two consecutive monitoring cycles, then implement 4" stubble height 4" stubble height on other creeks and 50% forage utilization in riparian/meadow areas Adaptive management	N/A	N/A
Upper Green River – Mud Lake/ Fish Creek rotation	Mud Lake East	Deferred rotation: three pastures	50% forage utilization in the uplands 4" stubble height and 50% forage utilization in riparian/meadow areas Adaptive management Establish new location for long term species composition monitoring site. Initial evaluation of trend to be accomplished at 10 year monitoring interval. Salt a minimum of ½ mile from Mud Lake	Relocate fence uphill to move Crow Creek into Mud Lake West pasture and consider development of up to two water sources one from Crow Creek and/or a spring within three full field seasons of project decision.	Upper Green Elk Feedground: No salting would be allowed and livestock would not intentionally be placed here. Any stray cattle would be actively herded away.
	Mud Lake West		50% forage utilization in the uplands 4" stubble height and 50% forage utilization in riparian/meadow areas Adaptive management	N/A	N/A
	Fish Creek		50% forage utilization in the uplands 4" stubble height and 50% forage utilization in riparian/meadow areas Strawberry Creek: 6" stubble height	N/A Consider developing fence to divide Fish Creek Pasture,	<u>Fish Creek Focus Area:</u> Fish Creek Site #1: 6" stubble height and 20% bank alteration

Allotment	**Pasture**	**Grazing System**	**Allowable Use:** **<u>Upland</u> - Max. forage utilization (%) on key forage species** **<u>Riparian/Meadow -</u> Min. stubble height (inches) and max. forage utilization (%)** **<u>Adaptive management-</u> applicable to all allotments#**	**Proposed Structures, Improvements, and select maintenance requirements**	**Focus Area Prescription**
			Raspberry Creek: Continue monitoring and identify alternative trailing locations Adaptive management	additional NEPA would be required to implement.	Rehabilitate (rip and seed) unauthorized road off of Forest Road #691 Fish Creek Site #2: 6" stubble height with option to add 20% bank alteration following next bank stability monitoring
Upper Green River – Mosquito Lake rotation	Mosquito SE	Deferred rotation four pastures with option of rest rotation Note:15% reduction in cattle numbers compared to Alt. 2	50% forage utilization in the uplands 4" stubble height and 50% forage utilization in riparian/meadow areas Adaptive management	Harden stream crossing approaches downstream of MIM site &maintain Wagon Creek electric fence exclosure when livestock are present. Install gate at start of closed road.	Wagon Creek Focus Area: Electric fence is in place at existing exclosure when cattle are using the pasture. Implement 6" stubble height outside exclosure within the focus area boundary.
	Mosquito NE		50% forage utilization in the uplands 4" stubble height and 50% forage utilization in riparian/meadow areas	N/A	N/A
	Mosquito NW		Average of 30% forage utilization over five year period with a max of 50% in any given year in the uplands and riparian/ meadow areas. 4" stubble height along the greenline Initial evaluation of trend to be accomplished at five year monitoring interval. Adaptive management	N/A	N/A
	Mosquito SW		Average of 30% forage utilization over five year period with a max of 50% in any given year in the uplands and riparian/meadow areas.	N/A	N/A

Allotment	Pasture	Grazing System	**Allowable Use:** **<u>Upland</u> - Max. forage utilization (%) on key forage species** **<u>Riparian/Meadow -</u> Min. stubble height (inches) and max. forage utilization (%)** **<u>Adaptive management-</u> applicable to all allotments#**	**Proposed Structures, Improvements, and select maintenance requirements**	**Focus Area Prescription**
			4" stubble height along the greenline Initial evaluation of trend to be accomplished at five year monitoring interval. Adaptive management		
Upper Green River – Tosi Creek/ Tepee Creek rotation	Tosi Creek	Deferred rotation: four pasture	50% forage utilization in the uplands 4" stubble height and 50% forage utilization in riparian/meadow areas Adaptive management	N/A	N/A
	Upper Tepee Creek		50% forage utilization in the uplands 4" stubble height and 50% forage utilization in riparian/meadow areas Adaptive management	N/A	N/A
	Lower Tepee Creek		50% forage utilization in the uplands 4" stubble height and 50% forage utilization in riparian/meadow areas Adaptive management	Construct permanent fence along Tepee Creek from downstream of the bridge to the change in gradient with water gap and hardened crossing	Tepee Creek Focus Area: Remove nonfunctional logs cabled into Tepee Creek. Construct exclosure along Tepee Creek.
	South Kinky Creek (new pasture added to rotation)		50% forage utilization in the uplands 4" stubble height and 50% forage utilization in riparian/meadow areas Adaptive management	Construct permanent fences in order to add Kinky Creek Pasture to Tosi-Tepee Creek rotation	N/A
	North Kinky Creek		Contingency pasture		

Allotment	Pasture	Grazing System	Allowable Use: Upland - Max. forage utilization (%) on key forage species Riparian/Meadow - Min. stubble height (inches) and max. forage utilization (%) Adaptive management- applicable to all allotments#	Proposed Structures, Improvements, and select maintenance requirements	Focus Area Prescription
Access to the Upper Green River, Wagon Creek, Roaring Fork, and Noble Pasture allotments	River Bottom Pasture and livestock driveway	Livestock are herded in along the livestock driveway in the spring, and drift out in the River Bottom Pasture and driveway during the fall	River Bottom Pasture: 50% forage utilization in the uplands 4" stubble height and 50% forage utilization in riparian/meadow areas Adaptive management Livestock driveway: maintain ≥60% ground cover	N/A	N/A

Implementation of adaptive management would be determined by the District Ranger with advice from an interdisciplinary team and permittees as described in the Adaptive Management section and in the monitoring plan (Appendix C).

+ River Bottom Pasture and livestock driveway is used to access Upper Green River, Wagon Creek, Roaring Fork, and Noble Pasture allotments

Detailed Descriptions by Allotment under Alternative 3

This section provides a detailed description of the livestock grazing management by allotment as proposed under Alternative 3. In addition, adaptive management would be implemented on any pasture not meeting or moving towards resource objectives as described in the Adaptive Management section and in the monitoring plan (Appendix C).

Badger Creek Allotment

Permitted Livestock Numbers, Season of Use and Management System

Under Alternative 3, the Badger Creek Allotment would remain as a single 7,254-acre pasture with 157 permitted cow/calf pairs or yearlings for a maximum of 622 animal unit months. The area determined to be capable and suitable for livestock grazing is 1,217 acres or 17 percent of the allotment. The grazing system would change to a deferred grazing system such that in three out of four years, livestock grazing would occur from July 1st to September 30th and in one out of four years, livestock grazing would occur from July 15th to Oct. 14th. This would defer livestock grazing until after seed-set for primary forage species in one of four years. No shift prior to the season of use would be allowed in years when the season of use is July 15th to Oct. 14th. The one week shift prior to the season of use could be authorized by the District Ranger for the Badger Allotment in years the season of use is July 1st to September 30th. The one week shift following the season of use could apply to Badger Allotment as described in Livestock Distribution, Range Improvements, and Best Management Practices under the Items Common to Action Alternative section. This would bring the allotment in compliance with the Forest Plan Forage Utilization Standard (U.S. Forest Service 1990).

Allowable Use

The maximum forage utilization on key forage species would be 50 percent in upland, riparian, and wetland areas and a 4-inch stubble height minimum would be retained along the greenline of streams. Key forage species are primarily Idaho fescue (*Festuca idahoensis)* in the uplands and sedges (*Carex* species) and/or tufted hairgrass (*Deschampsia*) in riparian and meadow areas. Other key species may be identified as appropriate on a site specific basis. Allowable use and long-term monitoring would be monitored at one key area (Figure 18).

Focus Area Prescription

There are no focus areas in the Badger Allotment.

Structural Improvements

Existing Structural Improvements: Figure 18 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: There are no proposed structural improvements.

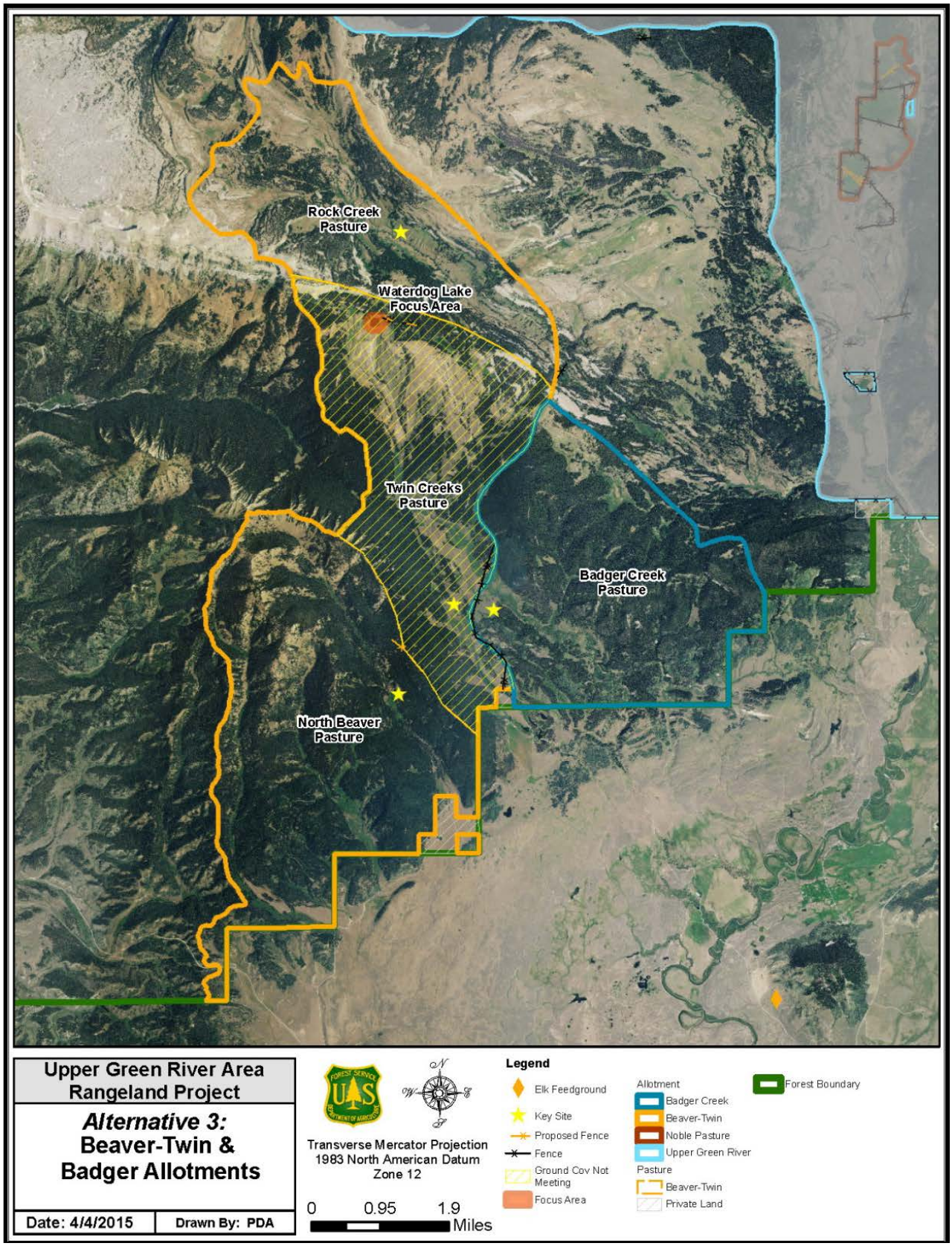

Figure 18 Badger and Beaver-Twin allotments under Alternative 3

Beaver-Twin Allotment

Permitted Livestock Numbers, Season of Use and Management System

Under Alternative 3, the Beaver-Twin Allotment is a 22,079-acre allotment that would be divided into three pastures to enhance livestock distribution and forage use. The three pastures would be Rock Creek (5,835 acres), Twin Creeks Pasture (6,883 acres) and North Beaver (9,361 acres). The grazing system would change to a three pasture deferred rotation grazing system with an option to implement a rest rotation system in compliance with the Forest Plan Forage Utilization Standard (U.S. Forest Service 1990). The allotment would continue to be permitted for 700 cow/calf pairs or yearlings from July 15th to October 15th (permitted season of use) for a maximum of 2,772 animal unit months. The area determined to be capable and suitable for livestock grazing is 6,337 acres or 29 percent of the allotment.

Pasture rotation schedule for Beaver-Twin Allotment under Alternative 3*

Pasture	Permitted Livestock Numbers	Year 1 Date Cattle Enter Unit	Year 1 Date Cattle Leave Unit	Year 2 Date Cattle Enter Unit	Year 2 Date Cattle Leave Unit
Rock Creek	700	7/15	8/15	8/15	9/15
Twin Creeks	700	8/15	9/15	7/15	8/15
North Beaver	700	9/15	10/30	9/15	10/30

* Actual dates may vary (within the maximum permitted occupancy stipulated on the permit face) and depend on resource conditions and actual use.

Allowable Use

The maximum forage utilization on key forage species would be 50 percent in upland, riparian, and wetland areas and a 4-inch stubble height minimum would be retained along the greenline of streams. Key forage species are primarily Idaho fescue (*Festuca idahoensis)* in the uplands and sedges (*Carex* species) and/or tufted hairgrass (*Deschampsia*) in riparian and meadow areas. Other key species may be identified as appropriate on a site specific basis. Allowable use and long-term monitoring would be monitored at three key areas (Figure 18).

Focus Area Prescription

Waterdog Lake Focus Area would be located within the Twin Creeks Pasture upon allotment division into three pastures. Cattle grazing would continue to be limited to a maximum forage utilization of 20 percent key forage species and outfitters would continue to not be allowed to graze their stock in the Waterdog Lake focus area.

Structural Improvements

Existing Structural Improvements: Figure 18 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: Structural improvements would be constructed to divide the allotment into three pastures (Figure 18). The Beaver-Twin Allotment Interior Fence #1 is located along the Rock Creek Buttes in the Rock Creek Pasture. This interior fence would be reconstructed along the ridgeline and tied into geographic features that restrict cattle movement. The fence would be approximately 0.4 miles in length, likely post and wire construction. Approximately 3 miles of post and wire fence would be constructed along the North Beaver Pasture and Twin Creeks Pasture to facilitate pasture division. This fence would be constructed within three full field seasons of project implementation. The proposed structural improvements are described in Table 7 and in Structural Improvements.

Table 7. Proposed structural improvements in the Beaver-Twin Allotment

Description	Location	Legal Description	Type and Length
Beaver-Twin Allotment Interior Fence #1	Rock Creek Buttes in the Rock Creek Pasture	Township 38N Range 111W, Section 11 Township 38N Range 111W,Section 14	~0.4 mile, permanent fence
Beaver-Twin Allotment Interior Fence #2	Boundary of North Beaver Pasture and Twin Creeks Pasture	Township 37N Range 111W, Section 10	~3 mile, permanent fence

Noble Pastures Allotment

Permitted Livestock Numbers, Season of Use and Management System

The Noble Pastures Allotment is a 762-acre irrigated four pasture allotment located in the center of the project area within the boundaries of the Upper Green River Allotment. The area determined to be capable and suitable for livestock grazing is 743 acres or 98 percent of the allotment. Under Alternative 3, the allotment would continue to be permitted for 314 cow/calf pairs, 110 yearlings (or equivalent) and four horses. Livestock would enter and exit the allotment from Pasture 1 or Pasture 4. Livestock would graze a pasture for up to two weeks then rotate to the next pasture. Because this allotment is flood irrigated, each pasture would be grazed twice during the grazing season from June 14th to September 20th. There is an option for three times over grazing infrequently (1 year in 4). Some trailing through pastures may also occur. A maximum of 1,605 animal unit months would be permitted. Pastures would be rested from grazing four to eight weeks (recovery period) before grazing would occur again. The recovery period would be shortest early in the grazing season during the rapid growth phase of cool season grasses, and would lengthen as growth slows toward the end of the growing season.

Pasture rotation schedule for Noble Pasture Allotment under Alternative 3*

Pasture	Permitted Livestock Numbers	Year 1 Date Cattle Enter Unit	Year 1 Date Cattle Leave Unit	Year 2 Date Cattle Enter Unit	Year 2 Date Cattle Leave Unit
Pasture 1	428	6/14 7/24	6/19 8/7	7/10 9/4	7/24 9/20
Pasture 2	428	6/19 8/7	6/26 8/21	6/26 8/21	7/10 9/4
Pasture 3	428	6/26 8/21	7/10 9/4	6/19 8/7	6/26 8/21
Pasture 4	428	7/10 9/4	7/24 9/20	6/14 7/24	6/19 8/7

* Actual dates may vary (within the maximum permitted occupancy stipulated on the permit face) and depend on resource conditions and actual use.

Allowable Use

The maximum forage utilization on the key forage species in irrigated Pasture 1 is 40 percent and 50 percent for Pastures 2, 3, and 4. Key forage species are primarily Idaho fescue (*Festuca idahoensis,)* sedges (*Carex* species) and/or tufted hairgrass (*Deschampsia*). Other key species may be identified as appropriate on a site specific basis. See the Focus Area Prescription for allowable use on Tosi Creek (Pasture 1) and Klondike Creek (Pasture 4). There are no creeks in pastures 2 and 3; cattle water from irrigation ditches. Allowable use and long-term monitoring would be conducted at four key areas (Figure 19).

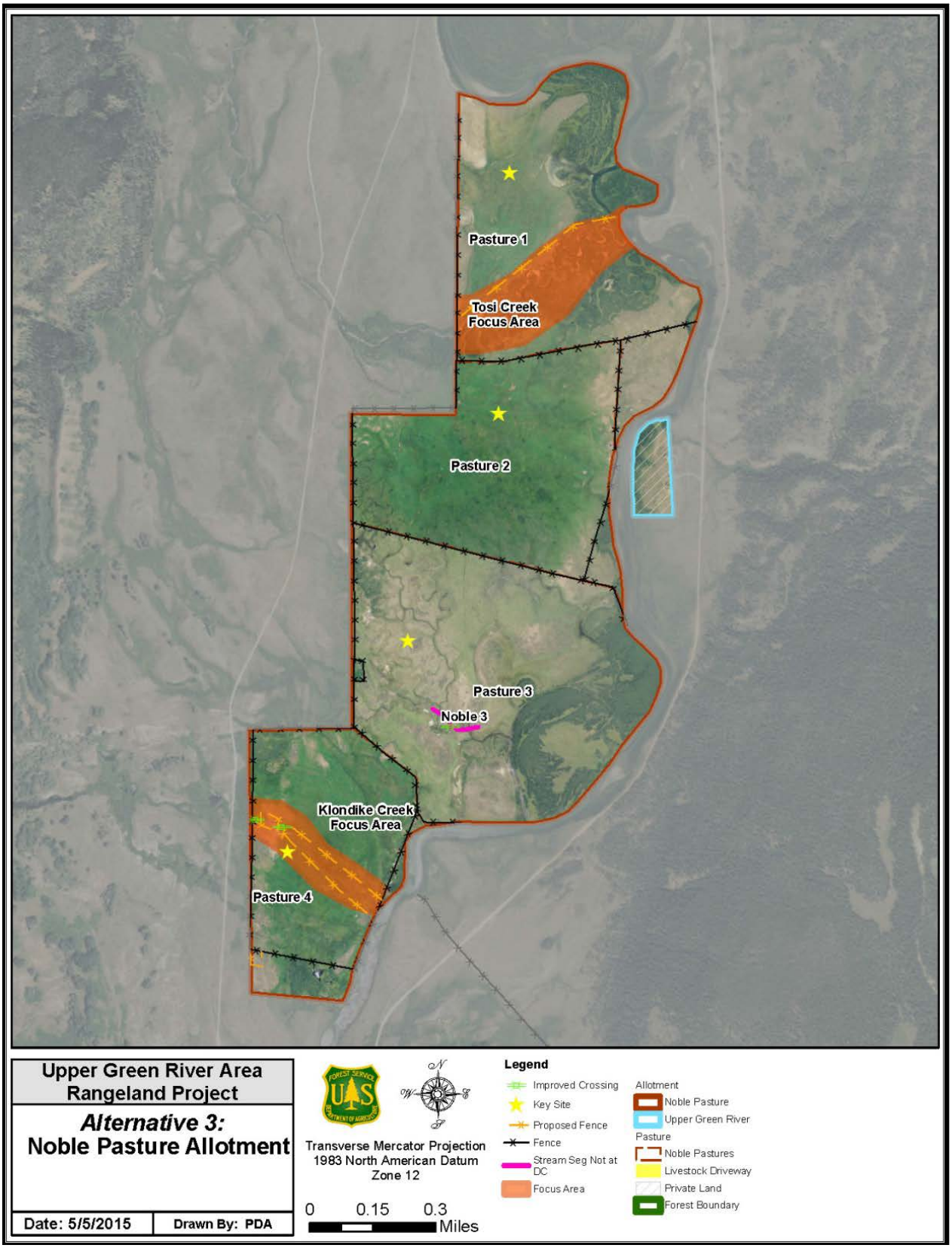

Figure 19. Noble Pastures Allotment under Alternative 3

Focus Area Prescription

Tosi Creek Focus Area is located along the entire length of Tosi Creek within Pasture #1. An annual maximum of 20 percent stream bank alteration and 6-inch stubble height minimum would be retained along Tosi Creek with an interim stream bank stability objective of a demonstrated increase in stream bank stability during the next monitoring cycle (3-5 years). If stream bank stability results in a static or downward trend after implementing a 20 percent stream bank alteration and 6-inch stubble height standards, an electric fence along Tosi Creek would be installed. Installation of an electric fence would also be authorized prior to five years if achieving a 20 percent maximum stream bank alteration and/or 6-inch stubble height was not practicable to implement. The electric fence along Tosi Creek would be located at T39N, R110W, Section 26 and would be constructed and maintained by the permittee.

Klondike Creek Focus Area is located within Pasture #4. The Klondike enclosure fence would be rebuilt and the area slightly enlarged with a top rail along the entire length of Klondike Creek. Two hardened water crossings would also be constructed to allow livestock access to drinking water. The two fences would be located at T38N R110W, Section 2, T39N R110W, Section 35. The Forest Service would construct and maintain the fence and plant willow stakes along Klondike Creek. The fenced enclosure would be managed as a riparian pasture with brief grazing allowed stimulating willow establishment by reducing competing grasses and sedges. The area would be grazed at a maximum forage utilization of 0.5 animal unit month per acre per year. The enclosure would be approximately 10 acres; therefore, 0.5 animal unit month per acre would equate, for example, to 50 head for three days or 15 head for ten days. Actual livestock numbers and use periods would be adjusted to enhance willow establishment and it is likely that no grazing would occur within the enclosure during many years.

Structural Improvements

Existing Structural Improvements: Water from Tosi and Klondike creeks would continue to be diverted into irrigation ditches to irrigate the four pastures, provide off-creek water for livestock, and maintain the Forest Service's water rights associated with the allotment. Irrigation ditches would continue to be maintained by the permittee. Existing fences would be maintained as needed by the Noble Allotment permittee. Figure 19 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: The proposed structural improvements are described in Focus Area Prescriptions and Structural Improvements and are displayed on Figure 19. The Forest Service would install a culvert in an irrigation ditch within Pasture 3 where cattle are currently trailing through the area and would construct a cattle holding area or trap adjacent to and south of Pasture 4.

Table 8. Proposed structural improvements in the Noble Pastures Allotment

Description	Location	Legal Description	Type and length
Tosi Creek Focus Area, fence #1 (optional fence)	Pasture 1	Township (T) 39N, Range (R) 110W, Section 26	Optional electric fence ~0.5 miles in length
Install culvert	Pasture 3	Township 39N Range 110W, Section 35	
Klondike Creek Focus Area, fence #2	Pasture 4	Township 38N Range 110W, Section 2 T39N R110W, Section 35	~0.4 miles of 3 or 4-strand wire with a top pole
Klondike Creek Focus Area, fence #3	Pasture 4	Township 38N Range 110W, Section 2	~0.4 miles of 3 or 4-strand wire with a top pole

Description	Location	Legal Description	Type and length
		T39N R110W, Section 35	
Klondike Creek Focus Area, hardened crossing #1	Pasture 4	Township 38N Range 110W, Section 2	
Klondike Creek Focus Area, hardened crossing #2	Pasture 4	Township 39N Range 110W, Section 35	
Trap	South of Pasture 4	Township 38N Range 110W, Section 2	~0.1 miles of fence enclosing ~0.65 acres

Roaring Fork Allotment

Permitted Livestock Numbers, Season of Use and Management System

Under Alternative 3, the 8,416-acre Roaring Fork Allotment would be managed as a three pasture deferred rotation system: Roaring Fork South (997 acres), Roaring Fork East (3,425 acres), and Roaring Fork West Pasture (3,994 acres). Managing the allotment as a three pasture rotation instead of one season-long pasture would bring the allotment in compliance with the Forest Plan Forage Utilization Standard (U.S. Forest Service 1990). The allotment would continue to be permitted for 170 cow/calf pairs or yearlings from June 16th to October 15th for a maximum of 898 animal unit months. The area determined to be capable and suitable for livestock grazing is 4,449 acres or 53 percent of the allotment.

Cattle would be moved through the allotment and managed by means of herding to help prevent livestock from congregating along the Green River bottom and manage livestock use of the Roaring Fork focus area (see prescription below). No new fencing is proposed for the Roaring Fork Allotment. Livestock would be allowed to graze in the Roaring Fork South Pasture annually from June 16th to June 30th in years that water flow in the Green River is low enough that the cattle can cross the river. This typically occurs every second year. Cattle would then be moved into Roaring Fork East Pasture and Roaring Fork West Pasture, alternating the order of the first pasture used between these two pastures annually.

Pasture rotation schedule for Roaring Fork Allotment under Alternative 3*

Pasture	Permitted Livestock Numbers	Year 1 Date Cattle Enter Unit	Year 1 Date Cattle Leave Unit	Year 2 Date Cattle Enter Unit	Year 2 Date Cattle Leave Unit
Roaring Fork South#	170	06/16	06/30	06/16	06/30
Roaring Fork West	170	06/30	08/15	08/15	10/15
Roaring Fork East	170	08/15	10/15	06/30	08/15

* Actual dates may vary (within the maximum permitted occupancy stipulated on the permit face) and depend on resource conditions and actual use.

Use of the Roaring Fork South Pasture is dependent on the ability of cattle to cross the Green River.

Allowable Use

The maximum forage utilization on key forage species would be 50 percent in upland, riparian, and wetland areas and a 4-inch stubble height minimum would be retained along the greenline of streams. Key forage species are primarily Idaho fescue (*Festuca idahoensis)* in the uplands and sedges (*Carex* species) and/or tufted hairgrass (*Deschampsia*) in riparian and meadow areas. Other key species may be identified as appropriate on a site specific basis. Allowable use and long-term monitoring would be conducted at one key site and in the Roaring Fork focus area (Figure 20).

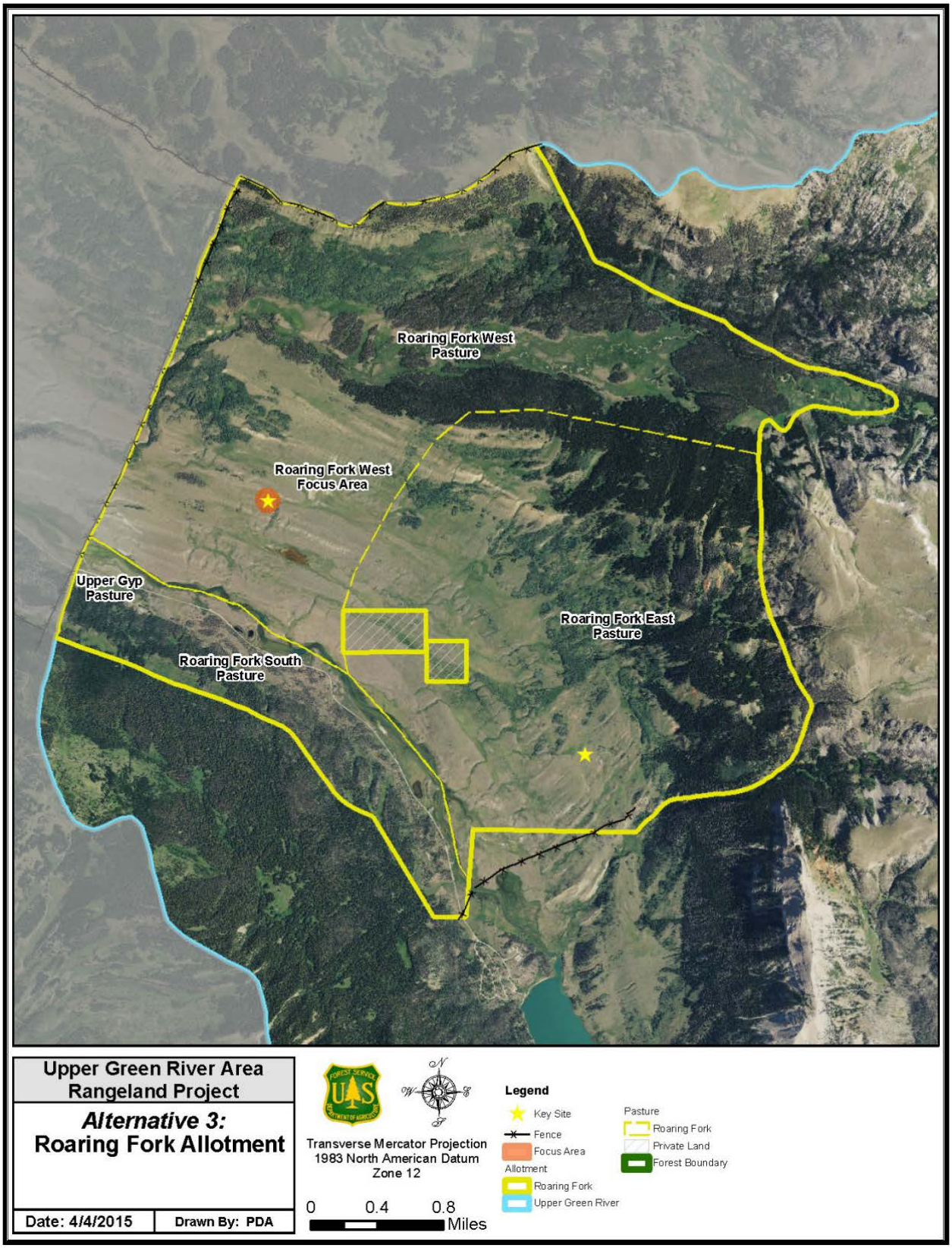

Figure 20 Roaring Fork Allotment under Alternative 3

Focus Area Prescription

Roaring Fork Focus Area is located in the Roaring Fork West Pasture and is impacted by the congregation of elk associated with the Upper Green River elk feedground. The focus area would be managed with special management consideration such that prior to livestock turn-out, forage utilization by elk will be determined. If forage utilization on key forage species (*Idaho fescue*) is greater than or equal to 50 percent, livestock use of the focus area would be avoided by actively herding livestock away from the area. If herding proves ineffective to keep livestock out of the focus area, livestock would be moved to the Roaring Fork East Pasture or off the allotment when Roaring Fork East Pasture has already been used by livestock for the grazing season. If forage utilization on key forage species is less than 50 percent, livestock would be allowed to use the focus area until 50 percent forage utilization is reached. Salting would not be allowed in the focus area.

Structural Improvements

Existing Structural Improvements: Existing fences would be maintained as needed by the Roaring Fork Allotment permittees. Figure 20 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: There are no proposed structural improvements.

Wagon Creek Allotment

Permitted Livestock Numbers, Season of Use and Management System

The Wagon Creek Allotment is a 186-acre single pasture adjacent to private land and is managed jointly in a pasture rotation system. Under Alternative 3, the Forest Service would continue to authorize 26 cow/calf pairs or yearlings to graze the allotment for a maximum of 103 animal unit months. The area determined to be capable and suitable for livestock grazing is 186 acres or 100 percent of the allotment. Livestock grazing would be authorized for a 45-day livestock grazing period (instead of a 90-day use currently permitted) with a variable entry date within the July 15th to October 15th permitted season of use. This means that the 45-day period of livestock use does not take place during the same exact calendar dates in the subsequent year.

Pasture rotation schedule for Wagon Creek Allotment under Alternative 3*

Pasture	Permitted Livestock Numbers	Year 1 Date Cattle Enter Unit	Year 1 Date Cattle Leave Unit	Year 2 Date Cattle Enter Unit	Year 2 Date Cattle Leave Unit
Wagon Creek	26	7/15	9/1	9/1	10/15

* Actual dates may vary (within the maximum permitted occupancy stipulated on the permit face) and depend on resource conditions and actual use.

Allowable Use

The maximum forage utilization on key forage species would be 50 percent in the upland, riparian, and wetland areas and a 4-inch stubble height minimum would be retained along the greenline of streams. Key forage species are primarily Idaho fescue (*Festuca idahoensis)* in the uplands and sedges (*Carex* species) and/or tufted hairgrass (*Deschampsia*) in riparian and meadow areas. Other key species may be identified as appropriate on a site specific basis. Allowable use and long-term monitoring would be conducted at one key area (Figure 21).

Focus Area Prescription

There are no focus areas in the Wagon Creek Allotment.

Structural Improvements

Existing Structural Improvements: Existing fences would be maintained as needed by the permittees. Figure 21 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: There are no proposed structural improvements.

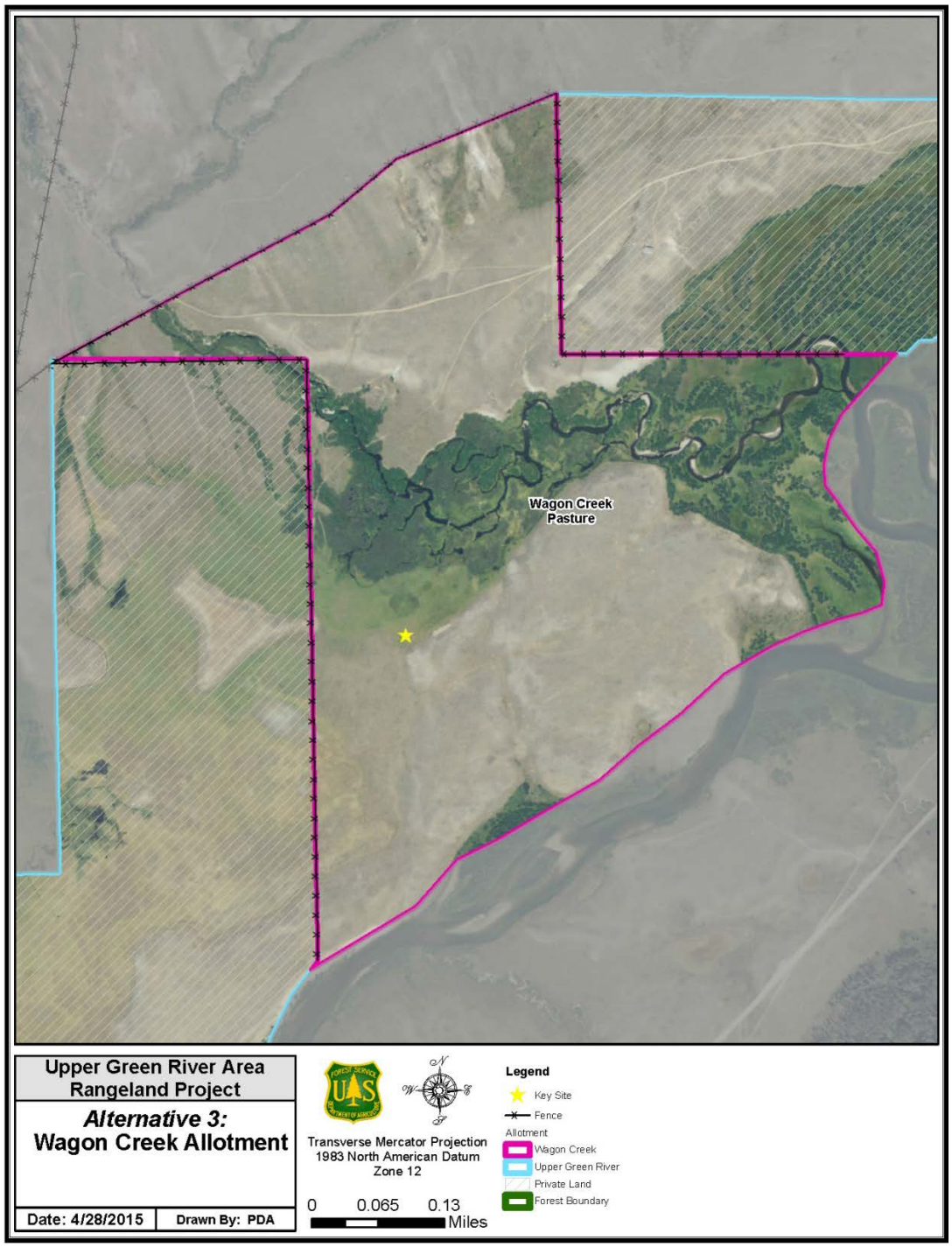

Figure 21 Wagon Creek Allotment under Alternative 3

Upper Green River Allotment

The Upper Green River Allotment is a 131,944-acre allotment that encompasses the majority of the project area and contains four pasture rotations: the Mud Lake/Fish Creek rotation, Mosquito Lake rotation, Tosi Creek/Tepee Creek/Kinky Creek rotation, and Gypsum Creek rotation (Figure 11). The area determined to be capable and suitable for livestock grazing is 61,331 acres or 46 percent of the allotment. Under Alternative 3, 7,295 cow/calf pairs or yearlings and 43 horses would be authorized to graze from June 16th to October 15th (the permitted season of use) for a maximum of 38,722 animal unit months. Of the 43 horses authorized in the allotment, 16 horses would be distributed throughout the allotment and 27 horses would be authorized in the Tosi/Tepee Creek rotation. Permittees of the Upper Green River, Wagon Creek, Roaring Fork and Noble Pastures allotments, move their livestock through the livestock driveway and the River Bottom Pasture to access their allotment and/or exit the Forest. Detailed information is presented by rotation and the River Bottom Pasture and livestock driveway below. Table 6 summarizes the grazing system, allowable use, proposed structural improvements and focus area prescriptions by rotation and pasture.

Mud Lake/Fish Creek Rotation

Permitted Livestock Numbers, Season of Use and Management System

Mud Lake/Fish Creek area is a 44,527-acre three pasture system Mud Lake East (6,297 acres), Mud Lake West (5,422 acres), and Fish Creek pastures (32,808 acres). The area determined to be capable and suitable for livestock grazing is 23,834 acres or 54 percent of the rotation. Under Alternative 3, 2,780 cow/calf pairs or yearlings would be authorized to graze in a deferred rotation grazing system from June 16th to October 15th (the permitted season of use) for a maximum of 14,678 animal unit months, with the option to implement a rest rotation system.

Pasture rotation schedule for the Mud Lake/Fish Creek rotation in the Upper Green River Allotment under Alternative 3*

Pasture	Permitted Livestock Numbers	Year 1 Date Cattle Enter Unit	Year 1 Date Cattle Leave Unit	Year 2 Date Cattle Enter Unit	Year 2 Date Cattle Leave Unit
Mud Lake West	2,780	6/16	7/15	9/15	10/15
Fish Creek	2,780	7/15	9/15	7/15	9/15
Mud Lake East	2,780	9/15	10/15	6/16	7/15

* Actual dates may vary (within the maximum permitted occupancy stipulated on the permit face) and depend on resource conditions and actual use.

The Forest Service will consider dividing the Fish Creek Pasture into two pastures and would conduct additional environmental analysis as required by NEPA before implementing.

Allowable Use

The maximum forage utilization on key forage species would be 50 percent in upland, riparian, and wetland areas and a 4-inch stubble height minimum would be retained along the greenline of streams for almost all pastures. The exception is Strawberry Creek in the Fish Creek Pasture in which the Forest Service would implement a 6-inch stubble height minimum measured along the greenline. Monitoring will continue at Raspberry Creek and alternative trailing routes will be identified. Key forage species are primarily Idaho fescue (*Festuca idahoensis)* in the uplands and sedges (*Carex* species) and/or tufted hairgrass (*Deschampsia*) in riparian and meadow areas. Other key species may be identified as appropriate on a site specific basis. Allowable use and long-term monitoring would be monitored at three key areas (Figure 22).

The Upper Green River elk feedground, located in the Mud Lake East and Upper Gypsum Pastures, would be managed for wintering elk and to minimize livestock use of the area. No salting would be allowed in the feedground and livestock would not intentionally be placed in this area. Any stray cattle would be actively herded away from the feedground. No salt would be allowed within ½ mile from Mud Lake.

Focus Area Prescription

Fish Creek Focus Area is located within the Fish Creek Pasture. Under Alternative 3, the allowable use at the Fish Creek site #1 would be a 6-inch stubble height minimum measured along the greenline and 20 percent stream bank alteration. An unauthorized two-track route to Fish Creek, off of Forest Service Road #691, would be rehabilitated by ripping and seeding with native seeds.

The allowable use at the Fish Creek site #2 would be a minimum 6-inch stubble height measured along the greenline with an option to add the 20 percent stream bank alteration prescription depending on stream bank stability monitoring results collected during the next monitoring cycle.

Structural Improvements

Existing Structural Improvements: Existing fences would be maintained as needed by the permittees. Figure 22 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: The Forest Service would relocate approximately 0.2 mile of fence in the southwest corner of Mud Lake East Pasture uphill to the east. This would remove Crow Creek from the Mud Lake East Pasture and place it in the Mud Lake West Pasture. The fence would be relocated within three full field seasons after project implementation. The Forest Service would consider water development(s) from up to two water sources in the Mud Lake East Pasture, a water source from Crow Creek and/or a spring to the east of Crow Creek. The proposal to implement water developments would be scoped pursuant to Forest Service Handbook 1909.15.31.3 and analyzed under NEPA in a separate document.

Table 9. Proposed structural improvement in Mud Lake/Fish Creek rotation of the Upper Green River Allotment

Description	Location	Legal Description	Type and Length
Fence relocation along southern boundary of Mud Lake East and West pastures	Southwest corner of the Mud Lake East Pasture	Township 39N Range 109W, Section 6	~0.2 mile, permanent fence relocated to the east of Crow Creek
Consider up to two water developments	Water from Crow Creek and/or a spring	Township 39N Range 109W, Section 6 water development off Crow Creek Township 39N Range 109W, Section 6 location of spring water development	To be determined in future NEPA analysis

Effectiveness Monitoring or Long-term Trend Monitoring

The Forest Service would establish a new key area for long-term monitoring of species composition in the Mud Lake East and Mud Lake West pastures. The initial evaluation of species composition trend would occur ten years post implementation. Appendix C describes the monitoring plan.

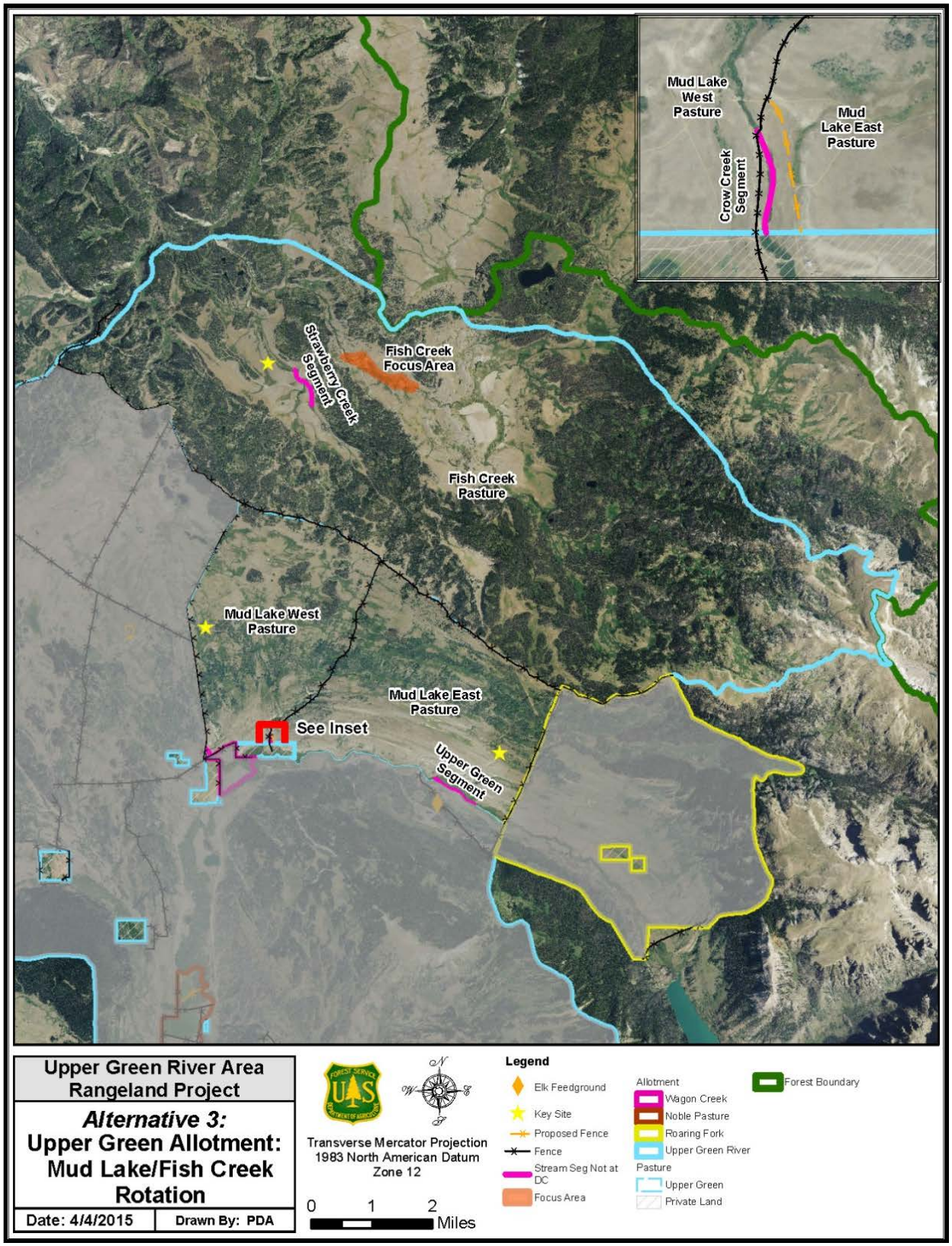

Figure 22. Mud Lake/Fish Creek Rotation of the Upper Green River Allotment

Mosquito Lake Rotation

Permitted Livestock Numbers, Season of Use and Management System

Mosquito Lake rotation is a 17,181-acre four pasture unit located in the northwestern portion of the project area. The four pastures are Mosquito NE (3,126 acres), Mosquito SE (3,826 acres), Mosquito SW (5,990 acres), and Mosquito NW (4,839 acres). The area determined to be capable and suitable for livestock grazing is 11,634 acres or 68 percent of the pasture area. Under Alternative 3, 1,530 cow/calf pairs or yearlings would be authorized to graze in a deferred rotation grazing system from June 16th to October 15th (the permitted season of use) for a maximum of 8,078 animal unit months, with the option to implement a rest rotation system. This represents a 15 percent reduction (270) in the permitted number of livestock, from 1,800 cow/calf pairs or yearlings in Alternative 2 to 1,530 cow/calf pairs or yearlings under Alternative 3. This reduction in permitted livestock numbers is associated with inactive or expired permits which would remain unallocated. Livestock would enter the Mosquito SE Pasture and rotate counterclockwise in year one and enter the Mosquito SW Pasture and rotate clockwise in year two.

Pasture rotation schedule for the Mosquito Lake rotation in the Upper Green River Allotment under Alternative 3*

Pasture	Permitted Livestock Numbers	Year 1 Date Enter Unit	Year 1 Date Leave Unit	Year 2 Date Enter Unit	Year 2 Date Leave Unit
Mosquito SE	1,530	6/15	7/15	9/15	10/15
Mosquito NE	1,530	7/15	8/15	8/15	9/15
Mosquito NW	1,530	8/15	9/15	7/15	8/15
Mosquito SW	1,530	9/15	10/15	6/15	7/15

* Actual dates may vary (within the maximum permitted occupancy stipulated on the permit face) and depend on resource conditions and actual use.

Allowable Use

In the Mosquito SW and Mosquito NW pastures, the maximum forage utilization on key forage species in upland, riparian, and wetland areas would be an average of 30 percent over five years, with a maximum of 50 percent in any given year, and a 4-inch stubble height minimum would be retained along the greenline of streams. This forage utilization standard is expected to address concerns in plant species composition in these two pastures and stream bank stability along Wagon Creek in the Mosquito NW Pasture. In the Mosquito SE and Mosquito NE pastures, the maximum forage utilization on key forage species would be 50 percent in upland, riparian, and wetland areas and a 4-inch stubble height minimum would be retained along the greenline of streams. Key forage species are primarily Idaho fescue (*Festuca idahoensis)* in the uplands and sedges (*Carex* species) and/or tufted hairgrass (*Deschampsia*) in riparian and meadow areas. Other key species may be identified as appropriate on a site specific basis. Allowable use and long-term monitoring would be monitored at four key areas (Figure 23). See the Focus Area Prescription section for allowable use standards for the Wagon Creek focus area.

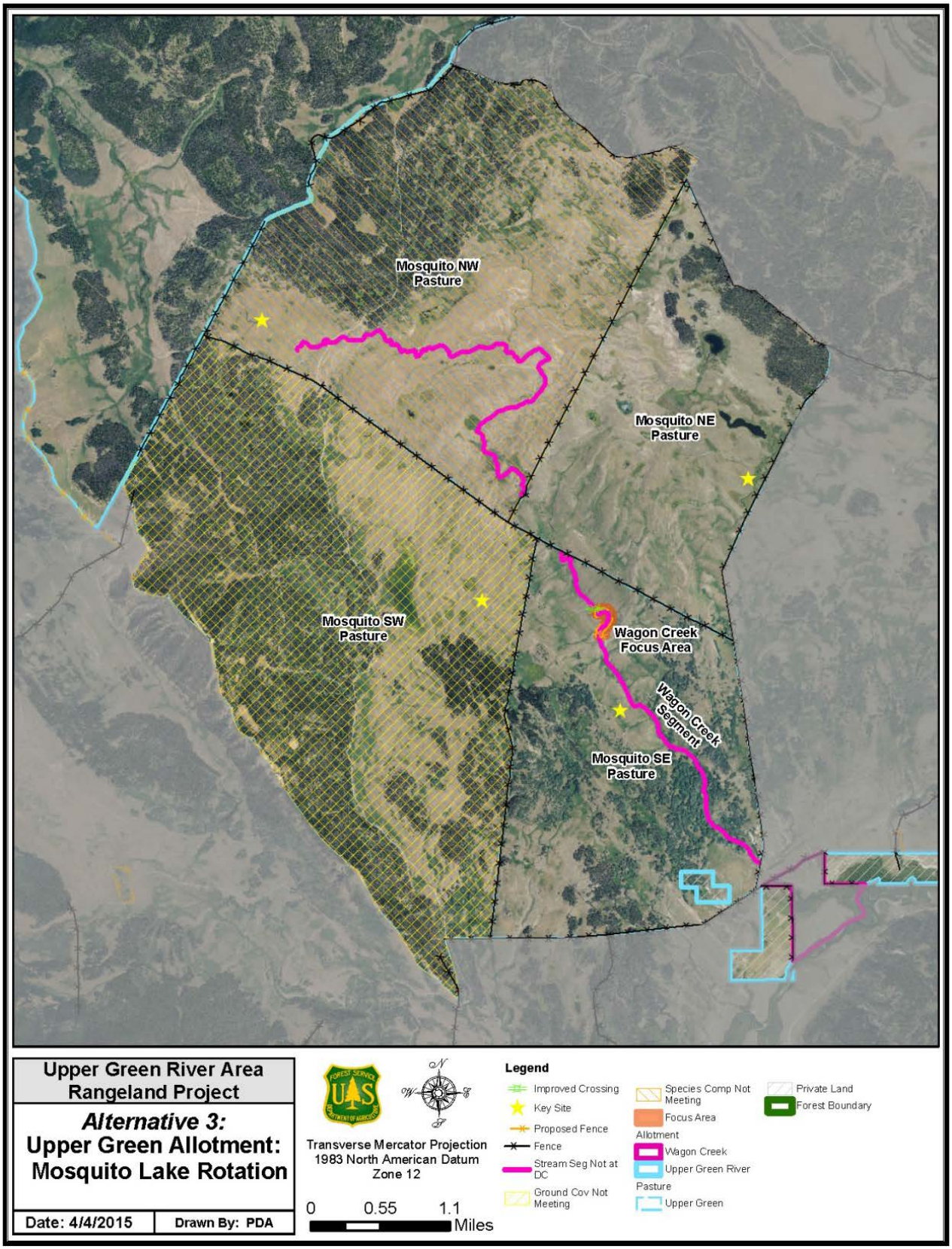

Figure 23 Mosquito Lake Rotation of the Upper Green River Allotment under Alterative 3

Focus Area Prescription

Wagon Creek Focus Area is located in the Mosquito SE Pasture in the Upper Green River Allotment. Under Alternative 3, the Forest Service would install a gate at the start of a closed road (Township 20N Range 110W, Section 27) to discourage public use while allowing administrative use. In addition, the Forest Service would harden the stream crossing approaches on Wagon Creek. The permittees would maintain an existing electric fence exclosure (0.7 miles) when the cattle are using the pasture. A 6-inch stubble height minimum would be retained outside of the exclosure and within the focus area. See Structural Improvements for additional information on electric fences.

Structural Improvements

See Structural Improvements for more information on structural improvements.

Existing Structural Improvements: Existing fences would be maintained as needed by the permittees. Figure 23 displays the location of existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: The structural improvements proposed for the Mosquito Lake rotation are located within the Wagon Creek focus area and are described above in the Focus Area Prescription.

Table 10. Proposed structural improvements in the Mosquito Lake rotation in the Upper Green River Allotment

Description	Location	Legal Description	Type and length
Wagon Creek exclosure #1	Wagon Creek focus area in the Mosquito SE Pasture	Township 40N Range 110W, Section 27	0.7 miles of electric fence
Wagon Creek harden approaches to crossing	Wagon Creek focus area in the Mosquito SE Pasture	Township 40N Range 110W, Section 27	
Gate	Closed road to Wagon Creek focus area in the Mosquito SE Pasture	Township20N Range 110W, Section 27	

Tosi Creek/Tepee Creek/Kinky Creek Rotation

Permitted Livestock Numbers, Season of Use and Management System

Tosi Creek/Tepee Creek area is a 26,934-acre four pasture system. Under Alternative 3, South Kinky Creek Pasture would be added to the rotation while the number of livestock and season of use would remain as authorized under Alternative 2. The four pastures consistently used in the rotation would be Tosi Creek Pasture (5,828 acres), Upper Tepee Creek Pasture (8,747 acres), Lower Tepee Creek Pasture (6,081 acres) and South Kinky Creek Pasture (3,327 acres). The North Kinky Creek Pasture (2,951 acres) would be authorized for livestock grazing as a contingency pasture with variable use by livestock. The area determined to be capable and suitable for livestock grazing in the Tosi Creek/Tepee Creek/Kinky Creek rotation is 9,738 acres or 41 percent of the pasture rotation. The Forest Service would continue to authorize 1,000 cow/calf pairs or yearlings and 27 horses to graze in a deferred rotation grazing system from June 16th to October 15th (the permitted season of use) for a maximum of 5,280 animal unit months (AUMs) for cattle and 130 AUMs for horses. The Forest Service would maintain an option to implement a rest rotation system.

Livestock use of South Kinky Creek Pasture would be concurrent with livestock use in Lower Tepee Creek Pasture. The permitted number of cattle (1,000 cow/calf pairs or yearlings) would be divided between the two pastures with a minority number in the Kinky Creek Pasture. Approximately 57 acres of the South Kinky Creek Pasture (an area adjacent to the Darwin Ranch, a private inholding) was managed under a special use

pasture permit, but beginning in 2014 the special use permit was not renewed. The Darwin Ranch holds a term-grazing permit to graze 27 horses in the Tosi Creek/Teepee Creek/Kinky Creek rotation. Under Alterative 3, 27 horses would be permitted to graze the four pastures in the rotation according to the rotation schedule established for all livestock. If the permittee choses to use only the South Kinky Creek Pasture, the permittee would be allowed to graze the horses in the South Kinky Creek Pasture only during the period when cattle are allowed in the same pasture.

North Kinky Creek Pasture serves as a contingency pasture with variable use by livestock. Conditions under which this pasture would be used include 1) to shorten the duration of livestock grazing in any of the other four pastures, 2) to alleviate predator problems, poisonous plant problems or to allow for rest of a pasture recovering from a wildfire or prescribed fire, and/or 3) to implement a rest rotation system. Livestock would be allowed to graze in this pasture for a maximum of 21 days within the same season of use for this rotation.

Pasture rotation schedule for the Tosi Creek/ Teepee Creek/ Kinky Creek rotation in the Upper Green River Allotment under Alternative 3*

Pasture	Permitted Livestock Numbers	Year 1 Date Cattle Enter Unit	Year 1 Date Cattle Leave Unit	Year 2 Date Cattle Enter Unit	Year 2 Date Cattle Leave Unit
Lower Tepee Creek & South Kinky Creek	1,000 cattle 27 horses	06/16	07/30	09/16	10/15
Upper Tepee Creek	1,000 cattle 27 horses	08/01	09/15	08/01	09/15
Tosi Creek	1,000 cattle 27 horses	09/16	10/15	06/16	07/30
North Kinky Creek	1,000 cattle 27 horses	Variable use	Variable use	Variable use	Variable use

* Actual dates may vary (within the maximum permitted occupancy stipulated on the permit face) and depend on resource conditions and actual use.

Allowable Use

The maximum forage utilization on key forage species would be 50 percent in upland, riparian, and wetland areas and a 4-inch stubble height minimum would be retained along the greenline of streams for all five pastures. Key forage species are primarily Idaho fescue (*Festuca idahoensis)* in the uplands and sedges (*Carex* species) and/or tufted hairgrass (*Deschampsia*) in riparian and meadow areas. Other key species may be identified as appropriate on a site specific basis. Allowable use and long-term monitoring would be conducted in four key areas.

Focus Area Prescription

The Tepee Creek focus area is located in the Lower Tepee Creek Pasture along Tepee Creek downstream of the bridge crossing Forest Road 620 (Figure 24). Under Alternative 3, the Forest Service would remove logs that were cabled into the Tepee Creek stream bank in the 1980s to promote riparian restoration, but that are currently contributing to stream bank instability and erosion. Logs and cables would be removed with a backhoe during low water flow. The Tepee Creek would also be fenced from below the bridge on Forest Road 620 to the change in gradient in order to exclude the area from livestock grazing. A hardened crossing at a water gap in the fence would be constructed to allow cattle to cross the creek and provide access to drinking water. The Forest Service would supply materials and permittees would construct a 3-strand wire fence with a top rail approximately 1.2 miles in length along Tepee Creek. The proposed structural improvements are also described in the Structural Improvements section.

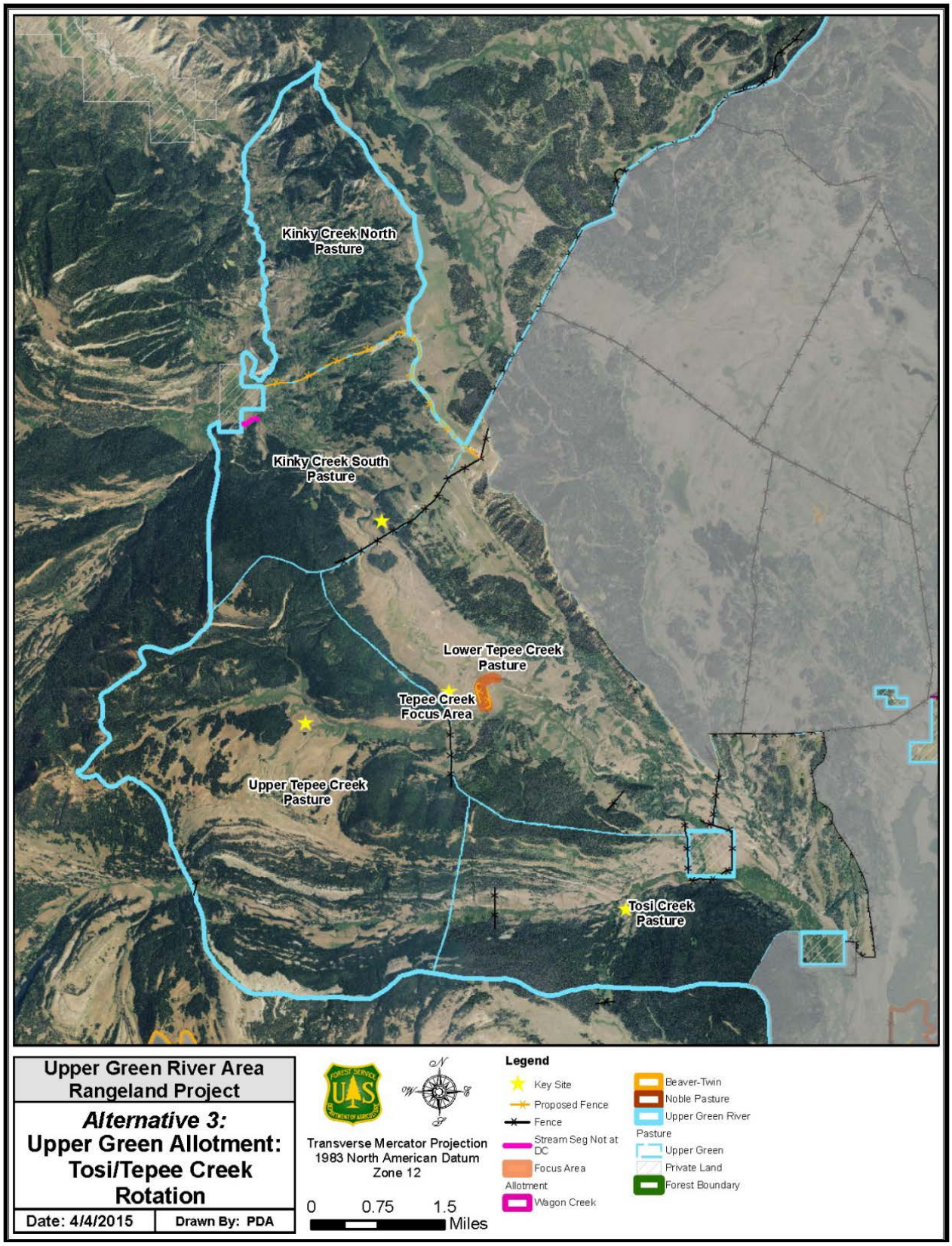

Figure 24. Tosi Creek/ Teepee Creek/Kinky Creek Rotation in the Upper Green River Allotment under Alternative 3

Structural Improvements

Existing Structural Improvements: Existing fences would be maintained as needed by the permittees. Figure 24 displays the location of existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: Proposed fences in the Kinky Creek Pasture would be constructed along ridgelines and/or tied into geographic features that restrict cattle movement in order to add the South Kinky Creek Pasture to the Tosi Creek/Tepee Creek rotation. Fences would be permanent fences, totaling approximately 3.6 miles in length. Table 11 describes the proposed fences in the Tosi Creek / Tepee Creek/Kinky Creek area. The Tepee Creek focus area exclosure is also described above in the Focus Area Prescription. The proposed fences are also described in the Structural Improvements section.

Table 11. Proposed structural improvements in the Tosi Creek/Teepee Creek/ Kinky Creek rotation in the Upper Green River Allotment

Description	Location	Type and Length
Kinky Creek Drift Fence	Township 40N Range 111W, Sections 13, 14, 22, and 23	fence ~ 1.8 mile
South Kinky Creek Allotment Boundary Fence	Section 24 Township 40N Range 111W, Section 13 Township 40N Range 111W, Section 25 Township 40N Range 111W	fence ~1.8 miles
Tepee Creek Focus Area Exclosure	Township 39N Range111W, Section1,Township 39N Range 110W Section 6	3-strand wire fence with top rail 1.2 miles

Gypsum Creek Rotation

Permitted Livestock Numbers, Season of Use and Management System

Gypsum Creek area is a 36,173-acre two pasture system located in the eastern portion of the project area. The two pastures are the Upper Gyp Pasture (20,391 acres) and Lower Gyp Pasture (15,782 acres). The area determined to be capable and suitable for livestock grazing is 9,852 acres or 27 percent of the pastures combined. Under Alternative 3, 1,985 cow/calf pairs or yearlings would continue to be authorized to graze in a deferred rotation grazing system from June 16th to October 15th (the permitted season of use) for a maximum of 10,480 animal unit months.

Pasture rotation schedule for the Gypsum Creek rotation in the Upper Green River Allotment under Alternative 3*

Pasture	Permitted Livestock Numbers	Year 1 Date Cattle Enter Unit	Year 1 Date Cattle Leave Unit	Year 2 Date Cattle Enter Unit	Year 2 Date Cattle Leave Unit
Upper Gyp	1,985	6/16	8/15	8/15	10/15
Lower Gyp	1,985	8/15	10/15	6/16	8/15

* Actual dates may vary (within the maximum permitted occupancy stipulated on the permit face) and depend on resource conditions and actual use.

Allowable Use

The maximum forage utilization on key forage species would be 50 percent in upland, riparian, and wetland areas and a 4-inch stubble height minimum retained along the greenline of streams with the exception of a 6-inch stubble height minimum along the South Gypsum Creek in the Lower Gypsum Pasture. Monitoring indicates that low stream bank stability on South Gypsum Creek is a result of sedimentation from the 2007

Salt Lick Fire and a 6-inch stubble height would be implemented to reduce potential livestock impacts on riparian recovery. A 4- inch stubble height minimum along the South Gypsum Creek would be implemented when monitoring indicates the stream bank stability objective is met for two consecutive monitoring cycles. Key forage species are primarily Idaho fescue (*Festuca idahoensis)* in the uplands and sedges (*Carex* species) and/or tufted hairgrass (*Deschampsia*) in riparian and meadow areas. Other key species may be identified as appropriate on a site specific basis. Allowable use and long-term monitoring would be conducted at two key areas (Figure 25).

The Upper Green River elk feedground, located in Upper Gyp and the Mud Lake East Pastures, would be managed for wintering elk and to minimize livestock use of the area. No salting would be allowed in the feedground and livestock would not intentionally be placed in this area. Any stray cattle would be actively herded away from the feedground.

Focus Area Prescription

There are no focus areas in the Gypsum Creek rotation.

Structural Improvements

Existing Structural Improvements: Fences, stock bridges, and cabins would be maintained by the permittees and reconstruction would be the responsibility of the permittees and the Forest Service. Figure 25 displays the location of existing fences and Table 4 describes the existing structural improvements in the allotment. See Structural Improvements section for more information on structural improvements.

Proposed Structural Improvement: There are no proposed range structural improvements.

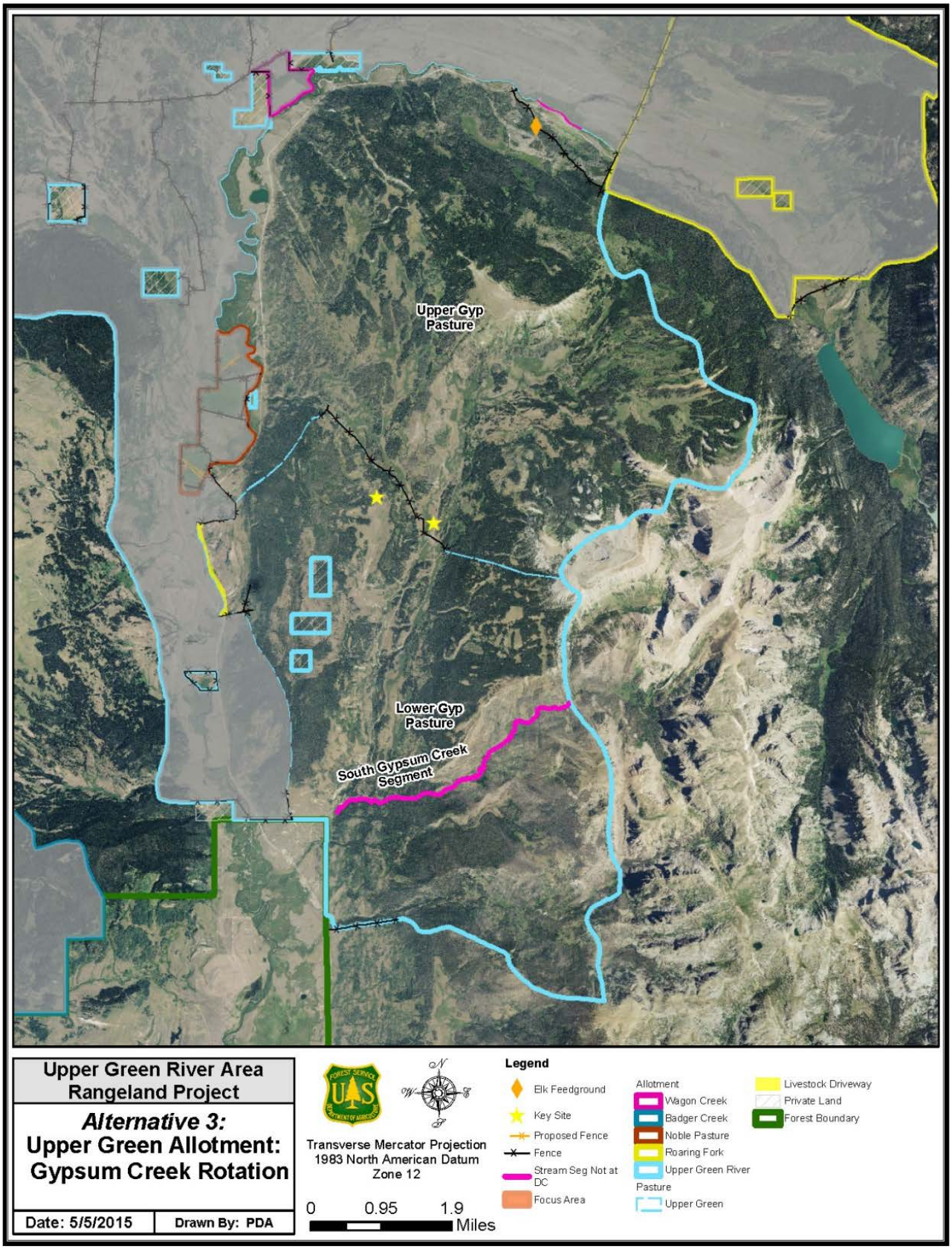

Figure 25. Gypsum Creek Rotation in the Upper Green River Allotment under Alternative 3

River Bottom Pasture and Livestock Driveway

Permitted Livestock Numbers, Season of Use and Management System

River Bottom Pasture and livestock driveway (also known as the Green River Drift Trail) are located within the south-central portion of the Upper Green River Allotment (Figure 26). The pasture and driveway are used jointly by livestock permitted to the Upper Green River, Wagon Creek, Roaring Fork, and Noble Pastures allotments to access the allotments in the spring and exit the Forest in the fall each year. The River Bottom Pasture is approximately 7,131 acres of which 4,973 (70 percent) is capable and suitable for livestock grazing. Under Alternative 3, 7,901 cow/calf pairs or yearlings and 20 horses would be authorized to use the livestock driveway and 5,746 cow/calf pairs or yearlings and 20 horses would be authorized to use the River Bottom Pasture from June 16th to October 15th (the permitted season of use). Fewer cattle use the River Bottom Pasture than the livestock driveway because cattle permitted for the Gypsum Creek rotation of the Upper Green River Allotment and the Roaring Fork Allotment do not travel through the River Bottom Pasture to exit the Forest.

The livestock driveway is located within the River Bottom Pasture and begins at the Forest southern boundary heading north primarily along the Forest Road 650 (Green River Lakes Road) as well as Forest Road 600 and 660 for approximately 12.5 miles to the bend in the Green River. The livestock driveway was enrolled on the National Register of Historic Places in 2013. It is generally considered to extend 200 feet on either side of the road; however, in some cases it is narrower when confined by fences or the Green River and adjacent riparian vegetation. The livestock driveway would be used primarily in the spring by Wagon Creek Allotment, Roaring Fork Allotment, Noble Pastures Allotment and the Upper Green River Allotment permittees to herd their cattle into the allotments. Livestock primarily travel on the roadway and the area immediately adjacent to the roadway with limited grazing. Cattle would be confined to the roadway when they are actively herded through the Kendal Warm Springs exclosure.

The River Bottom Pasture would be used in the fall by cattle in the Wagon Creek Allotment, Noble Allotment and the Upper Green River Allotment except for livestock from the Gypsum Creek rotation. Livestock would be allowed to drift through the pasture heading south to the Forest boundary, where they would be gathered and moved off the Forest.

Allowable Use

Under Alternative 3, the maximum forage utilization level on key forage species permitted for the River Bottom Pasture would be 50 percent in upland, riparian, and wetland areas and a 4-inch stubble height minimum would be retained along the greenline of streams. Key forage species are primarily Idaho fescue (*Festuca idahoensis)* in the uplands and sedges (*Carex* species) and/or tufted hairgrass (*Deschampsia*) in riparian and meadow areas. Other key species may be identified as appropriate on a site specific basis. Allowable use would be monitored at one key area (Figure 26). Allowable use in the livestock driveway would maintain a minimum of 60 percent ground cover to protect soils from erosion.

Spring cattle drives move livestock rapidly through the livestock driveway to the allotments and pastures; livestock primarily travel on the roadway and the area immediately adjacent to the roadway with limited time allowed for grazing. Cattle would be confined to the roadway when they are actively herded through the Kendal Warm Springs exclosure. In the fall, cattle would be allowed to drift out towards the southern Forest boundary and spend additional time grazing within the River Bottom Pasture and along the livestock driveway. If the allowable use limits were reached in any given year, livestock would be actively herded through the River Bottom Pasture and/or livestock driveway and removed from the Forest, rather than allowed to slowly drift to the Forest boundary.

Focus Area Prescription

There are no focus areas in the River Bottom Pasture and livestock driveway.

Structural Improvements

Existing Structural Improvements: Existing fences, cattle guards and stock bridges would be maintained by the permittees and reconstruction would be the responsibility of the permittees and the Forest Service. Figure 26 displays the location of existing fences and Table 4 describes the existing structural improvements in the River Bottom Pasture and livestock driveway.

Proposed Structural Improvement: There are no proposed range structural improvements.

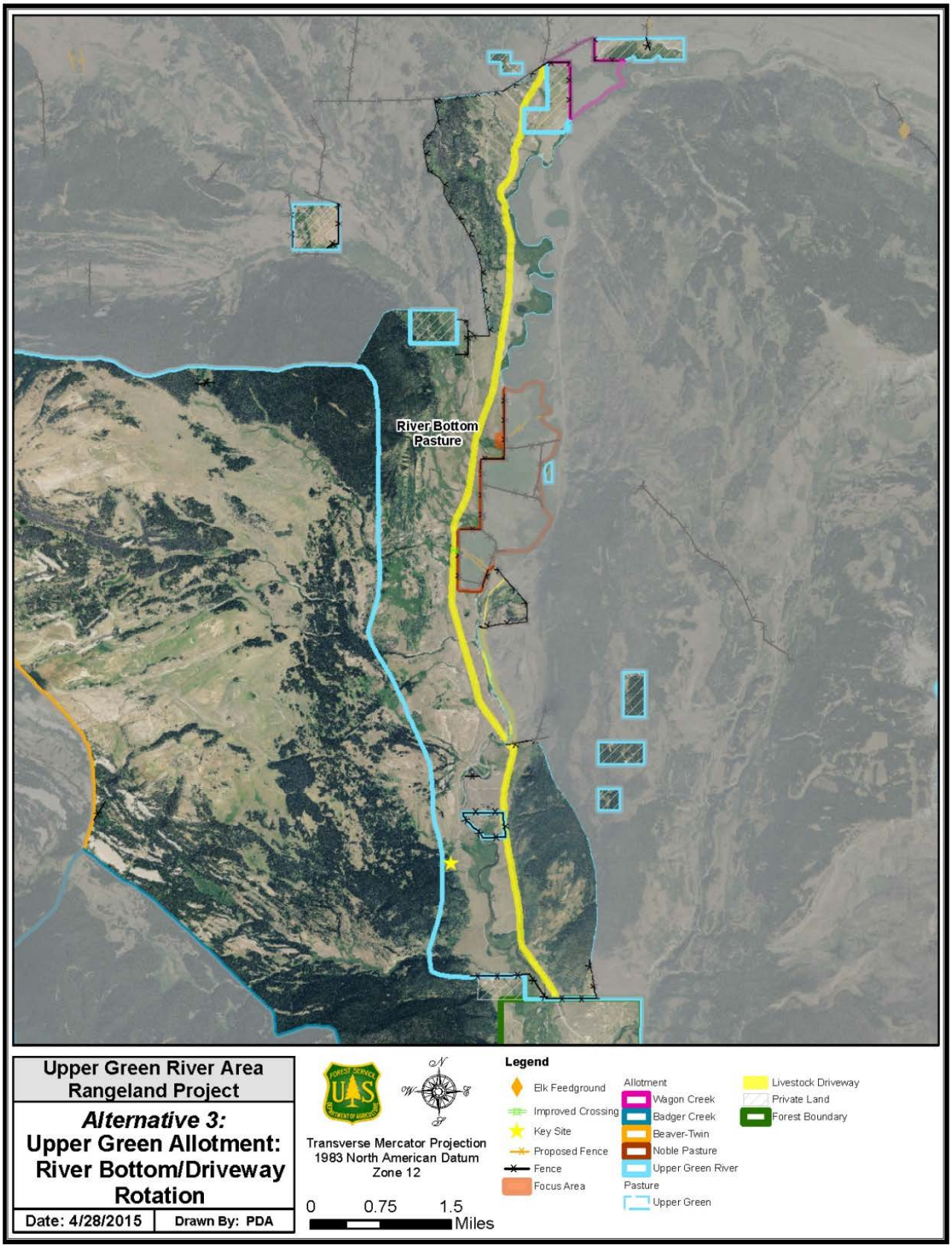

Figure 26 River Bottom Pasture and livestock driveway

Alternative 4 - Modified Grazing Management with Riparian Emphasis

Alternative 4 is a livestock grazing strategy designed to generally promote healthy riparian and wetland conditions and improve existing conditions at areas of concern. The management emphasis of this alternative is to provide habitat to meet the needs of riparian-dependent wildlife managed in balance with livestock grazing as described in the Forest Plan (U.S. Forest Service 1990, p. 235) for Desired Future Condition 10. Alternative 4 permits the most restrictive livestock allowable use levels of all action alternatives. It is similar to Alternative 3 with the primary difference being a reduction in the forage utilization permitted in riparian and meadow areas across four allotments when existing conditions meet desired conditions. Alternative 4 would permit a 35 percent maximum forage utilization on key forage species in riparian and meadow areas for Badger, Beaver-Twin, Roaring Fork and Upper Green River allotments compared with the 50 percent in Alternative 3. Alternative 4 brings the maximum utilization level for riparian and meadows in step with actual livestock use as described under Alternative 2- Current Management.

Under Alternative 4, the exceptions to the 35 percent utilization level for riparian and meadow areas is in the Noble Pastures Allotment (permits a maximum of 40 – 50 percent utilization) and Wagon Creek Allotment (permits a maximum of 50 percent utilization) as well as the Mosquito NW and SW pastures of the Upper Green River Allotment (permits an average of 30 percent utilization over five years with a maximum of 50 percent) in which the maximum utilization of key forage species permitted in riparian and meadow areas would be identical under Alternatives 3 and 4. Noble Pastures Allotment is an irrigated pasture system managed for the primary use of livestock grazing and both Noble Pastures and Wagon Creek allotments are relatively small allotments that have been reached a 50 percent forage utilization level under current management. Maintaining a 40 to 50 percent utilization level under Alternative 4 would ensure that the amount of available forage meets the forage demand for the permitted number of livestock and season of use in Noble Pastures and Wagon Creek allotments. In the case of Mosquito NW and SW pastures, the more restrictive allowable use level designed to address species composition concerns would apply to both Alternatives 3 and 4.

Livestock numbers, season of use, and management systems are identical for Alternative 3 (Table 5) and Alternative 4 (Table 12). Likewise, Alternative 3 and Alternative 4 have the same upland and greenline allowable use standards (i.e., maximum of a 50 percent forage utilization of key forage species in uplands and a 4-inch stubble height on the greenline), structural improvements, adaptive management, and prescriptions for areas of concern. Alternative 4 and Alternative 3 are similarly designed to move existing conditions towards desired conditions in cases where a gap has been identified (Table 1).

Under Alternative 4, livestock grazing would continue to be authorized on the Badger Creek, Beaver-Twin, Noble Pastures, Roaring Fork, Wagon Creek, and the Upper Green River allotments (Figure 27), using livestock management strategies designed to sustain or improve resource conditions where desired conditions are being met and improve resource conditions where a gap between existing conditions and desired conditions has been identified (Table 1). This alternative implements a livestock grazing management strategy that includes site specific allowable use standards (i.e., forage utilization and stubble height standards), focus area prescriptions, structural improvements, and adaptive management to meet or move conditions towards resource objectives. The livestock grazing management strategy is described in detail below and summarized in Table 12 and Table 13.

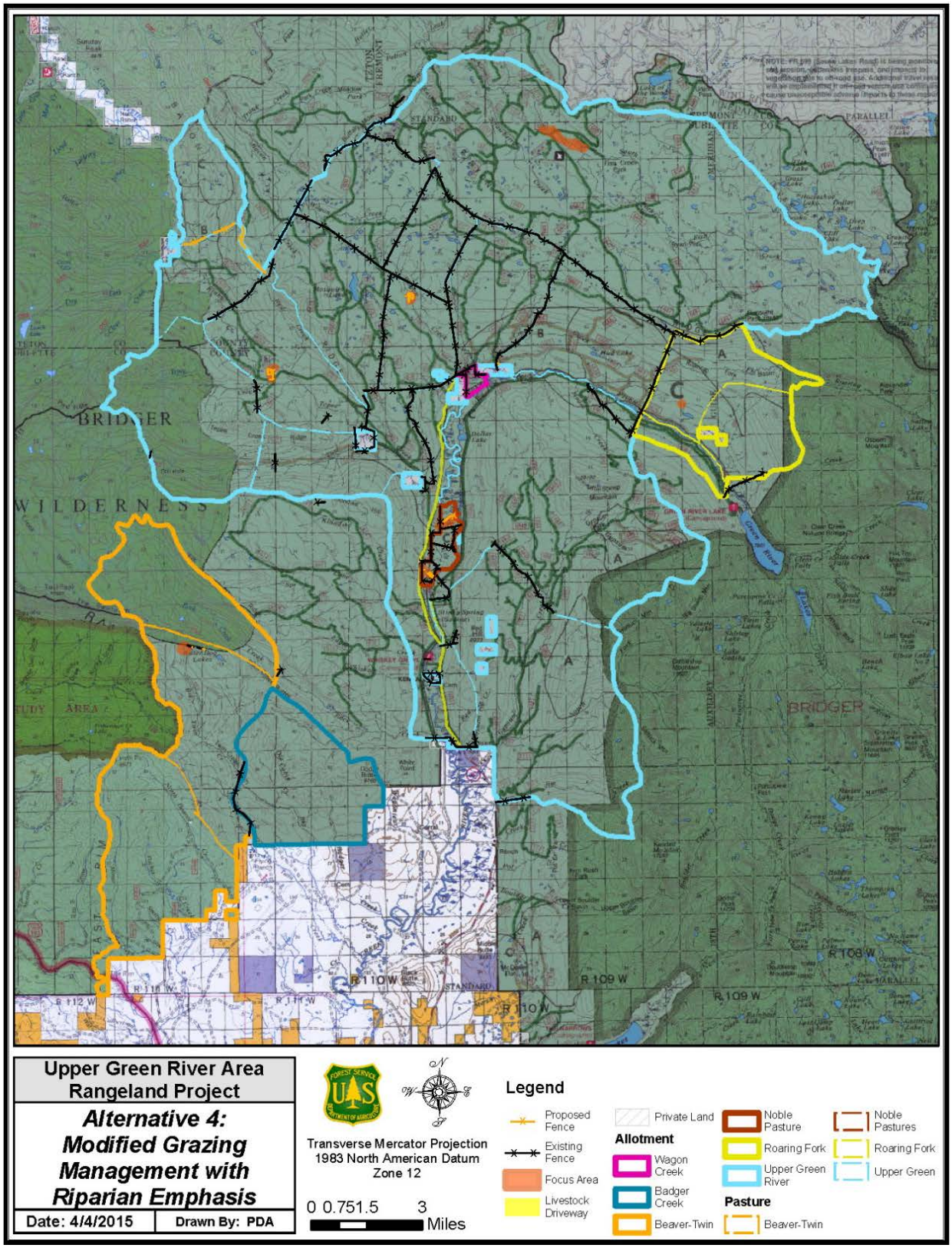

Figure 27. Map of the six allotments, pastures and the existing and proposed fencing on the Upper Green River project area under Alternative 4

In addition, Alternative 4 is designed to meet the emphasis for the Forest Plan's Desired Future Condition (DFC) 10 and 12 which comprises 84 percent of the project area. The management emphasis of DFC 10 is to "provide long-term and short-term habitat to meet the needs of wildlife managed in balance with timber harvest, grazing, and minerals development" (U.S. Forest Service 1990, p. 235). The management emphasis for DFC 12 is "on providing such important habitat as winter ranges, feedgrounds, calving areas, and security areas" (U.S. Forest Service 1990, p. 242).

Allotment management plans would be prepared or updated for each of the six allotments. Allotment management plans for the Upper Green River and Roaring Fork allotments would be revised and new allotment management plans would be completed for the Badger Creek, Beaver-Twin Creeks, Noble Pastures, and Wagon Creek allotments. The allotment management plans would contain the resource objectives and livestock management strategy described under this alternative.

The Forest Service would initiate a deferred or rotational grazing system in the Badger Creek, Beaver-Twin Creeks, and Roaring Fork allotments to meet Forest Plan requirements and would modify the management system in the Noble Pastures and Upper Green River allotments. The alternative would authorize 8,819 cow/calf pairs or yearlings including 47 horses and would allocate a maximum of 44,722 animal unit months of forage to permitted livestock. The permitted number of livestock under Alternative 4 is a 270 reduction from the currently permitted number of livestock in the Upper Green River Allotment under Alternative 2 and is equal to the permitted number of livestock under Alternative 3 for all allotments.

Items Common to Action Alternatives which include design features, grizzly bear conservation measures, terms and conditions, and monitoring would be part of Alternative 4. A slight difference in monitoring is proposed between Alternative 3 and Alternative 4. Monitoring under Alternative 4 would additionally be conducted in the Gypsum rotation of the Upper Green River Allotment and Noble Pastures Allotment to determine if livestock numbers and season of use can be sustained based on available forage and allowable use triggers. If livestock are moved off the Noble Pastures Allotment or the Gypsum rotation early in four out of five years prompted by allowable use triggers, livestock numbers and season of use would be reduced. The five years considered would be above-average, average or below-average years of forage production based on precipitation. Outlier years of forage production including drought years or unusually high moisture years would not be considered in the five years for purposes of firming up capacity. Outlier years are years that fall outside the 30 year average high or low for the SNOTEL site that comprised most of the watershed for the project area. The data source is found at: http://www.ncdc.noaa.gov/climate-information/climate-us. A five-year time period was selected because range sufficiency reviews are typically conducted at a minimum of five-year intervals following a range decision. A range sufficiency review is a review of project-level range decisions to determine if new information and/or changed circumstances might affect a range decision.

Table 12. Permitted livestock grazing within the Upper Green River project area under Alternative 4

Allotment	Capable & Suitable Acres / Total Acres (percent)	Permitted Number of Livestock	Kind	Class	Permitted Season of Use *	Permit animal unit months (AUMs)	Management System
Badger Creek	1,217 / 7,254 (17%)	157	cattle	cow/calf or yearling	07/01-09/30 (3 of 4 yrs.) or 07/15-10/14 (1 of 4 yrs.)#	622	1 pasture deferred
Beaver-Twin Creeks	6,337 / 22,079 (29%)	700	cattle	cow/calf or yearling	07/15-10/15	2,772	3 pasture deferred rotation
Noble Pastures	743 / 762 (98%)	314 110 4	cattle cattle horse	cow/calf &yearling & horse	06/14-09/20	1,605	4 pasture deferred rotation Grazed twice over. Livestock enter and exit rotation in Pasture 1 or 4. There is an infrequent option for grazing three times over (1 year in 4)
Roaring Fork	4,449 / 8,416 (53%)	170	cattle	cow/calf or yearling	06/16-10/15	898	3 pasture deferred rotation
Wagon Creek	186 / 186 (100%)	26	cattle	cow/calf or yearling	07/15-10/15 not to exceed 45 days	103	1 pasture with variable entry date
Upper Green River –Mud Lake/Fish Creek rotation	23,834 / 44,527 (54%)	2,780	cattle	cow/calf or yearling	06/16-10/15	14,678	3 pasture deferred rotation
Upper Green River – Mosquito Lake rotation	11,634 17,181 (68 %)	1,530	cattle	cow/calf yearling	06/16-10/15	8,078	4 pasture deferred rotation
Upper Green River –Tosi Creek /Tepee Creek / S. Kinky Creek rotation	9,738/ 23,983 (41%)	1,000 27	Cattle cattle horse	cow/calf or yearling & horse	06/16-10/15	5,280 130	4 pasture deferred rotation (South Kinky Creek added to rotation)

Allotment	Capable & Suitable Acres / Total Acres (percent)	Permitted Number of Livestock	Kind	Class	Permitted Season of Use *	Permit animal unit months (AUMs)	Management System
N. Kinky Creek Pasture	1,300 / 2,951 (44%)	0	cattle	-	06/16-10/15	0	-
Upper Green River – Gypsum Creek rotation	9,852 / 36,173 (27%)	1,985	cattle	cow/calf or yearling	06/16-10/15	10,480	2 pasture deferred rotation
Upper Green River – Distributed among pastures		16	horse	horse	06/16-10/15	76	
River Bottom Pasture and livestock driveway+	4,973 / 7,131 (70%)	7,901 (livestock driveway) 5,746 (River Bottom Pasture) 20	Cattle cattle horse	cow/calf or yearling & horse	06/12-10/15	AUMs included in the allotment calculations	Herded in along the livestock driveway in the spring, and drift out on the River Bottom Pasture during the fall
Total	74,263/ 170,643 (44%)	8,819				44,722	

*Alternative 4 would also include the potential for up to seven days shift to the beginning or the end of the permitted season to be decided on an annual basis by the District Ranger. The season of use would remain the same length (equivalent number of days) but could occur one week earlier or one week later than indicated in the permitted season of use. The one week shift prior to the season of use could apply to the Badger, Beaver-Twin, Noble Pastures and Roaring Fork allotments as well as the Gypsum Creek rotation of the Upper Green River Allotment. The one week shift following the season of use could apply to all six allotments.

No shift prior to the season of use would be allowed on Badger Creek Allotment in years the season of use is 07/15-10/14.

+ River Bottom Pasture and livestock driveway are used to access Upper Green River, Wagon Creek, Roaring Fork, and Noble Pasture allotments.

Permitted Livestock Numbers, Season of Use, and Grazing Management System

Collectively, the six allotments comprise approximately 170,643 acres. Under Alternative 4, 8,772 cow/calf pairs or yearlings and 47 horses would be permitted on the Upper Green River project area and would consume no more than 44,722 animal unit months of forage. The permitted season of use varies by allotment but the season of use generally occurs from June 14th to October 15th annually across the project area. Under Alternative 4, actual livestock numbers and/or actual season of use could be administratively adjusted within those permitted in any given year in order to meet allowable use standards and/or resource objectives.

A shift of one week maximum to the season of use could be authorized by the District Ranger in any given year as described in this paragraph and in the Items Common to the Action Alternatives. Alternative 4 would include the potential for up to seven days shift to the beginning or the end of the permitted season to be decided on an annual basis by the District Ranger. A shift to the season of use would occur at most on an infrequent basis (approximately two out of ten years) by either adding up to one week prior to or one week

following the permitted season of use. The season of use would remain the same length (equivalent number of days), but could occur a maximum of one week earlier or one week later than indicated in the permitted season of use. The potential of a one week shift prior to the season of use would apply to the Badger, Beaver-Twin, and Roaring Fork allotments as well as the Gypsum Creek rotation of the Upper Green River Allotment, but would not be an option for the Noble Pastures and Wagon Creek allotments and the Mud Lake/Fish Creek, Mosquito Lake, and the Tosi Creek/Tepee Creek/Kinky Creek rotations of the Upper Green River Allotment because these areas have Greater Sage-grouse nesting and early brood rearing habitat considerations. No shift prior to the season of use would be allowed in the Badger Allotment in one in four years when the season of use is from July 15th to October 14th to allow for seed set. A maximum of a one week shift following the season of use could apply to all six allotments. Any shift in the season of use is subject to the District Ranger's approval.

A decision to implement Alternative 4 would change the number of cattle permitted by decreasing the number permitted in Mosquito Lake rotation in the Upper Green River Allotment by 15 percent or 270 cow/calf pairs or yearlings to a maximum of 1,530 cow/calf pairs or yearlings compared with Alternative 2. Actual livestock numbers and/or season of use could be administratively adjusted within the established permitted use in any given year in order to meet allowable use standards, design features, and/or resource objectives under this alternative.

Rotational or deferred grazing systems would be implemented in the Badger Creek, Beaver-Twin Creeks, Roaring Fork and Wagon allotments that are currently permitted for grazing season-long grazing. Season-long grazing would also not occur in Noble Pasture 4. All allotments would be managed under a deferred rotation system with the option of implementing a rest rotation with the exception of Badger Creek and Wagon Creek allotments which are one-pasture. Badger Creek Allotment would be managed for a deferred entry date in one out of four years to allow seed set prior to livestock grazing. Wagon Creek Allotment is one pasture managed in conjunction with adjacent pastures on private land. Wagon Creek Allotment would be managed with a variable entry date to allow seed set and livestock use would not exceed 45 days. The South Kinky Creek Pasture would be added to the Tosi/Tepee Creek rotation in the Upper Green River Allotment. Table 12 summarizes the permitted livestock grazing under Alternative 4 for the six allotments and details are provided below by allotment. Table 12 also provides the number of acres identified as capable and suitable for livestock grazing. Incidental livestock grazing is expected to occur in places outside of areas identified as capable.

Allowable Use in Allotments/Pastures: Forage Utilization and Stubble Height

Under Alternative 4, the permitted allowable use standards in the six allotments would be more conservative than allowable use standards in Alternative 2- Grazing as Currently Permitted and Alternative 3. Alternative 4 would establish maximum allowable use with restrictive prescriptions and/or structural improvements tailored to address areas of concern including focus areas and pastures currently not meeting resource objectives. Additionally Alternative 4 would permit a 35 percent maximum forage utilization on key forage species in riparian and meadow areas for Badger, Beaver-Twin, Roaring Fork and Upper Green River allotments compared with 50 percent in Alternative 3.

Generally, a maximum of 35 percent forage utilization on key forage species would be permitted in the riparian and wetland areas in Badger, Beaver-Twin, Roaring Fork and Upper Green River allotments. In Noble Pastures and Wagon Creek allotments, a maximum of 50 percent forage utilization on key forage species would be allowed in the irrigated pastures, riparian and wetland areas. A 4-inch stubble height minimum would be retained at the greenline of streams for each pasture in all six allotments with the exception of South Gypsum Creek in Lower Gypsum Pasture and Strawberry Creek in the Fish Creek Pasture of the Upper Green River Allotment. These areas would have a 6-inch stubble height minimum along the greenline.

In the uplands and irrigated pastures, a maximum of 50 percent forage utilization on key forage species would be generally permitted across the six allotments. The exceptions are: a) Noble Pasture 1 in the Noble Pastures Allotment would have a maximum forage utilization of 40 percent on key forage species in the pasture with a more restrictive focus area prescription on Tosi Creek; and b) Mosquito NW and SW in the Upper Green River Allotment would have an average forage utilization of 30 percent in the upland and riparian areas over a five year period with a maximum forage utilization of 50 percent in any given year.

Key forage species are primarily Idaho fescue (*Festuca idahoensis)* in the uplands and sedges (*Carex* species) or tufted hairgrass (*Deschampsia*) in riparian and meadow areas. Other key species may be identified on a site specific basis. Key forage utilization would be measured at the end of the grazing season. The allowable use in the livestock driveway would be to maintain greater than or equal to 60 percent ground cover. Allowable use thresholds in focus areas differ from those stipulated for allotments and pastures and are described below.

Adaptive management, which are progressively more restrictive allowable use standards, would be implemented when changes in the livestock grazing management is necessary to move an area towards resource objectives. Adaptive management is described below.

Focus Area Prescription

Under Alternative 4, livestock grazing prescriptions would be implemented for each of the seven focus areas in order to move existing resource conditions towards resource objectives and desired conditions. The seven focus areas are: Waterdog Lake focus area in North Beaver Pasture of Beaver-Twin Creeks Allotment, Tosi Creek focus area in Pasture 1 of the Noble Pastures Allotment and Klondike Creek focus area in Pasture 4 of the Noble Pastures Allotment; Roaring Fork focus area in Roaring Fork West Pasture in Roaring Fork Allotment; Fish Creek focus area in Fish Creek Pasture, Wagon Creek focus area in the Mosquito SE Pasture, and Tepee Creek focus area in the Lower Tepee Pasture of the Upper Green River Allotment. Prescriptions for focus areas include retaining 6-inch stubble height along the greenline, stream bank alternation limits, willow plantings, and/or fencing. Each focus area prescription is described in detail by allotment and is summarized in Table 13.

Adaptive Management

Adaptive management would be implemented when livestock grazing is determined to be a causative factor and established allowable use levels, design features, and structural improvements do not result in improved resource conditions. More stringent allowable use standards, including a reduction in forage utilization to 30 percent and/or increases to a 6-inch stubble height along the greenline of streams, would be implemented under Alternative 4 to improve resource conditions if satisfactory progress toward meeting upland and riparian (including wetland) desired conditions were not achieved. Adaptive management was referred to as “progressive design features” in the specialist reports (Anderson 2015, Booth 2015, Booth and Hayward 2015, DeLong A. 2015, DeLong D. 2015, Eagan 2015, Johnson 2014, Murphy 2016, Roberts 2016, Robertson 2016, Schoen 2015, Stein 2016, Wilmot 2015, Winthers 2015). The term “progressive design features” is synonymous with “adaptive management.”

Desired conditions are expressed in terms of ground cover, species composition, riparian function stream bank stability, and stream temperature objectives for rangeland and/or riparian areas. Adaptive management would be incorporated into allotment management plans for each allotment. This process provides for timely adjustments to management under existing administrative authority. Adaptive management would not be implemented in response to wildlife objectives, rather adjustments to livestock management would be implemented through administrative action to address wildlife objectives and desired conditions.

Studies show that 6-inch stubble height measurement on key species in riparian areas, and 30-percent forage utilization on key forage species in upland and riparian areas result in rapid improvement of vegetation that is affected by livestock grazing (Meyers 1989, Holecheck 2004).

If existing conditions are not meeting or are not moving towards long term objectives, causative factors would be reviewed by the interdisciplinary team, permittees and District Ranger. If the undesirable condition is determined to be unrelated to any livestock grazing parameters (e.g. timing, intensity, frequency or duration) by the District Ranger, livestock grazing management would not be altered. If grazing intensity is determined to be a substantial causative factor, the decision to reduce forage utilization standard by10 percent increments to 30 percent forage utilization of key forage species, and/or to implement a minimum 6-inch stubble height standard along the greenline would be determined by the District Ranger with advice from the interdisciplinary team and the permittees regarding which would be most applicable and effective.

Adjust Forage Utilization: If rangeland and riparian objectives are not met, the maximum allowable use on key forage species would be reduced in increments of 10 percent in subsequent years to a minimum of 30 percent forage utilization until such time as the long-term monitoring data for ground cover and/or species composition demonstrates an upward trend toward the resource objective. The more restrictive forage utilization would be implemented for at least five years, allowing time for recovery. Annual monitoring of long-term trend indicators would be deferred during this period to allow an adequate period for any new trend to become measureable.

For example, if the ground cover objective for a pasture was 80 percent and the existing ground cover was measured at 75 percent and livestock grazing was determined to be a contributing reason for not meeting the objective, then the adaptive management would be implemented. If the current forage utilization was 50 percent, allowable use in the pasture would decrease to 40 percent allowable use on key forage species and remain at that level for a minimum of five years. If, at the end of five years, the ground cover was still measured at 75 percent, a 30 percent forage utilization standard would then be applied until 80 percent ground cover was measured in the key area. Under this example, livestock management would not return to either the 50 percent or 40 percent forage utilization standard after recovery, but would stay with 30 percent forage utilization until resource objectives were met, assuming that 30 percent resulted in a change toward desired condition. However if the 40 percent use standard resulted in an apparent trend towards desired ground cover (76 percent or more), the 40 percent use standard would be appropriate as long as the trend continued or resulted in meeting desired condition.

Adjust Stubble Height: If riparian condition and/or stream bank stability are not meeting nor moving towards resource objective(s) and livestock grazing is determined to be a causative factor, the minimum riparian stubble height threshold would increase from 4-inches to 6 inches until such time as the resource objective(s) is reached. The more restrictive stubble height would be implemented for at least five years, allowing time for recovery. Monitoring of long-term trend indicators would be deferred during this period to allow an adequate period for any new trend to become measureable. Increasing stubble height from 4-inches to 6 inches along the greenline would be an option to address upland rangeland conditions that are not meeting or moving towards desired conditions.

Under Alternative 4, other design features are described for areas of concern including focus areas and include construction of fences and implementation of a 20 percent stream bank alteration standard to improve riparian conditions currently not meeting desired conditions.

Other Adjustments: If a 30 percent forage utilization and/or 6-inch stubble height does not result in existing conditions meeting or moving towards resource objectives at monitoring sites, then selection of additional or alternate prescriptions would be determined by the District Ranger using the best available information from the interdisciplinary team, permittees, and/or other agencies. If, however, the timing, frequency, or duration

of livestock grazing is determined to be a primary causative factor, the applicable parameter (e.g. shorten season of use by at least 10 percent [example: 12 days in a 120 day season]) would be altered to reduce the effects of livestock grazing.

Monitoring Parameters

If ground cover values on any key area fall below fully functional level or decline from known groundcover capability in some instances (this level is site specific), then the next incrementally lower allowable use value will be implemented (40 percent or 30 percent or 6-inch stubble).

If species composition falls below mid-seral ecological status or exhibits a statistically significant declining trend (this level is site-specific and will be described for each site during development of the Allotment Management Plan), then the next incrementally lower allowable use value will be implemented, 40 percent or 30 percent.

Structural Improvements

Structural improvements, such as fences, hardened water crossings and cattle guards, have been constructed and would be constructed to improve the distribution of livestock and forage use, reduce livestock impacts in sensitive areas, and/or improve resource conditions. Fences would be maintained by the permittees and fence construction and reconstruction would be the responsibility of the permittees and the Forest Service. Typically, the Forest Service purchases the fencing materials and the permittees provide the labor for fence construction/reconstruction. Under Alternative 4, existing structural improvements identified under Alternative 2, Figure 6 and Table 4, including approximately 76 miles of existing fence would be maintained and reconstructed by the permittees as needed. The exception to fence maintenance and reconstruction is the Klondike Creek exclosure in Noble Pasture #4 which would be the sole responsibility of the Forest Service. Vehicles could be used along fence lines to maintain, reconstruct, or construct fences. Trucks and all-terrain vehicles would be used on open roads, roads closed to the public, and/or off-road to maintain/reconstruct structural improvements, as necessary.

Approximately 1.2 miles of electric fence and 6.0 miles of permanent fence would be erected under Alternative 4 over a five year period. Proposed structural improvements in the project area are the same as those proposed under Alternative 3 and are shown on Figure 27, listed in Table 13, and are described in more detail by allotment. Overland routes would be used to access fences. Occasional use of motorized vehicles to access, maintain, and construct existing fences, proposed fences and other improvements in the project area, on a case-by-case basis, is authorized under the Travel Management Plan for the Pinedale Ranger District (U.S. Forest Service 1995) and would continue under this alternative.

New fences and reconstructed fences would conform to the Forest Plan Fencing Riparian Area Guideline and the Structural Improvement Standard (U.S. Forest Service 1990, p. 125 and 129) and the Wyoming Game and Fish Department’s wildlife friendly fencing standards (Paige 2012). New permanent fences would be either a three or four strand wire fence with wood or metal posts. The bottom wire would be smooth and 16 to 18 inches off the ground. The top wire would be barbed, a maximum height of 42 inches off the ground and approximately12 inches above the second wire. When practicable, the top wire would be smooth and/or placed 40 inches off the ground. Proposed fences may tie into topographic features and forested vegetation cover types that naturally deter cattle movement.

Permanent fences across riparian areas or upland areas adjacent to riparian areas would be built using a wooden top pole or other state-of–the-art marking technique to increase visibility of the fence and reduce possible collision of swans, cranes, waterfowl, and Greater Sage-grouse. Temporary electric fences will be a maximum height of 42 inches. Electric tape would be used across riparian areas, instead of electric wire, to

increase visibility. Electric wire/tape would be removed within two weeks of livestock departure from the pasture.

Construction and reconstruction of fences within 4 miles of occupied Greater Sage-grouse leks in connectivity habitat would be designed to minimize the risk of Greater Sage-grouse collision with fences. Design features may include marking fences, laydown fences, and considerations regarding location of fences. Range improvement construction and reconstruction activities within amphibian breeding zone for Columbia spotted frog, western boreal toad, and boreal chorus frog would not occur until the breeding seasons has passed.

Vehicles would be used on open roads by herders living in five herder camps in the project area. Herders typically leave and return to their camps primarily on horseback, with the exception of several work days each month when they would drive to join other personnel driving onto the project area to move cattle between pastures. Herders also use vehicles one-two days per week when they leave the project area for their days off of work.

No new roads are proposed and none would be removed under Alternative 4. Two management actions would be taken to enforce existing designations. A new gate would be installed off of Forest Service Road 662 on a closed road to the Wagon Creek focus area. The gate would be closed to preclude motorized access by the general public; administrative use of the road would remain the same as described in the Travel Management Plan (U.S. Forest Service 1995). An unauthorized two-track route that leads to the Fish Creek focus area would be ripped and seeded to eliminate all motorized access for all users. This unauthorized route is 875-foot in length and is a spur route off of Forest Service Road 691 to Fish Creek.

Table 13. Alternative 4: Livestock Grazing Strategy

Allotment	Pasture	Grazing System	**Allowable Use:** *1.* **Upland - Max. forage utilization (%) on key forage species** *2.* **Riparian/Meadow - Min. stubble height (inches) on greenline and max. forage utilization (%) on key forage species**	Proposed Structures, Improvements, and select maintenance requirements	Focus Area Prescription
Badger Creek	Badger	Deferred 1 pasture	• 50% forage utilization in uplands • 4" stubble height on greenline and 35% forage utilization in riparian/ meadow areas • Adaptive management • Permitted season of use is July 1 to Sept. 30; • At least 1 year in 4, defer use until after seed-set, July 15 to Oct 14.	N/A	N/A
Beaver - Twin Creeks	Rock Creek	Deferred rotation: 3 pastures	50% forage utilization in uplands 4" stubble height on greenline and 35% forage utilization in riparian/meadow areas Adaptive management	Reconstruct fence along Rock Creek Buttes	N/A
	Twin Creeks		50% forage utilization in uplands 4" stubble height on greenline and 35% forage utilization in riparian/meadow areas Adaptive management	Construct approximately. 3 miles of pasture fence between North Beaver and Twin Creeks Pastures within three full field seasons of project implementation	Waterdog Lake Focus Area: 20% cattle allowable use
	North Beaver		50% forage utilization in uplands 4" stubble height on greenline and 35% forage utilization in riparian/meadow areas Adaptive management	Construct 0.4 mile drift fence, T37N, R111W, Sec. 10&11	N/A

Allotment	Pasture	Grazing System	**Allowable Use:** *1.* **Upland - Max. forage utilization (%) on key forage species** ***2.*** **Riparian/Meadow - Min. stubble height (inches) on greenline and max. forage utilization (%) on key forage species**	Proposed Structures, Improvements, and select maintenance requirements	Focus Area Prescription
Noble Pastures	Pasture 1 (northern)	Deferred rotation: 4 pastures 2-3 times over grazing	40% forage utilization in uplands and riparian/ meadow areas Adaptive management See also focus area prescription	Option to install a temporary electric fence to achieve focus area prescription. Maintain irrigation ditches to provide off-stream livestock water and maintain hydric vegetation.	Tosi Creek Focus Area: maximum 20% stream bank alteration, 6" stubble height, and 40% forage utilization in riparian/meadow areas. Option to install a temporary electric fence
	Pasture 2		50% forage utilization in uplands and meadow areas (There is no creek in this pasture) Adaptive management	Maintain irrigation ditches to provide off-stream livestock water and maintain hydric vegetation	N/A
	Pasture 3		50% forage utilization in uplands and meadow areas (There is no creek in this pasture) Adaptive management	Install culvert and add fill Maintain irrigation ditches to provide off-stream livestock water and maintain hydric vegetation	N/A
	Pasture 4 (southern)		50% forage utilization in uplands and riparian/meadow areas Adaptive management See also focus area prescription	Rebuild fence entire length of creek w/ two hardened crossings. Construct holding area in unfenced portion of pasture Maintain irrigation ditches to provide off-stream livestock water and maintain hydric vegetation	Klondike Focus Area: Rebuild and slightly expand the riparian fence with a top rail fence, & two harden crossings. Plant live-stake willows. Manage as a riparian pasture with brief grazing to stimulate willow establishment. The area would be grazed at a maximum forage utilization of 0.5

Allotment	Pasture	Grazing System	**Allowable Use:** *1.* **Upland - Max. forage utilization (%) on key forage species** ***2.*** **Riparian/Meadow - Min. stubble height (inches) on greenline and max. forage utilization (%) on key forage species**	Proposed Structures, Improvements, and select maintenance requirements	Focus Area Prescription
					AUMs per acre per year and would likely not be grazed some years.
Roaring Fork	Roaring Fork South	Deferred rotation: three pastures	Graze only in June, out before July 1 50% forage utilization in uplands 4" stubble height on greenline and 35% forage utilization in riparian/meadow areas Adaptive management	N/A	N/A
	Roaring Fork East		50% forage utilization in uplands 4" stubble height on greenline and 35% forage utilization in riparian/meadow areas Adaptive management	N/A	N/A
	Roaring Fork West		50% forage utilization in uplands 4" stubble height on greenline and 35% forage utilization in riparian/meadow areas Adaptive management	N/A	Roaring Fork West Focus Area: Cattle would be herded to avoid the focus area when forage utilization by elk is ≥50% prior to the "on date" for livestock. Cattle would not be placed (herded) to the focus area and salting would not be allowed in the focus area. If forage utilization in the focus area exceeds 50% and herding proves ineffective to keep livestock out of the focus area, livestock would be moved to the Roaring Fork East pasture or off the allotment when Roaring Fork East pasture has already been used by livestock for the grazing season.
Wagon Creek	Wagon Creek	Deferred rotation: one pasture	50% forage utilization in the uplands 4" stubble height and 50% forage utilization in riparian/meadow areas	N/A	N/A

Allotment	Pasture	Grazing System	**Allowable Use:** *1.* **Upland - Max. forage utilization (%) on key forage species** ***2.*** **Riparian/Meadow - Min. stubble height (inches) on greenline and max. forage utilization (%) on key forage species**	Proposed Structures, Improvements, and select maintenance requirements	Focus Area Prescription
			Adaptive Management		
Upper Green River - Gypsum rotation	Upper Gypsum	Deferred rotation: two pastures	50% forage utilization in the uplands 4" stubble height on greenline and 35% forage utilization in riparian/meadow areas; Adaptive Management	N/A	N/A
	Lower Gypsum		50% forage utilization in the uplands 6" stubble height on greenline of South Gypsum Creek until meeting stream bank stability objective for two consecutive monitoring cycles, then implement 4" stubble height on greenline 4" stubble height on greenline of other creeks and 35% forage utilization in all riparian/meadow areas Adaptive Management	N/A	N/A
Upper Green River – Mud Lake/ Fish Creek rotation	Mud Lake East	Deferred rotation: 3 pastures	50% forage utilization in the uplands 4" stubble height on greenline and 35% forage utilization in riparian/meadow areas Adaptive management Establish new location for long term species composition monitoring site. Initial evaluation of trend to be accomplished at 10 year monitoring interval Salt a minimum of ½ mile from Mud Lake	Relocate fence uphill to move Crow Creek into Mud Lake West pasture and consider development of up to two water sources one from Crow Creek and/or a spring within three full field seasons of project decision.	Upper Green Elk Feedground: No salting would be allowed and livestock would not intentionally be placed here. Any stray cattle would be actively herded away.
	Mud Lake West		50% forage utilization in the uplands 4" stubble height on greenline and 35% forage utilization in riparian/meadow areas Adaptive management	N/A	N/A

Allotment	Pasture	Grazing System	**Allowable Use:** *1.* **Upland - Max. forage utilization (%) on key forage species** ***2.*** **Riparian/Meadow - Min. stubble height (inches) on greenline and max. forage utilization (%) on key forage species**	Proposed Structures, Improvements, and select maintenance requirements	Focus Area Prescription
	Fish Creek		50% forage utilization in the uplands 4" stubble height on greenline and 35% forage utilization in riparian/meadow areas Strawberry Creek: 6" stubble height and 35% forage utilization Raspberry Creek: Continue monitoring and identify alternative trailing locations Adaptive management	N/A Consider developing fence to divide Fish Creek Pasture, additional NEPA would be required to implement.	Fish Creek Focus Area: Fish Creek Site #1: 6" stubble height, 20% bank alteration, 35% forage utilization Fish Creek Site #2: 6" stubble height and 35% forage utilization with option to add 20% bank alteration following next bank stability monitoring
Upper Green River – Mosquito Lake rotation	Mosquito SE	Deferred rotation four pastures with option of rest rotation Note:15% reduction in cattle numbers compared to Alt. 2	50% forage utilization in the uplands 4" stubble height on greenline and 35% forage utilization in riparian/meadow areas Adaptive management	Harden stream crossing approaches downstream of MIM site &maintain Wagon Creek electric fence exclosure when livestock are present. Install gate at start of closed road.	Wagon Creek Focus Area: Electric fence is in place at existing exclosure when cattle are using the pasture. Implement 6" stubble height outside exclosure within the focus area boundary.
	Mosquito NE		50% forage utilization in the uplands 4" stubble height on greenline and 35% forage utilization in riparian/meadow areas Adaptive management	N/A	N/A
	Mosquito NW		Average of 30% forage utilization over five year period with a max of 50% in any given year in the uplands and riparian/meadow areas. 4" stubble height on greenline	N/A	N/A

Allotment	Pasture	Grazing System	**Allowable Use:** *1.* **Upland - Max. forage utilization (%) on key forage species** ***2.*** **Riparian/Meadow - Min. stubble height (inches) on greenline and max. forage utilization (%) on key forage species**	**Proposed Structures, Improvements, and select maintenance requirements**	**Focus Area Prescription**
			Initial evaluation of trend to be accomplished at five year monitoring interval. Adaptive management		
	Mosquito SW		Average of 30% forage utilization over five year period with a max of 50% in any given year in the uplands and riparian/meadow areas. 4" stubble height on greenline Initial evaluation of trend to be accomplished at five year monitoring interval. Adaptive management	N/A	N/A
Upper Green River – Tosi Creek/ Tepee Creek rotation	Tosi Creek	Deferred rotation: four pastures	50% forage utilization in the uplands 4" stubble height on greenline and 35% forage utilization in riparian/meadow areas Adaptive management	N/A	N/A
	Upper Tepee Creek		50% forage utilization in the uplands 4" stubble height and 35% forage utilization in riparian/meadow areas Adaptive management	N/A	N/A
	Lower Tepee Creek		50% forage utilization in the uplands 4" stubble height on greenline and 35% forage utilization in riparian/meadow areas Adaptive management	Construct permanent fence along Tepee Creek from downstream of the bridge to the change in gradient with water gap and hardened crossing	Tepee Creek Focus Area: Remove nonfunctional logs cabled into Tepee Creek. Construct exclosure fence along Tepee Creek.

Allotment	Pasture	Grazing System	**Allowable Use:** *1.* **Upland - Max. forage utilization (%) on key forage species** ***2.*** **Riparian/Meadow - Min. stubble height (inches) on greenline and max. forage utilization (%) on key forage species**	Proposed Structures, Improvements, and select maintenance requirements	Focus Area Prescription
	South Kinky Creek (new pasture added to rotation)		50% forage utilization in the uplands 4" stubble height on greenline and 35% forage utilization in riparian/wetland areas Adaptive management	Construct permanent fences in order to add Kinky Creek Pasture to Tosi-Tepee Creek rotation	N/A
	North Kinky Creek		Contingency pasture		
Access to the Upper Green River, Wagon Creek, Roaring Fork, and Noble Pasture allotments	River Bottom Pasture and livestock driveway	Livestock are herded in along the livestock driveway in the spring, and drift out in the River Bottom Pasture and driveway during the fall	River Bottom Pasture: 50% forage utilization in the uplands 4" stubble height on greenline and 35% forage utilization in riparian/wetland areas Adaptive management Livestock driveway: maintain ≥60% ground cover	N/A	N/A

Implementation of adaptive management would be determined by the District Ranger with advice from an interdisciplinary team and permittees as described in the Adaptive Management section).

+ River Bottom Pasture and livestock driveway is used to access Upper Green River, Wagon Creek, Roaring Fork, and Noble Pasture allotments

Detailed Descriptions by Allotment under Alternative 4

This section provides a detailed description of the livestock grazing management by allotment as proposed under Alternative 4. In addition, adaptive management would be implemented on any pasture not meeting or moving towards resource objectives as described in the Adaptive Management section.

Badger Creek Allotment

Permitted Livestock Numbers, Season of Use and Management System

Under Alternative 4, the Badger Creek Allotment would remain as a single 7,254-acre pasture with 157 permitted cow/calf pairs or yearlings for a maximum of 622 animal unit months. The area determined to be capable and suitable for livestock grazing is 1,217 acres or 17 percent of the allotment. The grazing system would change to a deferred grazing system such that in three out of four years, livestock grazing would occur from July 1st to September 30th and in one out of four years, livestock grazing would occur from July 15th to Oct. 14th. This would defer livestock grazing until after seed-set for primary forage species in one of four years.

The one week shift prior to the season of use could be authorized by the District Ranger for the Badger Allotment in years the season of use is July 1st to September 30th. No shift prior to the season of use would be allowed in years when the season of use is July 15th to Oct. 14th (one of four years) to allow for seed set. The one week shift following the season of use could apply to Badger Allotment as described in Livestock Distribution, Range Improvements, and Best Management Practices under the Items Common to Action Alternative section. This would bring the allotment in compliance with the Forest Plan Forage Utilization Standard (U.S. Forest Service 1990).

Allowable Use

The maximum forage utilization on key forage species would be 35 percent in riparian and wetland areas and 50 percent in uplands. A 4-inch stubble height minimum would be retained along the greenline of streams. Key forage species are primarily Idaho fescue (*Festuca idahoensis)* in the uplands and sedges (*Carex* species) and/or tufted hairgrass (*Deschampsia*) in riparian and meadow areas. Other key species may be identified as appropriate on a site specific basis. Allowable use and long-term monitoring would be monitored at one key area (Figure 28).

Focus Area Prescription

There are no focus areas in the Badger Allotment.

Structural Improvements

Existing Structural Improvements: Figure 28 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: There are no proposed structural improvements.

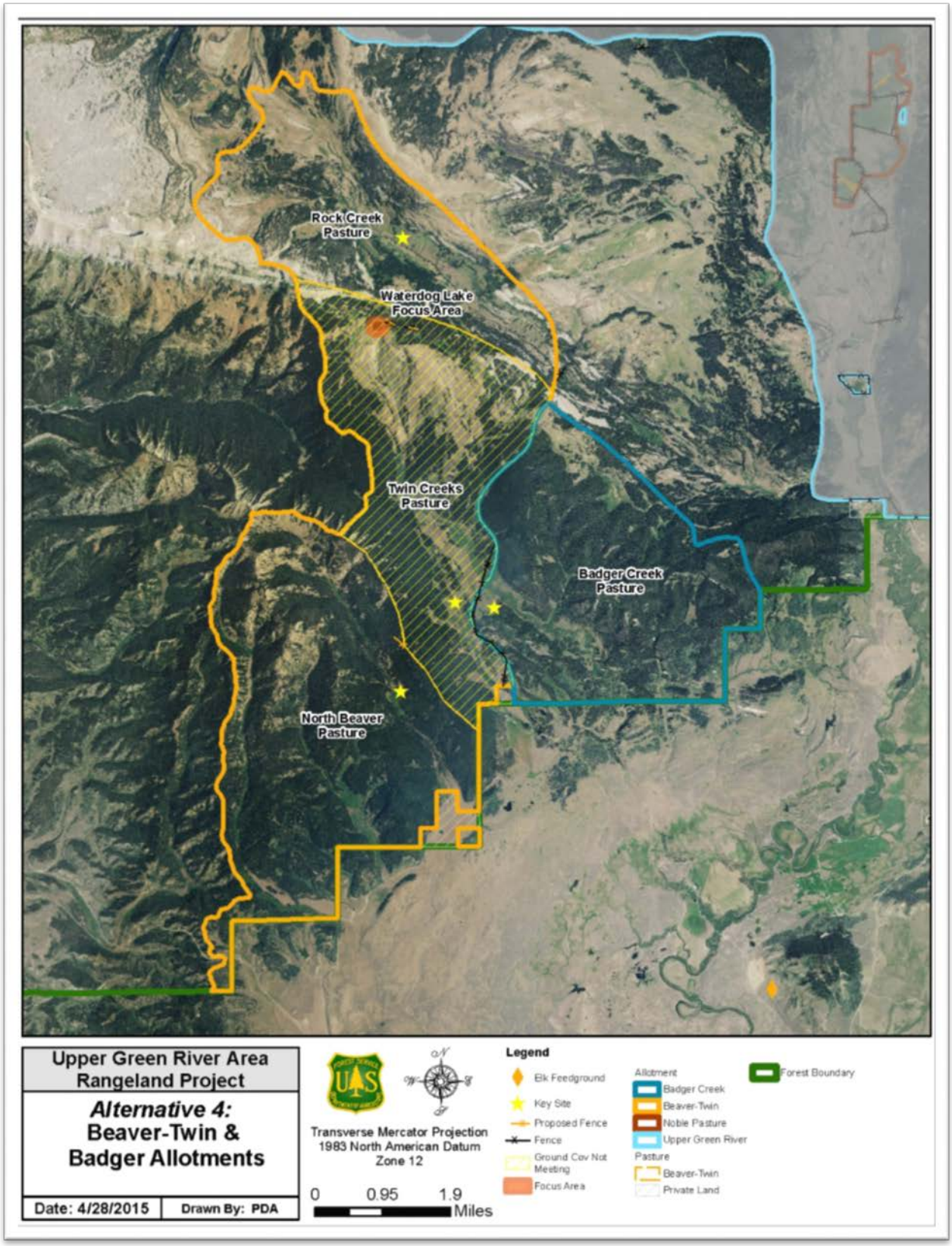

Figure 28. Badger and Beaver-Twin allotments under Alternative 4

Beaver-Twin Allotment

Permitted Livestock Numbers, Season of Use and Management System

Under Alternative 4, the Beaver-Twin Allotment is a 22,079-acre allotment that would be divided into three pastures to enhance livestock distribution and forage use. The three pastures would be Rock Creek (5,835 acres), Twin Creeks Pasture (6,883 acres) and North Beaver (9,361 acres). The grazing system would change to a three pasture deferred rotation grazing system with an option to implement a rest rotation system in compliance with the Forest Plan Forage Utilization Standard (U.S. Forest Service 1990). The allotment would continue to be permitted for 700 cow/calf pairs or yearlings from July 15th to October 15th (permitted season of use) for a maximum of 2,772 animal unit months. The area determined to be capable and suitable for livestock grazing is 6,337 acres or 29 percent of the allotment.

Pasture rotation schedule for Beaver-Twin Allotment under Alternative 4*

Pasture	Permitted Livestock Numbers	Year 1 Date Cattle Enter Unit	Year 1 Date Cattle Leave Unit	Year 2 Date Cattle Enter Unit	Year 2 Date Cattle Leave Unit
Rock Creek	700	7/15	8/15	8/15	9/15
Twin Creeks	700	8/15	9/15	7/15	8/15
North Beaver	700	9/15	10/30	9/15	10/30

* Actual dates may vary (within the maximum permitted occupancy stipulated on the permit face) and depend on resource conditions and actual use.

Allowable Use

The maximum forage utilization on key forage species would be 35 percent in riparian and wetland areas and 50 percent in uplands. A 4-inch stubble height minimum would be retained along the greenline of streams. Key forage species are primarily Idaho fescue (*Festuca idahoensis)* in the uplands and sedges (*Carex* species) and/or tufted hairgrass (*Deschampsia*) in riparian and meadow areas. Other key species may be identified as appropriate on a site specific basis. Allowable use and long-term monitoring would be monitored at three key areas (Figure 28).

Focus Area Prescription

Waterdog Lake Focus Area would be located within the Twin Creeks Pasture upon allotment division into three pastures. Cattle grazing would continue to be limited to a maximum forage utilization of 20 percent key forage species and outfitters would continue to not be allowed to graze their stock in the Waterdog Lake focus area.

Structural Improvements

Existing Structural Improvements: Figure 28 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: Structural improvements would be constructed to effectively divide the allotment into three pastures (Figure 28). The Beaver-Twin Allotment Interior Fence #1 is located along the Rock Creek Buttes in the Rock Creek Pasture. This interior fence would be reconstructed along the ridgeline and tied into geographic features that restrict cattle movement. The fence would be approximately 0.4 miles in length, likely post and wire construction. Approximately 3 miles of post and wire fence would be constructed along the North Beaver Pasture and Twin Creeks Pasture to facilitate pasture division. This fence would be constructed within three full field seasons of project implementation. The proposed structural improvements are described in Structural Improvements.

Table 29. Proposed structural improvements in the Beaver-Twin Allotment

Description	Location	Legal Description	Type and Length
Beaver-Twin Allotment Interior Fence #1	Rock Creek Buttes in the Rock Creek Pasture	Township 38N Range 111W, Section 11 Township 38N Range 111W,Section 14	~0.4 mile, permanent fence
Beaver-Twin Allotment Interior Fence #2	Boundary of North Beaver Pasture and Twin Creeks Pasture	Township 37N Range 111W, Section 10	~3 mile, permanent fence

Noble Pastures Allotment

Permitted Livestock Numbers, Season of Use and Management System

The Noble Pastures Allotment is a 762-acre irrigated four pasture allotment located in the center of the project area within the boundaries of the Upper Green River Allotment. The area determined to be capable and suitable for livestock grazing is 743 acres or 98 percent of the allotment. Under Alternative 4, the allotment would continue to be permitted for 314 cow/calf pairs, 110 yearlings (or equivalent) and four horses. Livestock would enter and exit the allotment from Pasture 1 or Pasture 4. Livestock would graze a pasture for up to two weeks then rotate to the next pasture. Because this allotment is flood irrigated, each pasture would be grazed twice during the grazing season from June 14^{h} to September 20th. There is an option for three times over grazing infrequently (one year in four). Some trailing through pastures may also occur. A maximum of 1,605 animal unit months would be permitted. Pastures would be rested from grazing four to eight weeks (recovery period) before grazing would occur again. The recovery period would be shortest early in the grazing season during the rapid growth phase of cool season grasses, and would lengthen as growth slows toward the end of the growing season.

Pasture rotation schedule for Noble Pasture Allotment under Alternative 4*

Pasture	Permitted Livestock Numbers	Year 1 Date Cattle Enter Unit	Year 1 Date Cattle Leave Unit	Year 2 Date Cattle Enter Unit	Year 2 Date Cattle Leave Unit
Pasture 1	428	6/14 7/24	6/19 8/7	7/10 9/4	7/24 9/20
Pasture 2	428	6/19 8/7	6/26 8/21	6/26 8/21	7/10 9/4
Pasture 3	428	6/26 8/21	7/10 9/4	6/19 8/7	6/26 8/21
Pasture 4	428	7/10 9/4	7/24 9/20	6/14 7/24	6/19 8/7

* Actual dates may vary (within the maximum permitted occupancy stipulated on the permit face) and depend on resource conditions and actual use.

Allowable Use

The maximum forage utilization on the key forage species in irrigated Pasture 1 is 40 percent and 50 percent for Pastures 2, 3, and 4. Key forage species are primarily Idaho fescue (*Festuca idahoensis,)* sedges (*Carex* species) and/or tufted hairgrass (*Deschampsia*). Other key species may be identified as appropriate on a site specific basis. See the Focus Area Prescription for allowable use on Tosi Creek (Pasture 1) and Klondike Creek (Pasture 4). There are no creeks in pastures 2 and 3; cattle water from irrigation ditches. Allowable use and long-term monitoring would be conducted at four key areas (Figure 30).

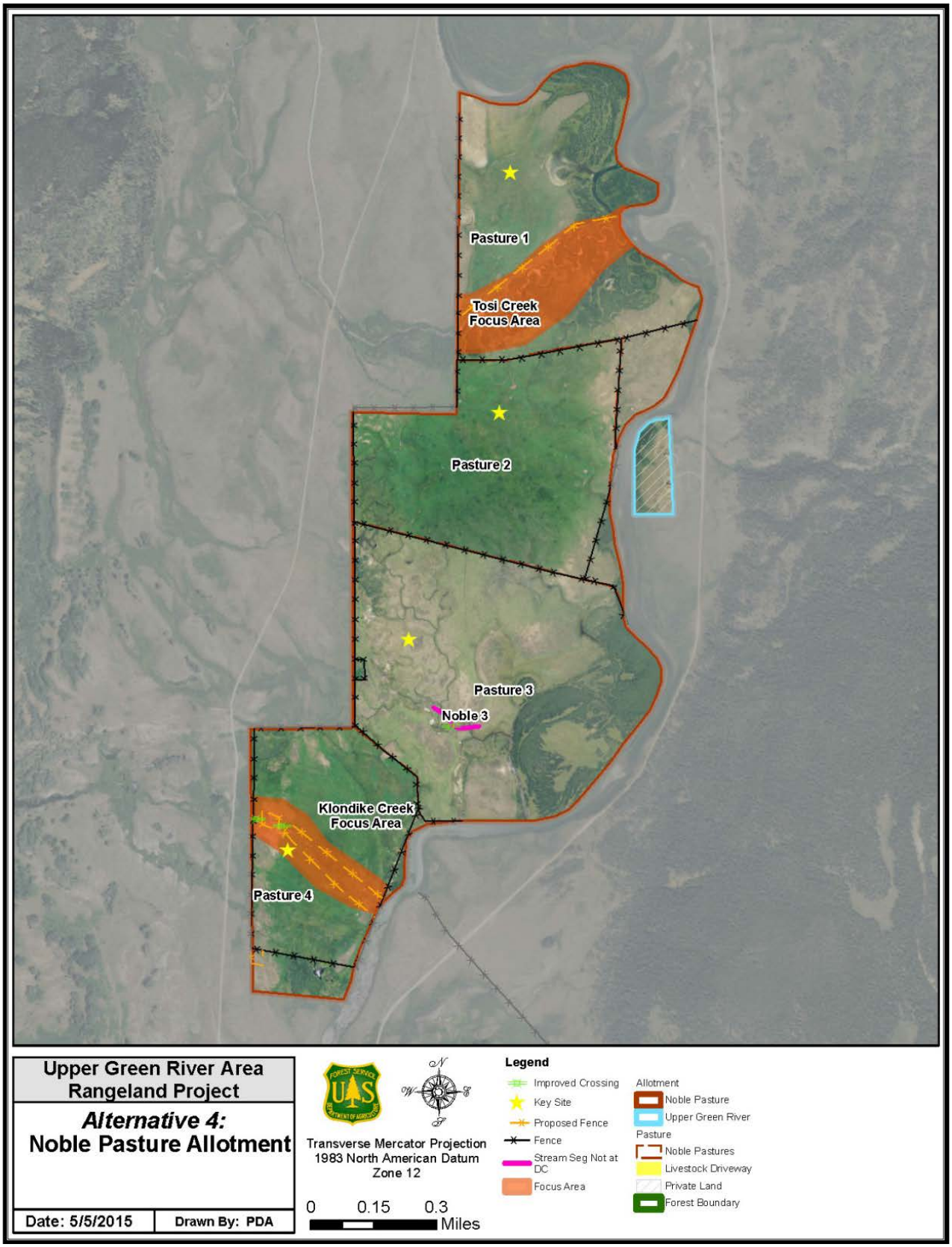

Figure 30. Noble Pastures Allotment under Alternative 4

Focus Area Prescription

Tosi Creek Focus Area is located along the entire length of Tosi Creek within Pasture 1. An annual maximum of 20 percent stream bank alteration and 6-inch stubble height minimum would be retained along Tosi Creek with an interim stream bank stability objective of a demonstrated increase in stream bank stability during the next monitoring cycle (three-five years). If stream bank stability results in a static or downward trend after implementing a 20 percent stream bank alteration and 6-inch stubble height standards, an electric fence along Tosi Creek would be installed. Installation of an electric fence would also be authorized prior to five years if achieving a 20 percent maximum stream bank alteration and/or 6-inch stubble height was not practicable to implement. The electric fence along Tosi Creek would be located at T39N, R110W, Section 26 and would be constructed and maintained by the permittee.

Klondike Creek Focus Area is located within Pasture 4. The Klondike enclosure fence would be rebuilt and the area slightly enlarged with a top rail along the entire length of Klondike Creek. Two hardened water crossings would also be constructed to allow livestock access to drinking water. The two fences would be located at T38N R110W, Section 2, T39N R110W, Section 35. The Forest Service would construct and maintain the fence and plant willow stakes along Klondike Creek. The fenced enclosure would be managed as a riparian pasture with brief grazing allowed stimulating willow establishment by reducing competing grasses and sedges. The area would be grazed at a maximum forage utilization of 0.5 animal unit month per acre per year. The enclosure would be approximately 10 acres; therefore, 0.5 animal unit month per acre would equate, for example, to 50 head for three days or 15 head for ten days. Actual livestock numbers and use periods would be adjusted to enhance willow establishment and it is likely that no grazing would occur within the enclosure during many years.

Structural Improvements

Existing Structural Improvements: Water from Tosi and Klondike Creeks would continue to be diverted into irrigation ditches to irrigate the four pastures, provide off-creek water for livestock, and maintain the Forest Service's water rights associated with the allotment. Irrigation ditches would continue to be maintained by the permittee. Existing fences would be maintained as needed by the Noble Allotment permittee. Figure 30 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: The proposed structural improvements are described in Focus Area Prescriptions and Structural Improvements and are displayed on Figure 30. The Forest Service would install a culvert in an irrigation ditch within Pasture 3 where cattle are currently trailing through the area and would construct a cattle holding area or trap adjacent to and south of Pasture 4.

Table 14. Proposed structural improvements in the Noble Pastures Allotment

Description	Location	Legal Description	Type and length
Tosi Creek Focus Area, fence #1 (optional fence)	Pasture 1	Township (T) 39N, Range (R) 110W, Section 26	Optional electric fence ~0.5 miles in length
Install culvert	Pasture 3	Township 39N Range 110W, Section 35	
Klondike Creek Focus Area, fence #2	Pasture 4	Township 38N Range 110W, Section 2 T39N R110W, Section 35	~0.4 miles of 3 or 4-strand wire with a top pole
Klondike Creek Focus Area, fence #3	Pasture 4	Township 38N Range 110W, Section 2 T39N R110W, Section 35	~0.4 miles of 3 or 4-strand wire with a top pole

Description	Location	Legal Description	Type and length
Klondike Creek Focus Area, hardened crossing #1	Pasture 4	Township 38N Range 110W, Section 2	
Klondike Creek Focus Area, hardened crossing #2	Pasture 4	Township 39N Range 110W, Section 35	
Trap	South of Pasture 4	Township 38N Range 110W, Section 2	~0.1 miles of fence enclosing ~0.65 acres

Monitoring

Monitoring would generally be conducted as described for Alternative 3 with one difference. Under Alternative 4, monitoring would be conducted in Noble Pastures Allotment, in addition to the Gypsum rotation, to determine if livestock numbers and season of use can be sustained based on allowable use triggers. If livestock are moved off the allotment/rotation early in four out of five years as determined by allowable use triggers, livestock numbers and season of use would be reduced.

The five years considered would be above-average, average or below-average years of forage production based on precipitation. Outlier years of forage production including drought years or unusually high moisture years would not be considered as part of the five years for purposes of firming up capacity. Outlier years are years that fall outside the 30-year average high or low for the SNOTEL site that comprised most of the watershed for the project area. The data source is found at: http://www.ncdc.noaa.gov/climate-information/climate-us. A five-year time period was selected because range sufficiency reviews are typically conducted at a minimum of every five years following a range decision. A range sufficiency review is a review of project-level range decisions to determine if new information and/or changed circumstances might affect a range decision.

Roaring Fork Allotment

Permitted Livestock Numbers, Season of Use and Management System

Under Alternative 4, the 8,416-acre Roaring Fork Allotment would be managed as a three pasture deferred rotation system: Roaring Fork South (997 acres), Roaring Fork East (3,425 acres), and Roaring Fork West Pasture (3,994 acres). Managing the allotment as a three pasture rotation instead of one season-long pasture would bring the allotment in compliance with the Forest Plan Forage Utilization Standard (U.S. Forest Service 1990). The allotment would continue to be permitted for 170 cow/calf pairs or from June 16th to October 15th for a maximum of 898 animal unit months. The area determined to be capable and suitable for livestock grazing is 4,449 acres or 53 percent of the allotment.

Cattle would be moved through the allotment and managed by means of herding to help prevent livestock from congregating along the Green River bottom and manage livestock use of the Roaring Fork focus area (see prescription below). No new fencing is proposed for the Roaring Fork Allotment. Livestock would be allowed to graze in the Roaring Fork South Pasture annually from June 16th to June 30th in years that water flow in the Green River is low enough that the cattle can cross the river. This typically occurs every second year. Cattle would then be moved into Roaring Fork East Pasture and Roaring Fork West Pasture, alternating the order of the first pasture used between these two pastures annually.

Pasture rotation schedule for Roaring Fork Allotment under Alternative 4*

Pasture	Permitted Livestock Numbers	Year 1 Date Cattle Enter Unit	Year 1 Date Cattle Leave Unit	Year 2 Date Cattle Enter Unit	Year 2 Date Cattle Leave Unit
Roaring Fork South#	170	06/16	06/30	06/16	06/30
Roaring Fork West	170	06/30	08/15	08/15	10/15
Roaring Fork East	170	08/15	10/15	06/30	08/15

* Actual dates may vary (within the maximum permitted occupancy stipulated on the permit face) and depend on resource conditions and actual use.

Use of the Roaring Fork South Pasture is dependent on the ability of cattle to cross the Green River.

Allowable Use

The maximum forage utilization on key forage species would be 35 percent in riparian and wetland areas and 50 percent in uplands. A 4-inch stubble height minimum would be retained along the greenline of streams. Key forage species are primarily Idaho fescue (*Festuca idahoensis)* in the uplands and sedges (*Carex* species) and/or tufted hairgrass (*Deschampsia*) in riparian and meadow areas. Other key species may be identified as appropriate on a site specific basis. Allowable use and long-term monitoring would be conducted at one key site and in the Roaring Fork focus area (Figure 31).

Focus Area Prescription

Roaring Fork Focus Area is located in the Roaring Fork West Pasture and is impacted by the congregation of elk associated with the Upper Green River elk feedground. The focus area would be managed with special management consideration such that prior to livestock turn-out, forage utilization by elk will be determined. If forage utilization on key forage species (*Idaho fescue*) is greater than or equal to 50 percent, livestock use of the focus area would be avoided by actively herding livestock away from the area. If herding proves ineffective to keep livestock out of the focus area, livestock would be moved to the Roaring Fork East Pasture or off the allotment when Roaring Fork East Pasture has already been used by livestock for the grazing season. If forage utilization on key forage species is less than 50 percent, livestock would be allowed to use the focus area until 50 percent forage utilization is reached. Salting would not be allowed in the focus area.

Structural Improvements

Existing Structural Improvements: Existing fences would be maintained as needed by the Roaring Fork Allotment permittees. Figure 31 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: There are no proposed structural improvements.

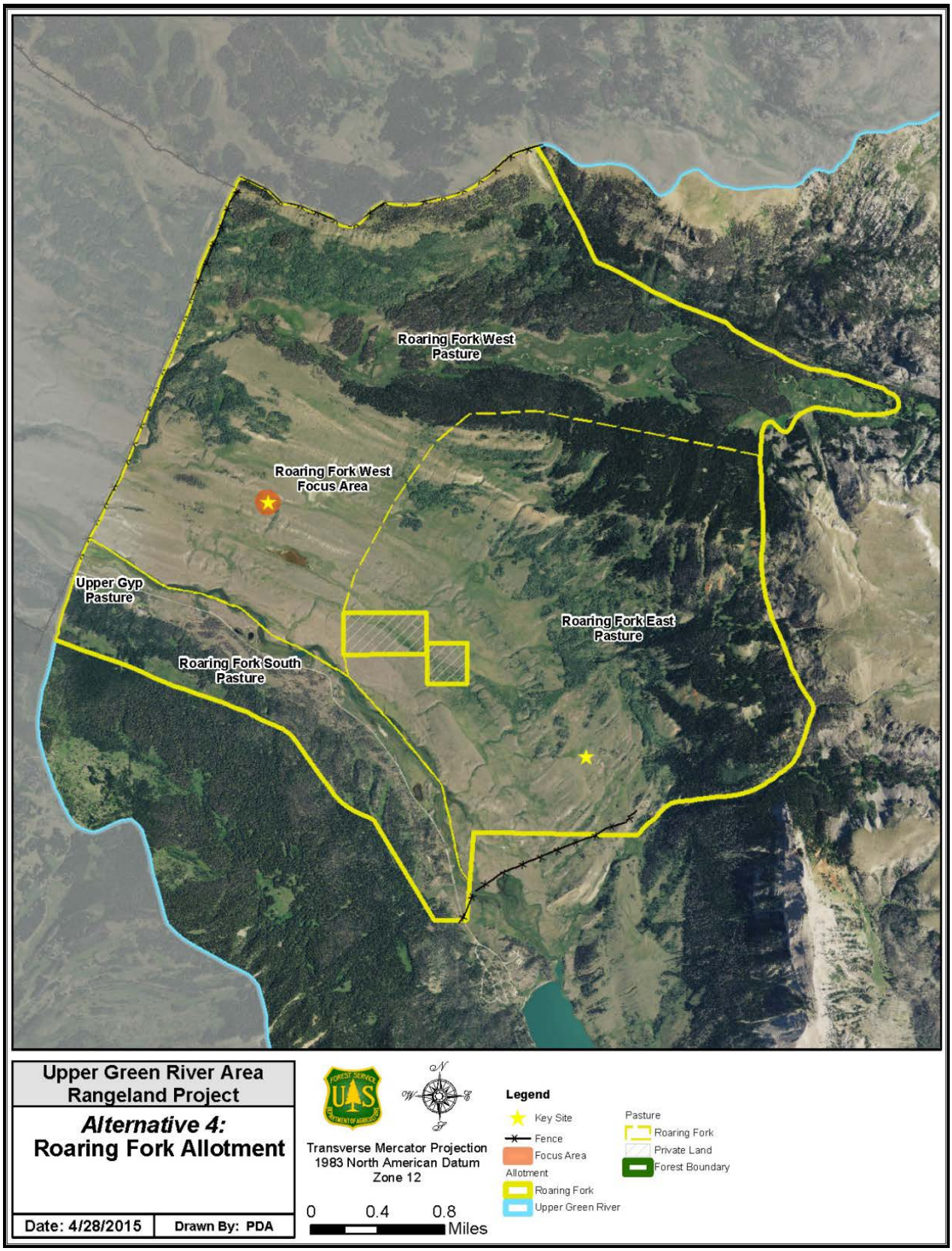

Figure 31. Roaring Fork Allotment under Alternative 4

Wagon Creek Allotment

Permitted Livestock Numbers, Season of Use and Management System

The Wagon Creek Allotment is a 186-acre single pasture adjacent to private land and is managed jointly in a pasture rotation system. Under Alternative 4, the Forest Service would continue to authorize 26 cow/calf pairs or yearlings to graze the allotment for a maximum of 103 animal unit months. The area determined to be capable and suitable for livestock grazing is 186 acres or 100 percent of the allotment. Livestock grazing would be authorized for a 45-day livestock grazing period (instead of a 90-day use currently permitted) with a variable entry date within the July 15th to October 15th permitted season of use. This means that the 45-day period of livestock use does not take place during the same exact calendar dates in the subsequent year.

Pasture rotation schedule for Wagon Creek Allotment under Alternative 4*

Pasture	Permitted Livestock Numbers	Year 1 Date Cattle Enter Unit	Year 1 Date Cattle Leave Unit	Year 2 Date Cattle Enter Unit	Year 2 Date Cattle Leave Unit
Wagon Creek	26	7/15	9/1	9/1	10/15

* Actual dates may vary (within the maximum permitted occupancy stipulated on the permit face) and depend on resource conditions and actual use.

Allowable Use

The maximum forage utilization on key forage species would be 50 percent in upland, riparian and wetland areas. A 4-inch stubble height minimum would be retained along the greenline of streams. Key forage species are primarily Idaho fescue (*Festuca idahoensis)* in the uplands and sedges (*Carex* species) and/or tufted hairgrass (*Deschampsia*) in riparian and meadow areas. Other key species may be identified as appropriate on a site specific basis. Allowable use and long-term monitoring would be conducted at one key area (Figure 21).

Focus Area Prescription

There are no focus areas in the Wagon Creek Allotment.

Structural Improvements

Existing Structural Improvements: Existing fences would be maintained as needed by the permittees. Figure 32 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: There are no proposed structural improvements.

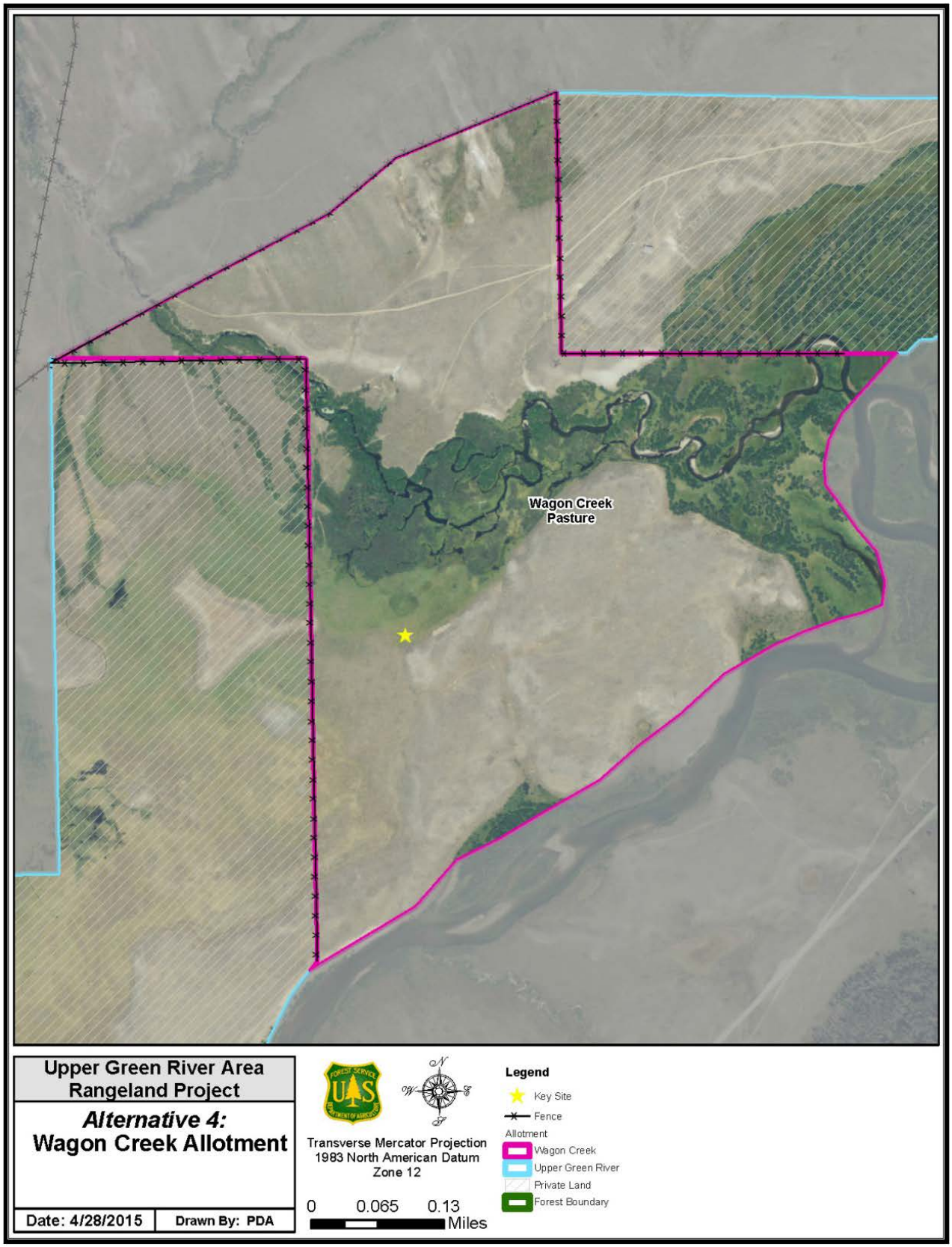

Figure 32. Wagon Creek Allotment under Alternative 4

Upper Green River Allotment

The Upper Green River Allotment is a 131,944-acre allotment that encompasses the majority of the project area and contains four pasture rotations: the Mud Lake/Fish Creek rotation, Mosquito Lake rotation, Tosi Creek/Tepee Creek/Kinky Creek rotation, and Gypsum Creek rotation (Figure 11). The area determined to be capable and suitable for livestock grazing is 61,331 acres or 46 percent of the allotment. Under Alternative 4, 7,295 cow/calf pairs or yearlings and 43 horses would be authorized to graze from June 16th to October 15th (the permitted season of use) for a maximum of 38,722 animal unit months. Of the 43 horses authorized in the allotment, 16 horses would be distributed throughout the allotment and 27 horses would be authorized in the Tosi/Tepee Creek rotation. Permittees of the Upper Green River, Wagon Creek, Roaring Fork and Noble Pastures allotments, move their livestock through the livestock driveway and the River Bottom Pasture to access their allotment and/or exit the Forest. Detailed information is presented by rotation and the River Bottom Pasture and livestock driveway below. Table 13 summarizes the grazing system, allowable use, proposed structural improvements and focus area prescriptions by rotation and pasture.

Mud Lake/Fish Creek Rotation

Permitted Livestock Numbers, Season of Use and Management System

Mud Lake/Fish Creek area is a 44,527-acre three pasture system Mud Lake East (6,297 acres), Mud Lake West (5,422 acres), and Fish Creek pastures (32,808 acres). The area determined to be capable and suitable for livestock grazing is 23,834 acres or 54 percent of the rotation. Under Alternative 4, 2,780 cow/calf pairs or yearlings would be authorized to graze in a deferred rotation grazing system from June 16th to October 15th (the permitted season of use) for a maximum of 14,678 animal unit months, with the option to implement a rest rotation system.

Pasture rotation schedule for the Mud Lake/Fish Creek rotation in the Upper Green River Allotment under Alternative 4*

Pasture	Permitted Livestock Numbers	Year 1 Date Cattle Enter Unit	Year 1 Date Cattle Leave Unit	Year 2 Date Cattle Enter Unit	Year 2 Date Cattle Leave Unit
Mud Lake West	2,780	6/16	7/15	9/15	10/15
Fish Creek	2,780	7/15	9/15	7/15	9/15
Mud Lake East	2,780	9/15	10/15	6/16	7/15

* Actual dates may vary (within the maximum permitted occupancy stipulated on the permit face) and depend on resource conditions and actual use.

The Forest Service will consider dividing the Fish Creek Pasture into two pastures and would conduct additional environmental analysis as required by NEPA before implementing.

Allowable Use

The maximum forage utilization on key forage species would be 35 percent in riparian and wetland areas and 50 percent in uplands. A 4-inch stubble height minimum would be retained along the greenline of streams for all pastures. The exception is Strawberry Creek in the Fish Creek Pasture in which the Forest Service would implement a 6-inch stubble height minimum measured along the greenline. Monitoring will continue at Raspberry Creek and alternative trailing routes will be identified. Key forage species are primarily Idaho fescue (*Festuca idahoensis)* in the uplands and sedges (*Carex* species) and/or tufted hairgrass (*Deschampsia*) in riparian and meadow areas. Other key species may be identified as appropriate on a site specific basis. Allowable use and long-term monitoring would be monitored at three key areas (Figure 33).

The Upper Green River elk feedground, located in the Mud Lake East and Upper Gypsum Pastures, would be managed for wintering elk and to minimize livestock use of the area. No salting would be allowed in the feedground and livestock would not intentionally be placed in this area. Any stray cattle would be actively herded away from the feedground. No salt would be allowed within ½ mile from Mud Lake.

Focus Area Prescription

Fish Creek Focus Area is located within the Fish Creek Pasture. Under Alternative 4, the allowable use at the Fish Creek site #1 would be a 6-inch stubble height minimum measured along the greenline and 20 percent stream bank alteration. An unauthorized two-track route to Fish Creek, off of Forest Service Road #691, would be rehabilitated by ripping and seeding with native seeds.

The allowable use at the Fish Creek site #2 would be a minimum 6-inch stubble height measured along the greenline with an option to add the 20 percent stream bank alteration prescription depending on stream bank stability monitoring results collected during the next monitoring cycle.

Structural Improvements

Existing Structural Improvements: Existing fences would be maintained as needed by the permittees. Figure 33 displays locations of the existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: The Forest Service would relocate approximately 0.2 mile of fence in the southwest corner of Mud Lake East Pasture uphill to the east. This would remove Crow Creek from the Mud Lake East Pasture and place it in the Mud Lake West Pasture. The fence would be relocated within three full field seasons after project implementation. The Forest Service would consider water development(s) from up to two water sources in the Mud Lake East Pasture, a water source from Crow Creek and/or a spring to the east of Crow Creek. The proposal to implement water developments would be scoped pursuant to Forest Service Handbook 1909.15.31.3 and analyzed under NEPA in a separate document.

Table 15. Proposed structural improvement in Mud Lake/Fish Creek rotation of the Upper Green River Allotment

Description	Location	Legal Description	Type and Length
Fence relocation along southern boundary of Mud Lake East and West pastures	Southwest corner of the Mud Lake East Pasture	Township 39N Range 109W, Section 6	~0.2 mile, permanent fence relocated to the east of Crow Creek
Consider up to two water developments	Water from Crow Creek and/or a spring	Township 39N Range 109W, Section 6 water development off Crow Creek Township 39N Range 109W, Section 6 location of spring water development	To be determined in future NEPA analysis

Effectiveness Monitoring or Long-term Trend Monitoring

The Forest Service would establish a new key area for long-term monitoring of species composition in the Mud Lake East and Mud Lake West pastures. The initial evaluation of species composition trend would occur ten years post implementation.

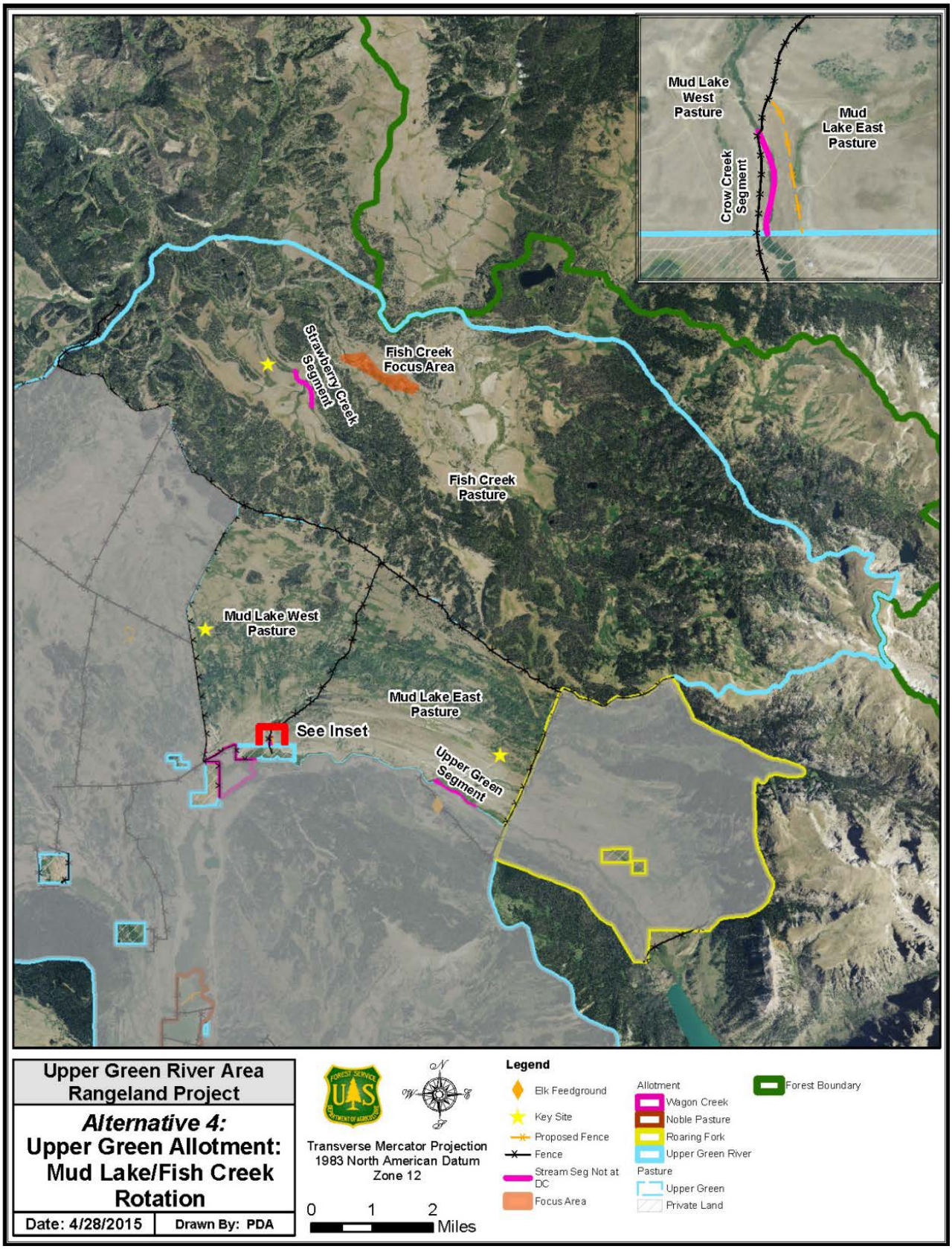

Figure 33. Mud Lake/Fish Creek Rotation of the Upper Green River Allotment

Mosquito Lake Rotation

Permitted Livestock Numbers, Season of Use and Management System

Mosquito Lake rotation is a 17,181-acre four pasture unit located in the northwestern portion of the project area. The four pastures are Mosquito NE (3,126 acres), Mosquito SE (3,826 acres), Mosquito SW (5,990 acres), and Mosquito NW (4,839 acres). The area determined to be capable and suitable for livestock grazing is 11,634 acres or 68 percent of the pasture area. Under Alternative 4, 1,530 cow/calf pairs or yearlings would be authorized to graze in a deferred rotation grazing system from June 16th to October 15th (the permitted season of use) for a maximum of 8,078 animal unit months, with the option to implement a rest rotation system. This represents a 15 percent reduction (270) in the permitted number of livestock, from 1,800 cow/calf pairs or yearlings in Alternative 2 to 1,530 cow/calf pairs or yearlings of under Alternative 4. This reduction in permitted livestock numbers is associated with inactive or expired permits which would remain unallocated. Livestock would enter the Mosquito SE Pasture and rotate counterclockwise in year one and enter the Mosquito SW Pasture and rotate clockwise in year two.

Pasture rotation schedule for the Mosquito Lake rotation in the Upper Green River Allotment under Alternative 4*

Pasture	Permitted Livestock Numbers	Year 1 Date Enter Unit	Year 1 Date Leave Unit	Year 2 Date Enter Unit	Year 2 Date Leave Unit
Mosquito SE	1,530	6/15	7/15	9/15	10/15
Mosquito NE	1,530	7/15	8/15	8/15	9/15
Mosquito NW	1,530	8/15	9/15	7/15	8/15
Mosquito SW	1,530	9/15	10/15	6/15	7/15

* Actual dates may vary (within the maximum permitted occupancy stipulated on the permit face) and depend on resource conditions and actual use.

Allowable Use

In the Mosquito SW and Mosquito NW pastures, the maximum forage utilization on key forage species in upland, riparian, and wetland areas would be an average of 30 percent over five years, with a maximum of 50 percent in any given year, and a 4-inch stubble height minimum would be retained along the greenline of streams. This forage utilization standard is expected to address concerns in plant species composition in these two pastures and stream bank stability along Wagon Creek in the Mosquito NW Pasture.

In the Mosquito SE and Mosquito NE pastures, the maximum forage utilization on key forage species would be 35 percent in riparian and wetland areas and 50 percent in uplands. A 4-inch stubble height minimum would be retained along the greenline of streams. Key forage species for the four pastures are primarily Idaho fescue (*Festuca idahoensis)* in the uplands and sedges (*Carex* species) and/or tufted hairgrass (*Deschampsia*) in riparian and meadow areas. Other key species may be identified as appropriate on a site specific basis. Allowable use and long-term monitoring would be monitored at four key areas (Figure 34). See the Focus Area Prescription section for allowable use standards for the Wagon Creek focus area.

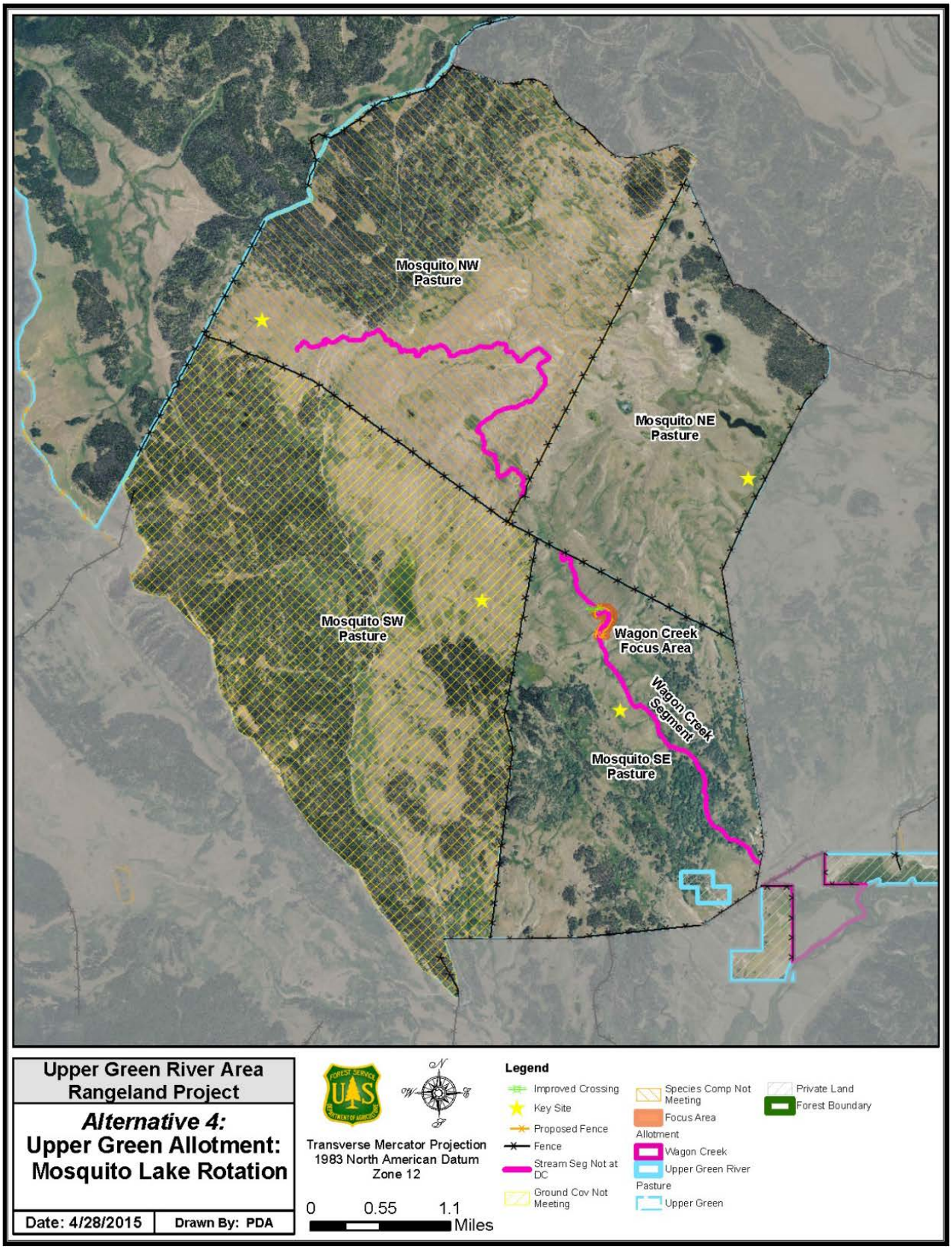

Figure 34. Mosquito Lake Rotation of the Upper Green River Allotment under Alterative 4

Focus Area Prescription

Wagon Creek Focus Area is located in the Mosquito SE Pasture in the Upper Green River Allotment. Under Alternative 4, the Forest Service would install a gate at the start of a closed road (Township 20N Range 110W, Section 27) to discourage public use while allowing administrative use. In addition, the Forest Service would harden the stream crossing approaches on Wagon Creek. The permittees would maintain an existing electric fence exclosure (0.7 miles) when the cattle are using the pasture. A 6-inch stubble height minimum would be retained outside of the exclosure and within the focus area. See Structural Improvements for additional information on electric fences.

Structural Improvements

See Structural Improvements for more information on structural improvements.

Existing Structural Improvements: Existing fences would be maintained as needed by the permittees. Figure 34 displays the location of existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: The structural improvements proposed for the Mosquito Lake rotation are located within the Wagon Creek focus area and are described above in the Focus Area Prescription and below in Table 16.

Table 16. Proposed structural improvements in the Mosquito Lake rotation of the Upper Green River Allotment

Description	Location	Legal Description	Type and length
Wagon Creek exclosure #1	Wagon Creek focus area in the Mosquito SE Pasture	Township 40N Range 110W, Section 27	0.7 miles of electric fence
Wagon Creek harden approaches to crossing	Wagon Creek Focus Area in the Mosquito SE Pasture	Township 40N Range 110W, Section 27	
Gate	Closed road to Wagon Creek focus area in the Mosquito SE Pasture	Township20N Range 110W, Section 27	

Tosi Creek/Tepee Creek/Kinky Creek Rotation

Permitted Livestock Numbers, Season of Use and Management System

Tosi Creek/Tepee Creek area is a 26,934-acre four pasture system. Under Alternative 4, South Kinky Creek pasture would be added to the rotation while the number of livestock and season of use would remain as authorized under the Alternative 2. The four pastures consistently used in the rotation would be Tosi Creek Pasture (5,828 acres), Upper Tepee Creek Pasture (8,747 acres), Lower Tepee Creek Pasture (6,081 acres) and South Kinky Creek Pasture (3,327 acres). The North Kinky Creek Pasture (2,951 acres) would be authorized for livestock grazing as a contingency pasture with variable use by livestock. The area determined to be capable and suitable for livestock grazing in the Tosi Creek/Tepee Creek/Kinky Creek rotation is 9,738 acres or 41 percent of the pasture rotation. The Forest Service would continue to authorize 1,000 cow/calf pairs or yearlings and 27 horses to graze in a deferred rotation grazing system from June 16th to October 15th (the permitted season of use) for a maximum of 5,280 animal unit months for cattle and 130 animal unit months for horses. The Forest Service would maintain an option to implement a rest rotation system.

Livestock use of South Kinky Creek Pasture would be concurrent with livestock use in Lower Tepee Creek Pasture. The permitted number of cattle (1,000 head) would be divided between the two pastures with a minority number in the Kinky Creek Pasture. Approximately 57 acres of the South Kinky Creek Pasture (an

area adjacent to the Darwin Ranch, a private inholding) was managed under a special use pasture permit, but beginning in 2014 the special use permit was not renewed. The Darwin Ranch holds a term-grazing permit to graze 27 horses in the Tosi Creek/Teepee Creek/Kinky Creek rotation. Under Alterative 4, 27 horses would be permitted to graze the four pastures in the rotation according to the rotation schedule established for all livestock. If the permittee choses to use only the South Kinky Creek Pasture, the permittee would be allowed to graze the horses in the South Kinky Creek Pasture only during the period when cattle are allowed in the same pasture.

North Kinky Creek Pasture serves as a contingency pasture with variable use by livestock. Conditions under which this pasture would be used include 1) to shorten the duration of livestock grazing in any of the other four pastures, 2) to alleviate predator problems, poisonous plant problems or to allow for rest of a pasture recovering from a wildfire or prescribed fire, and/or 3) to implement a rest rotation system. Livestock would be allowed to graze in this pasture for a maximum of 21 days within the same season of use for this rotation.

Pasture rotation schedule for the Tosi Creek/ Teepee Creek/ Kinky Creek rotation in the Upper Green River Allotment under Alternative 4*

Pasture	Permitted Livestock Numbers	Year 1 Date Cattle Enter Unit	Year 1 Date Cattle Leave Unit	Year 2 Date Cattle Enter Unit	Year 2 Date Cattle Leave Unit
Lower Tepee Creek & South Kinky Creek	1,000 cattle 27 horses	06/16	07/30	09/16	10/15
Upper Tepee Creek	1,000 cattle 27 horses	08/01	09/15	08/01	09/15
Tosi Creek	1,000 cattle 27 horses	09/16	10/15	06/16	07/30
North Kinky Creek	1,000 cattle 27 horses	Variable use	Variable use	Variable use	Variable use

* Actual dates may vary (within the maximum permitted occupancy stipulated on the permit face) and depend on resource conditions and actual use.

Allowable Use

The maximum forage utilization on key forage species would be 35 percent in riparian and wetland areas and 50 percent in uplands. A 4-inch stubble height minimum would be retained along the greenline of streams for all five pastures. Key forage species are primarily Idaho fescue (*Festuca idahoensis)* in the uplands and sedges (*Carex* species) and/or tufted hairgrass (*Deschampsia*) in riparian and meadow areas. Other key species may be identified as appropriate on a site specific basis. Allowable use and long-term monitoring would be conducted in four key areas.

Focus Area Prescription

The Tepee Creek focus area is located in the Lower Tepee Creek Pasture along Tepee Creek downstream of the bridge crossing Forest Road 620 (Figure 35). Under Alternative 4, the Forest Service would remove logs that were cabled into the Tepee Creek stream bank in the 1980s to promote riparian restoration, but that are currently contributing to stream bank instability and erosion. Logs and cables would be removed with a backhoe during low water flow. Tepee Creek would also be fenced from below the bridge on Forest Road 620 to the change in gradient in order to exclude the area from livestock grazing. A hardened crossing at a water gap in the fence would be constructed to allow cattle to cross the creek and provide access to drinking water. The Forest Service would supply materials and permittees would construct a three-strand wire fence with a top rail approximately 1.2 miles in length along Tepee Creek. The proposed structural improvements are also described in Structural Improvements section.

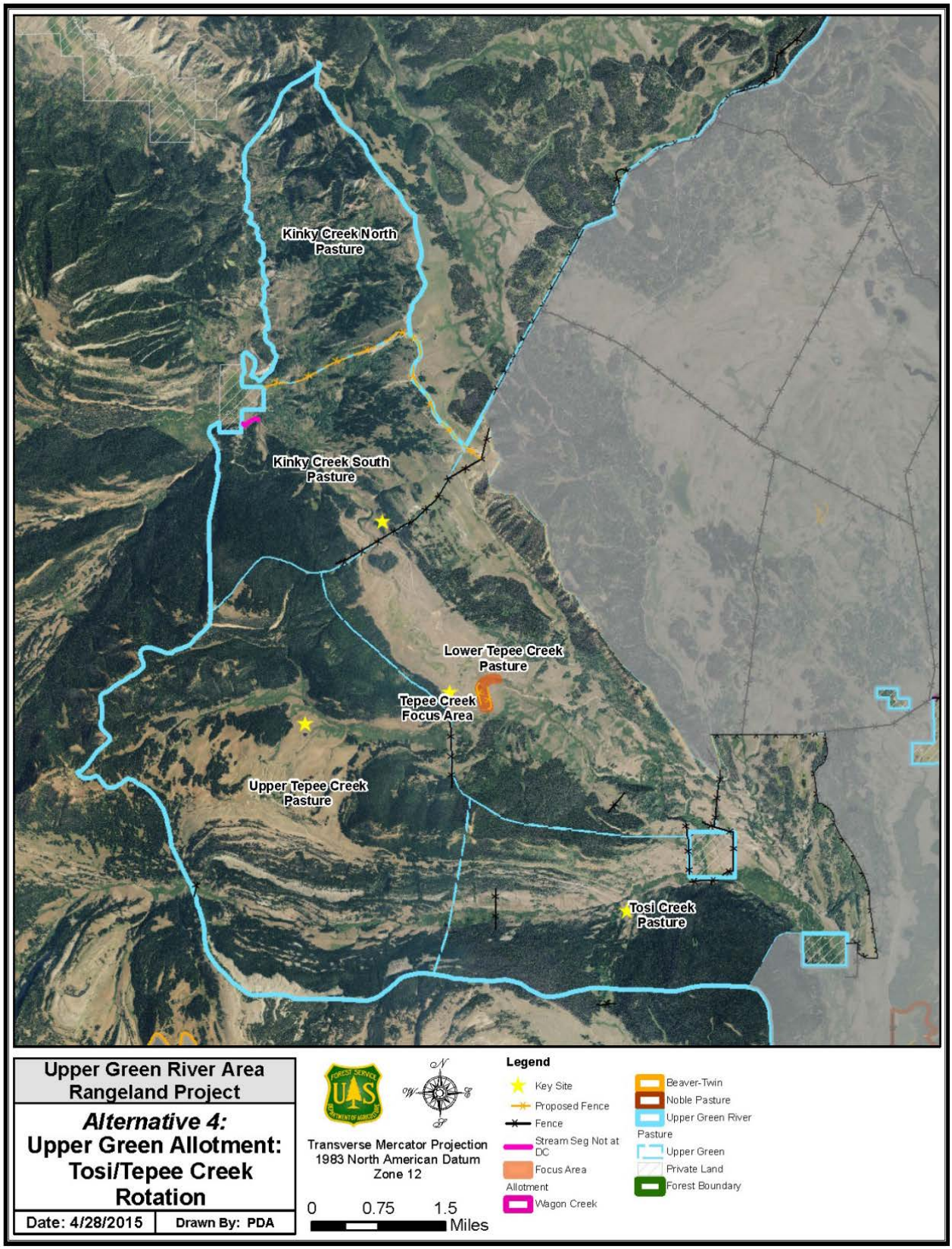

Figure 35. Tosi Crk/ Teepee Creek/Kinky Creek Rotation in the Upper Green River Allotment under Alternative 4

Structural Improvements

Existing Structural Improvements: Existing fences would be maintained as needed by the permittees. Figure 35 displays the location of existing fences and Table 4 describes the existing structural improvements in the allotment.

Proposed Structural Improvement: Proposed fences in the Kinky Creek Pasture would be constructed along ridgelines and/or tied into geographic features that restrict cattle movement in order to add the South Kinky Creek Pasture to the Tosi Creek/Tepee Creek rotation. Fences would be permanent fences, totaling approximately 3.6 miles in length. Table 17 describes the proposed fences in the Tosi Creek / Tepee Creek/Kinky Creek area. The Tepee Creek focus area exclosure is also described above in the Focus Area Prescription. The proposed fences are also described in Structural Improvements section.

Table 17. Proposed structural improvements in the Tosi Creek/Teepee Creek/ Kinky Creek rotation in the Upper Green River Allotment.

Description	Location	Type and Length
Kinky Creek Drift Fence	Township 40N Range 111W, Sections 13, 14, 22, and 23	fence ~ 1.8 mile
South Kinky Creek Allotment Boundary Fence	Section 24 Township 40N Range 111W, Section 13 Township 40N Range 111W, Section 25 Township 40N Range 111W	fence ~1.8 miles
Tepee Creek Focus Area Exclosure	Township 39N Range111W, Section1,Township 39N Range 110W Section 6	three-strand wire fence with top rail 1.2 miles

Gypsum Creek Rotation

Permitted Livestock Numbers, Season of Use and Management System

Gypsum Creek area is a 36,173-acre two pasture system located in the eastern portion of the project area. The two pastures are the Upper Gyp Pasture (20,391 acres) and Lower Gyp Pasture (15,782 acres). The area determined to be capable and suitable for livestock grazing is 9,852 acres or 27 percent of the pastures combined. Under Alternative 4, 1,985 cow/calf pairs or yearlings would continue to be authorized to graze in a deferred rotation grazing system from June 16th to October 15th (the permitted season of use) for a maximum of 10,480 animal unit months.

Pasture rotation schedule for the Gypsum Creek rotation in the Upper Green River Allotment under Alternative 4*

Pasture	Permitted Livestock Numbers	Year 1 Date Cattle Enter Unit	Year 1 Date Cattle Leave Unit	Year 2 Date Cattle Enter Unit	Year 2 Date Cattle Leave Unit
Upper Gyp	1,985	6/16	8/15	8/15	10/15
Lower Gyp	1,985	8/15	10/15	6/16	8/15

* Actual dates may vary (within the maximum permitted occupancy stipulated on the permit face) and depend on resource conditions and actual use.

Allowable Use

The maximum forage utilization on key forage species would be 35 percent in riparian and wetland areas and 50 percent in uplands. A 4-inch stubble height minimum retained along the greenline of streams with the exception of a 6-inch stubble height minimum along the South Gypsum Creek in the Lower Gypsum Pasture. Monitoring indicates that low stream bank stability on South Gypsum Creek is a result of sedimentation from

the 2007 Salt Lick Fire and a 6-inch stubble height would be implemented to reduce potential livestock impacts on riparian recovery. A 4- inch stubble height minimum along the South Gypsum Creek would be implemented when monitoring indicates stream bank stability objective is met for two consecutive monitoring cycles. Key forage species are primarily Idaho fescue (*Festuca idahoensis)* in the uplands and sedges (*Carex* species) and/or tufted hairgrass (*Deschampsia*) in riparian and meadow areas. Other key species may be identified as appropriate on a site specific basis. Allowable use and long-term monitoring would be conducted at two key areas (Figure 37).

The Upper Green River elk feedground, located in Upper Gypsum and the Mud Lake East Pastures, would be managed for wintering elk and to minimize livestock use of the area. No salting would be allowed in the feedground and livestock would not intentionally be placed in this area. Any stray cattle would be actively herded away from the feedground.

Focus Area Prescription

There are no focus areas in the Gypsum Creek rotation.

Structural Improvements

Existing Structural Improvements: Fences, stock bridges, and cabins would be maintained by the permittees and reconstruction would be the responsibility of the permittees and the Forest Service. Figure 36 displays the location of existing fences and Table 4 describes the existing structural improvements in the allotment. See Structural Improvements section for more information on structural improvements.

Proposed Structural Improvement: There are no proposed range structural improvements.

Monitoring

Monitoring would generally be conducted as described for Alternative 3 with one difference. Under Alternative 4, monitoring would be conducted in the Gypsum rotation, in addition to Noble Pastures Allotment, to determine if livestock numbers and season of use can be sustained based on allowable use triggers. If livestock are moved off the allotment/rotation early in four out of five years as determined by allowable use triggers, livestock numbers and season of use would be reduced.

The five years considered would be above-average, average or below-average years of forage production based on precipitation. Outlier years of forage production including drought years or unusually high moisture years would not be considered in the five years for purposes of firming up capacity. Outlier years are years that fall outside the 30 year average high or low for the SNOTEL site that comprised most of the watershed for the project area. The data source is found at: http://www.ncdc.noaa.gov/climate-information/climate-us. A five-year time period was selected because range sufficiency reviews are typically conducted at a minimum of five years following a range decision. A range sufficiency review is a review of project-level range decisions to determine if new information and/or changed circumstances might affect a range decision.

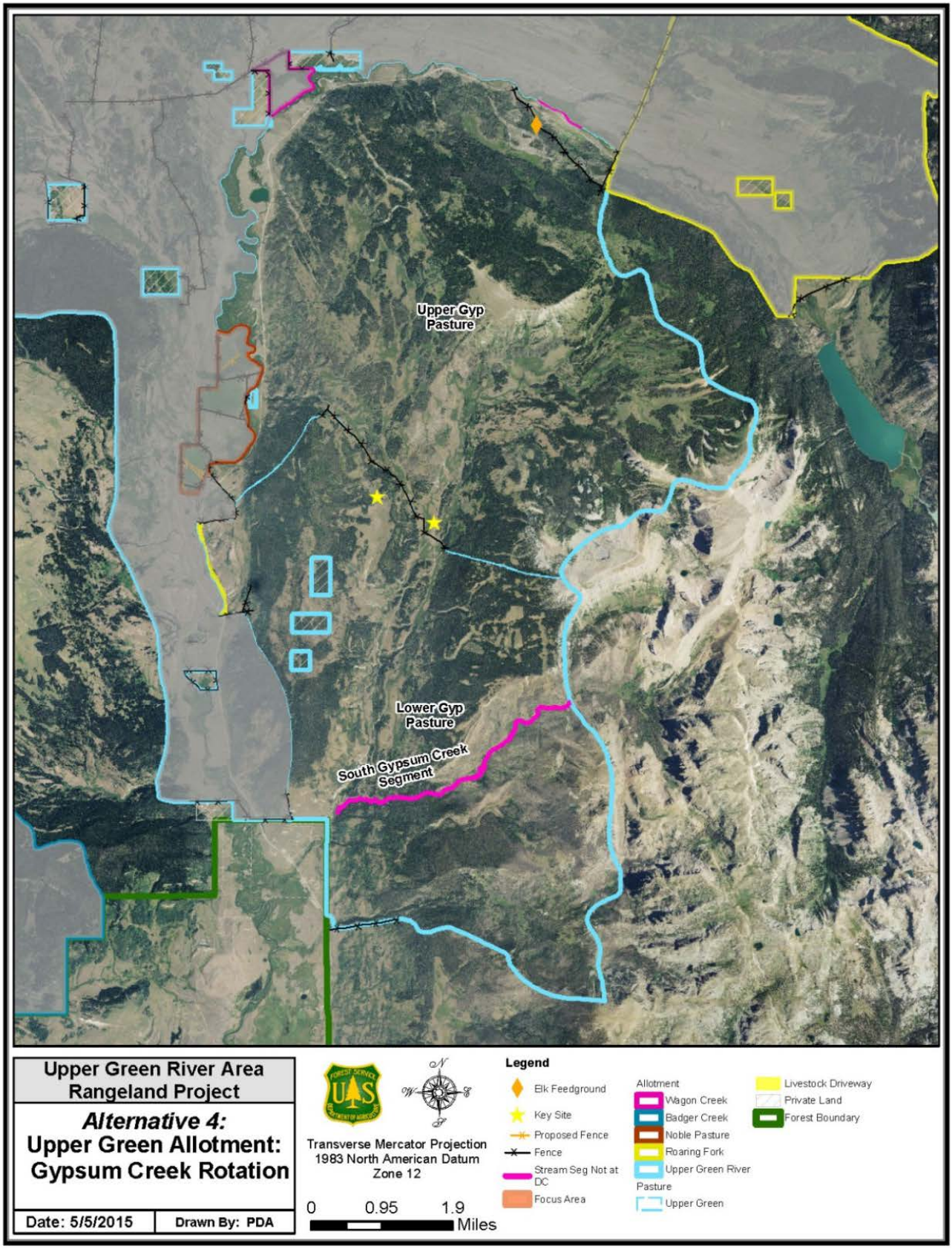

Figure 36. Gypsum Creek Rotation in the Upper Green River Allotment under Alternative 4

River Bottom Pasture and Livestock Driveway

Permitted Livestock Numbers, Season of Use and Management System

River Bottom Pasture and livestock driveway (also known as the Green River Drift Trail) are located within the south-central portion of the Upper Green River Allotment (Figure 26). The pasture and driveway are used jointly by livestock permitted to the Upper Green River, Wagon Creek, Roaring Fork, and Noble Pastures allotments to access the allotments in the spring and exit the Forest in the fall each year. The River Bottom Pasture is approximately 7,131 acres of which 4,973 (70 percent) is capable and suitable for livestock grazing. Under Alternative 4, 7,901 cow/calf pairs or yearlings and 20 horses would be authorized to use the livestock driveway and 5,746 cow/calf pairs or yearlings and 20 horses would be authorized to use the River Bottom Pasture from June 16th to October 15th (the permitted season of use). Fewer cattle use the River Bottom Pasture than the livestock driveway because cattle permitted for the Gypsum Creek rotation of the Upper Green River Allotment and the Roaring Fork Allotment do not travel through the River Bottom Pasture to exit the Forest.

The livestock driveway is located within the River Bottom Pasture and begins at the Forest southern boundary heading north primarily along the Forest Road 650 (Green River Lakes Road) as well as Forest Road 600 and 660 for approximately 12.5 miles to the bend in the Green River. The livestock driveway was enrolled on the National Register of Historic Places in 2013. It is generally considered to extend 200 feet on either side of the road; however, in some cases it is narrower when confined by fences or the Green River and adjacent riparian vegetation. The livestock driveway would be used primarily in the spring by the Wagon Creek Allotment, Roaring Fork Allotment, Noble Pastures Allotment and the Upper Green River Allotment permittees to herd their cattle into the allotments. Livestock primarily travel on the roadway and the area immediately adjacent to the roadway with limited grazing. Cattle would be confined to the roadway when they are actively herded through the Kendal Warm Springs exclosure.

The River Bottom Pasture would be used in the fall by cattle in the Wagon Creek Allotment, Noble Allotment and the Upper Green River Allotment except for livestock from the Gypsum Creek rotation. Livestock would be allowed to drift through the pasture heading south to the Forest boundary, where they would be gathered and moved off the Forest.

Allowable Use

Under Alternative 4, the maximum forage utilization on key forage species would be 35 percent in riparian and wetland areas and 50 percent in uplands. A 4-inch stubble height minimum would be retained along the greenline of streams. Key forage species are primarily Idaho fescue (*Festuca idahoensis)* in the uplands and sedges (*Carex* species) and/or tufted hairgrass (*Deschampsia*) in riparian and meadow areas. Other key species may be identified as appropriate on a site specific basis. Allowable use would be monitored at one key area (Figure 37). Allowable use in the livestock driveway would maintain a minimum of 60 percent ground cover to protect soils from erosion.

Spring cattle drives move livestock rapidly through the livestock driveway to the allotments and pastures; livestock primarily travel on the roadway and the area immediately adjacent to the roadway with limited time allowed for grazing. Cattle would be confined to the roadway when they are actively herded through the Kendal Warm Springs exclosure. In the fall, cattle would be allowed to drift out towards the southern Forest boundary and spend additional time grazing within the River Bottom Pasture and along the livestock driveway. If the allowable use limits were reached in any given year, livestock would be actively herded through the River Bottom

Pasture and/or livestock driveway and removed from the Forest, rather than allowed to slowly drift to the Forest boundary.

Focus Area Prescription

There are no focus areas in the River Bottom Pasture and livestock driveway.

Structural Improvements

Existing Structural Improvements: Existing fences, cattle guards and stock bridges would be maintained by the permittees and reconstruction would be the responsibility of the permittees and the Forest Service. Figure 37 displays the location of existing fences and Table 4 describes the existing structural improvements in the River Bottom Pasture and livestock driveway.

Proposed Structural Improvement: There are no proposed range structural improvements.

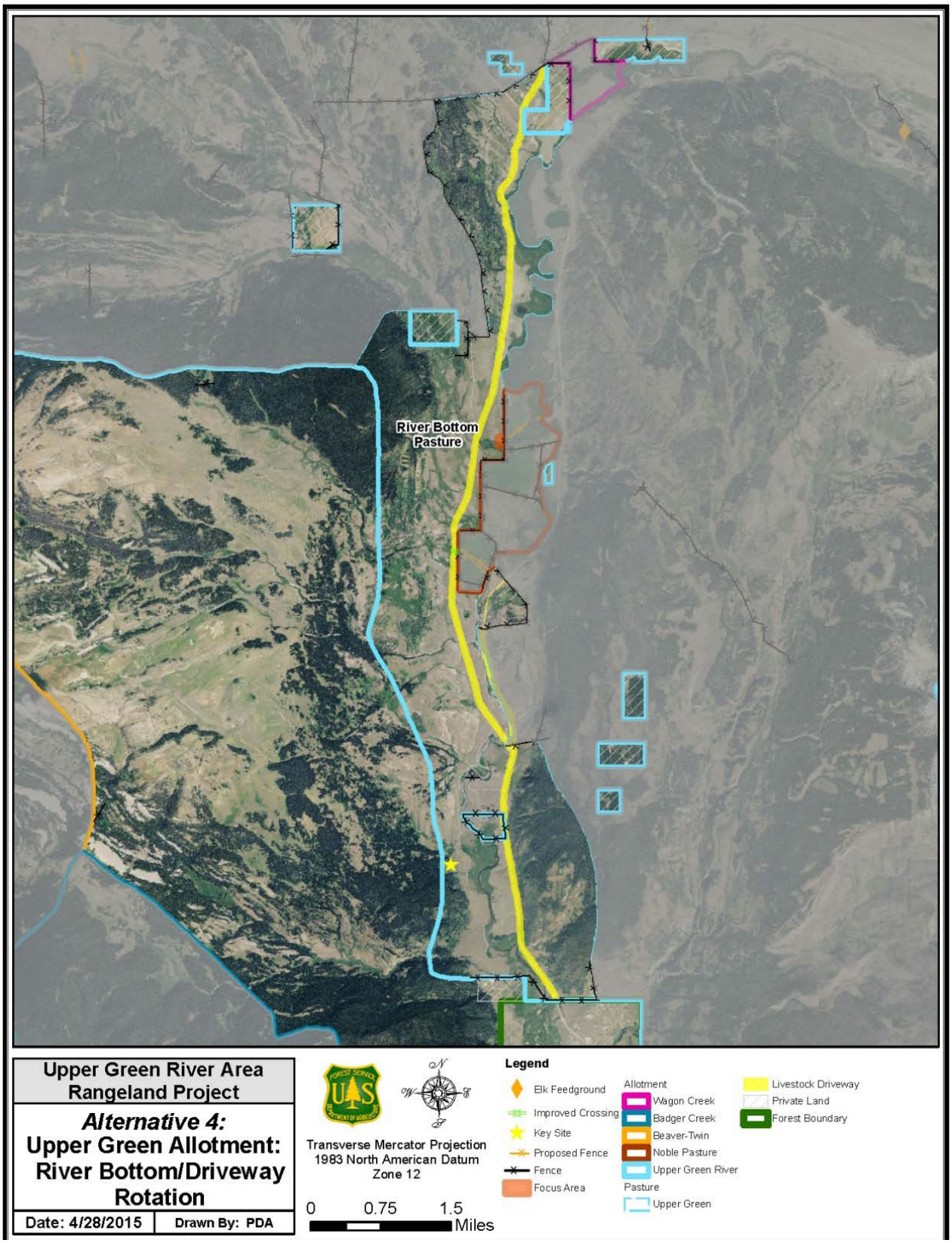

Figure 37. River Bottom Pasture and livestock driveway

Items Common to Action Alternatives (Alternatives 2, 3 and 4)

Design Features Common to the Action Alternatives

The Forest Service also developed the following measures to be used as part of the action alternatives to ensure compliance with various Forest Plan standards and guidelines.

Heritage Resources

- Heritage resource sites would continue to be inventoried and monitored. If monitoring indicates that sites are being directly affected, then procedures would be developed in conjunction with the Wyoming State Historic Preservation Office to protect those sites. Protective measures may include fencing the site area, placing barriers or woody debris over site areas to prevent livestock from impacting sensitive site areas, or data recovery. All proposed range improvements would be evaluated and cleared by a heritage resource specialist prior to implementation.

Wildlife and Fish Resources

- A Biological Assessment would be prepared for all threatened and endangered species and submitted to the U.S. Fish and Wildlife Service, as needed.
- The Grizzly Bear Conservation Measures and Terms and Conditions would be implemented as required by the U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service 2014) to minimize grizzly bear/livestock and grizzly bear/human safety concerns. The Terms and Conditions for grizzly bear management were established for nine allotments, including the six allotments in the Upper Green River project area.

<u>Grizzly Bear Conservation Measures</u>

1. The Forest Service would reinitiate consultation with the U.S. Fish and Wildlife Service (USFWS) in the event of significant changes to the grazing situation.
2. All livestock predation would be reported to USFWS, Bridger-Teton National Forest (BTNF), and Wyoming Game and Fish Department (WGFD).
3. Annual discussions between USFWS, BTNF, WGFD, Wildlife Services, and permittees would be conducted to discuss the conservation measures and notification protocol.
4. Livestock depredations will be investigated and managed by WGFD or its authorized agent following Interagency Nuisance Bear Guidelines (U.S. Fish and Wildlife Service et al. 1986, pp. 51-70).
5. Bear Sanitation Guidelines would be followed for all camps associated with livestock operations (Forest Food Storage Order 04-00-104, U.S. Forest Service 2004).
6. Herders and riders would be required to watch all livestock closely for sick, injured, or stray animals.
7. Forest Service employees designated by the Pinedale District Ranger will monitor allotments on a regular basis.
8. Conservation measure regarding sheep allotments is not included in this document.
9. This measure—removal of cattle carcasses—was removed per modifications provided in a letter (U.S. Forest Service 2014b).
10. On cattle allotments: 1) All carcasses located within ½ mile of Green River Lakes Road, Union Pass Rd, FS 605, 660, 663B and 663C, GRL and Whiskey Campgrounds, private cabins, Kendall and Fish Creek guard station, permitted cow camps, permitted outfitter camps, Waterdog Lakes, and North

Beaver and Tosi trailheads will be removed if possible or moved so that the carcass is at least ½ mile away from the above described facilities, trailheads or roads; 2) All carcasses in locations not described in 1 above that pose a health or safety hazard to the public or to the environment will be removed if possible or moved so that the carcass is at least ¼ mile from live streams, springs, lakes, riparian areas, system roads and trails, developed recreation areas, dispersed camping sites, and picnic sites; and 3) All sick or injured animals will be removed or treated. In the event that compliance with this measure is not physically possible, an exception may be granted per the discretion of the Pinedale District Ranger and/or his designated representative. In the event that rider safety is deemed an issue, an exception may be allowed as described in Conservation Measure #11.

11. Exceptions to requirements for removing or moving carcasses described in Conservation Measure #8 and #10 may be granted by the Pinedale District Ranger and/or his/her designated representative if human rider or herder safety is of concern. Rider or herder safety concerns include the possible presence of a grizzly bear in the immediate vicinity of carcasses, and carcasses being located in hazardous terrain such that attempting to move or remove may not be possible or unsafe. In such cases, a USFS employee or the WGFD bear specialist will be notified immediately of the hazard location and need for exception.
12. It is recommended that all permittees and their representatives (herders, riders, or other employees) carry bear spray while working within allotments; spray canisters should be holstered or otherwise carried so that they are available for use in the event of encounters with bears; storing spray canisters in back packs, saddle bags, and vehicles are acceptable methods of storage during non-working time periods. Only brands of Bear Spray certified by the Interagency Grizzly Bear Committee are acceptable.
13. Conservation measure regarding sheep night penning is not relevant to this document.
14. Continue to identify and implement opportunities that reduce the potential for grizzly bear conflicts.
15. Through the permitting process and at annual meetings, the USFS will make grazing permittees aware of their responsibilities under the Endangered Species Act (ESA) in regard to laws and regulations concerning the taking of grizzly bears (Interagency Grizzly Bear Guidelines).
16. Continue to work in cooperation with the Service, the Wyoming Game and Fish Department, and the Interagency Grizzly Bear Study Team to identify and collect information related to the habitat use, survival, reproduction, and depredation tendencies of grizzly bears inhabiting livestock grazing allotments on Northern Portions of the Pinedale Ranger District. With assistance of cooperators listed above, the Forest will continue to support trapping efforts to capture and radio collar bears in the Upper Green project area and initiate the data collection process described.
17. The Forest will initiate a re-assessment of the Grizzly Bear Habitat Security analysis initially completed in 2009 for the 2010 Amended BA. The analysis would be used to identify areas within the Upper Green Project Area that currently provide for less than desirable grizzly bear security values as defined in the Grizzly Bear Conservation Strategy. This analysis may identify the locations of “user created” motorized routes not authorized for motorized uses in the current Travel Management Plan for the Pinedale Ranger District that could be physically closed or reclaimed to improve grizzly bear security habitat within the Upper Green Project area.
18. The Forest will investigate and explore additional means of reducing grizzly bear-livestock conflicts, which will include assessments of: 1) changing classes of livestock (from cow/calf pairs to yearlings); 2) cattle herding; and, 3) the use of guard dogs. Where appropriate, and when permittees are willing participants, study sites may be developed within allotments to "test" new management actions.

Terms and Conditions:

19. If five or more grizzly bears are lethally removed, including three or more females, related to grazing activities on the nine allotments in any given year, the Forest will contact the Service to discuss the adequacy of existing mechanisms to minimize additional take. Similarly, the Forest will contact the Service if and when the amount of incidental take or relocations is reached.
20. In conjunction with the Forest's Conservation Measures #3 and #7 (annual meetings and monitoring allotments on a regular basis, respectively), the Forest will, at their annual meeting or no later than the date livestock are turned out for the season, define what their "regular" monitoring schedule will be for the upcoming grazing season (e.g., once per week and additionally as needed to respond to situations). The Forest has improved its recent monitoring efforts; however, the Service believes additional documentation explaining how and when this monitoring will be conducted is necessary to adequately achieve this Term and Condition.
21. This term regarding sheep night penning is not included in this document.
22. The Forest will, in coordination with the Service, annually (or more often as necessary) review the effectiveness of the Forest's Conservation Measures and other management efforts outlined in the 2014 Biological Assessment as they apply to all allotments and describe the progress of the proposed action, including impacts to the grizzly bear (50 CFR 402.T4(l)(3)). This review shall consider adverse effects resulting from Project activities, including grizzly bear and grazing conflicts and resolutions for these nine allotments within the Forest, and will be in writing.

Conservation Recommendation:

CR1: The Forest will continue to educate livestock grazing permittees and their employees about their responsibilities relating to conservation of grizzly bears, the potential occurrence of grizzly bears on grazing allotments, the risks of working in bear country, the protected status of the grizzly bear, the need for heightened awareness of bears, appropriate personal safety measures, and proper behavior in bear country.

Livestock Distribution, Range Improvements, and Best Management Practices

- Range readiness: Livestock would not be allowed to enter the allotment prior to range readiness. The determination of range readiness is dependent on precipitation and temperature and their effects on vegetation production. Range readiness takes into account whether key plant species have had sufficient growth and development to adequately provide for their vigor and whether soils are dry enough to prevent substantial damage from hoof compaction.
- Within the maximum occupancy authorized by the permit, allowable use standards (e.g. forage utilization, stubble height and/or stream bank alteration standards) and resource conditions determine the dates of actual livestock use. The permittee must be aware of the actual use levels relative to allowable use standards. If the allowable use is reached on key areas prior to the scheduled off-date, permittees are required to remove their livestock from the allotment earlier than scheduled. If actual use on the key areas is less than the allowable use standards by the scheduled off date, and within the maximum occupancy authorized by the permit, permittees may request approval to remain on a particular pasture for an additional period of time.
- A shift of up to one week to the permitted season of use could be authorized by the District Ranger on an infrequent basis (approximately two years out of ten) for any given year. This shift of the permitted season of use would provide flexibility in livestock management, adjusting for annual variations in precipitation, plant phenology, and forage production. This in effect would slide the season of use a maximum of one week prior to or one week following the permitted season of use displayed in Table 3 for Alternative 2, Table 5 for Alternative 3, and Table 12 for Alternative 4. The

season of use would remain the same number of days. For example, under certain circumstances and with District Ranger approval, permittees would be allowed to graze livestock one week earlier than the permitted season of use, in which case livestock would be removed from the allotment one week earlier than the permitted season of use. Or under certain circumstances and with District Ranger approval, permittees would be allowed to delay bringing livestock onto the allotment by one week in which case their departure could be one week later than the permitted season of use. The purpose of this adjustment is to reflect annual variation of the growing season.

Under Alternative 2, the one week shift could apply to all six allotments (Badger, Beaver-Twin, Noble Pastures, Roaring Fork, Wagon Creek and Upper Green River allotments) with the District Rangers approval.

Under Alternative 3 and 4, the one week shift prior to the season of use could apply to the Badger, Beaver-Twin, Noble Pastures and Roaring Fork allotments as well as the Gypsum Creek rotation of the Upper Green River Allotment, but would not be an option for the Wagon Creek Allotment and the Mud Lake/Fish Creek, Mosquito Lake, and the Tosi Creek/Tepee Creek/Kinky Creek rotations of the Upper Green River Allotment in order to enhance Greater Sage-grouse nesting/ early brood rearing habitat. No shift prior to the season of use would be allowed in the Badger Allotment in one of four years when the season of use is delayed until July 15th to October 14th to allow for seed set. The one week shift maximum following the season of use could apply to all six allotments. Any shift in the season of use is subject to the District Ranger's approval.

- Cooperative work with permittees to improve livestock distribution through herding and proper salt placement would continue as identified in allotment management plans, grazing permits, and annual operating instructions. Salt would be placed a minimum distance of 200 yards from system trails and ¼ mile from streams.
- Approximately 76 miles of existing fence, cattle guards and water developments would continue to be maintained or reconstructed as needed by the permittees unless otherwise noted as a Forest Service responsibility.
- Fences and cattle guards would continue to be maintained to exclude cattle from the Green River Lakes Campground, Whisky Grove Campground, Kendall Guard Station, and Fish Creek Guard Station.
- Cattle would continue to be actively herded away from the Green River Forest boundary, Kendall Bridge, Dollar Lake and Roaring Fork Trail (#7146) to minimize potential conflicts with Forest recreationists and visitors. Salting would not be allowed in these areas.
- The enclosure fence at Kendall Warm Springs would be maintained to limit livestock impacts on the Kendall Warm Springs dace.
- Cooperative work with Wyoming Game and Fish Department (WGFD) would continue in order to address such issues as meeting herd objectives for various species, monitoring forage availability, and maintaining migration routes.
- No salting would be allowed in the elk feedground and livestock would not be intentionally placed at the feedground. Any stray cattle would be actively herded away.
- Herders typically operate from horseback to move cattle from pasture to pasture and will operate from horseback and from vehicles (trucks, ATVs) to herd cattle along the livestock driveway. Herders and permittees use trucks and all-terrain vehicles on roads to access areas, but typically do not use vehicles to herd cattle from pasture to pasture. Trucks and ATVs are used on roads that are closed to the public and off-road to maintain and reconstruct fences and other structural improvements.

- Implement all range improvements associated with riparian or wetland areas outside of the amphibian breeding season and trumpeter swan nesting seasons, when they are present, to minimize disturbance to these species.
- Any new or reconstructed fences would employ wildlife friendly fencing design appropriate to the location.
- Where applicable, implement Wyoming Grazing Best Management Practices: Practice #1A: Proper Grazing-Domestic Animals, #1E: Proper Grazing-Riparian and Wetland Areas, #2: Fencing, #3 Livestock Herding, #4: Access Roads, #5: Water Development – Instream and Offstream, #6A: Land Treatment – Biological, and #7: Weed and Pest Management (Wyoming Department of Environmental Quality 1997).
- Livestock grazing would not be allowed on areas that contain less than 60 percent ground cover, such as an area immediately following a wildfire.
- Only certified weed-free hay is allowed on the Bridger-Teton National Forest. Permittees would be expected to comply with this special order.

Monitoring

Monitoring would take place to insure that the selected alternative is implemented as described and to evaluate whether the livestock grazing prescriptions and adaptive management are effective in achieving, or establishing an adequate trend toward achieving the desired conditions described in this DEIS (Appendix C).

Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by National Environmental Policy Act (NEPA) to explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the proposed action provided suggestions for alternative methods for achieving the purpose and need. Some of these alternatives were similar to alternatives considered in detail or were outside the scope of reasonable livestock management.

Most livestock grazing on the Bridger-Teton National Forest and more specifically the Upper Green River project area has occurred in areas presently grazed for over a hundred years. During that time numerous grazing practices have been implemented along with accompanying range improvements. Stocking rates and seasons of use have been adjusted; the timing, intensity, frequency, and duration of grazing have been continually fine-tuned over time. More recently, further adjustments have been made on many allotments to provide for the needs of species federally listed under the Endangered Species Act of 1973 (16 USC 1531 et seq.), protection of clean water, and protection of archeological structures and artifacts. This dynamic evolution of management on the six allotments in the Upper Green River project area results in the ability to narrow the range of alternatives that must be analyzed in detail. Three alternatives were considered, but dismissed from detailed consideration for reasons summarized below.

Allotment Management Plan Alternative

An alternative considered but not analyzed in detail was an alternative proposing livestock management requirements specified solely by allotment management plans and not requirements found in the annual operating instructions or updated term grazing permits. The range analysis handbook (Forest Service Handbook 2209.13 Chapter 90, section 92.31) directs that current management should be analyzed in detail as an alternative to the proposed action if current management meets the stated purpose and need for action. Current management is defined as livestock management actions over the last three to five years with the

direction contained in the allotment management plan, annual operating instructions, requirements associated with conserving threatened and endangered and sensitive species, or a combination thereof.

The Allotment Management Plan Alternative was not analyzed in detail for several reasons. First, four of six allotments lack an allotment management plan and the allotment management plans for the remaining two allotments have not been updated. The annual operating instructions and term grazing permits best define current management for all six allotments in the project area and these were used to develop Alternative 2 (Grazing as Currently Permitted and Current Management). Second, the Allotment Management Plan Alternative would require analysis of an alternative that had little chance of being chosen by the decision maker because it does not meet Forest Plan direction and the requirements associated with conserving threatened and endangered species. For example, the current allotment management plans lack provisions for protection of grizzly bears as required in the Grizzly Bear Conservation Measures and Terms and Conditions required by the U.S. Fish and Wildlife Service (2014) and specified in the term grazing permits.

Adaptive Management by Monitored Ecological Objectives Alternative

The second alternative considered but eliminated from detail study was the Adaptive Management by Monitored Ecological Objectives Alternative submitted by the permittees. The permittee alternative provided a general process that proposes to: 1) establish a technical team to establish goals for each allotment/rotation, 2) establish vegetative objectives by pasture, 3) identify and discuss current management, 4) identify a suite of management tools impacting movement toward objectives which can be used in the adaptive management process, and 5) monitor and use adaptive management to adjust livestock management as necessary.

This alternative was not analyzed in detail because 1) it proposes to restart the planning process by revisiting goals and objectives, 2) is similar to Alternative 2 (Grazing as Currently Permitted and Current Management) even in terms of adaptive management, which as proposed, is non-specific and can be implemented through permit administration and proposed monitoring in Alternative 2, and 3) is too vague and does not propose any specific changes in livestock management at this time, and therefore does not warrant detailed analysis as a separate alternative.

The Adaptive Management by Monitored Ecological Objectives Alternative outlines a similar planning process as that used for this project in which vegetative objectives (referred to as resource objectives) were established for the project area by a Forest Service interdisciplinary team using direction from the Forest Plan (U.S. Forest Service 1990), Forest Service regulation and policy, applicable laws, and best science. Existing conditions achieved under current management were compared to desired conditions as measured by resource objectives (outlined in Chapter 1 Gap between Desired and Existing Conditions). The need for the project is in part to address areas of concern (i.e. gap between desired and existing conditions) by changing current management. The permittees and the Sublette County Conservation District were updated and consulted during this project planning and NEPA process.

Adaptive management as proposed by the permittees is equivalent to adjustments made to livestock management authorized under Forest Service permit administration. Permit administration is a component of all action (grazing) alternatives. Therefore, the process used for this planning effort and the description of Alternative 2: Grazing as Permitted and Current Management follows closely to items 1 through 4 as proposed under the Adaptive Management by Monitored Ecological Objectives Alternative.

The primary difference in approach to the planning and NEPA process, however, is that the permittees recommend that specific livestock management strategies, such as those described in the Alternative 3-Modified Grazing Alternative (Modified Proposed Action) and Alternative 4- Modified Grazing Alternative with Riparian Emphasis, not be identified and analyzed in this NEPA document because they are too definitive and limit management options. Instead their proposed alternative would make available a suite of

livestock management tools which would be selected from when developing the allotment management plans subsequent to this environmental analysis and NEPA document. The Adaptive Management by Monitored Ecological Objectives Alternative does not provide sufficient detail to analyze the effects of implementing the alternative because project goals and objectives are unidentified and may change from those stated in Chapter 1 and adaptive management is unspecified. Under the current planning process, areas of concern (Table 1) were identified based on the differences between existing and desired conditions defined by resource objectives. The Adaptive Management by Monitored Ecological Objectives Alternative proposes to reevaluate objectives and therefore, reevaluate the areas of concern and use adaptive management, defined only as a suite of management tools, to address any necessary changes in livestock management.

This violates the Forest Service regulation requiring that the effects of an adaptive management proposal be disclosed and analyzed in the NEPA document because the adaptive management proposed under this alternative is undefined and non-specific. 36 CFR 220.5(e)(2) directs that an adaptive management proposal or alternative must clearly identify adjustment(s) that may be made when monitoring during the project implementation indicates that the action is not having its intended effect, or is causing unintended and undesirable effects. The EIS must disclose not only the effect of the proposed action or alternative but also the effect of the adjustment. Such proposal or alternative must also describe the monitoring that would take place to inform the Responsible Official during implementation whether the action is having its intended effect.

Second, this alternative is similar to and represented by Alternative 2 (Grazing as Permitted and Current Management) because livestock management can be adjusted under permit administration which is essentially the adaptive management as proposed in the Adaptive Management by Monitored Ecological Objectives Alternative. No specific livestock management actions or design features are proposed for areas of concern. Both alternatives allow changes within the sideboards of the Alternative 2-Grazing as Currently Permitted and both would require additional NEPA analysis in order to implement any new structural improvements. No specific livestock management actions or design features are proposed under this adaptive management approach. This alternative does not provide enough detail to analyze differently from Alternative 2: Grazing as Currently Permitted and Current Management.

Finally, the Adaptive Management by Monitored Ecological Objectives Alternative postpones determination of specific livestock management actions to the allotment management planning phase and does not provide a comprehensive disclosure of the proposed management actions and the environmental impacts of the actions to the public. Therefore, this alternative was considered but eliminated from detailed study.

Bear-Friendly Alternative

Another alternative considered but eliminated from detail study was a Bear-Friendly Alternative designed to implement design features that were proposed and considered over the course of 2013 and 2014 Section 7 Consultation with the U.S. Fish and Wildlife Service. The Forest Service has considered requiring permittees to graze yearlings and/or mature cattle only and not permit calves. An option to graze yearlings solely or in combination with cow/calf pairs would be authorized under Alternative 2, 3 and 4, but was not developed as an alternative for several reasons. First, the assumption that yearlings are less susceptible to predation by bears may not be entirely accurate. During 2012 and 2013 grazing seasons in the Upper Green project area, 32 percent of all known grizzly bear-caused cattle mortalities involved yearlings or adult cattle (Turnbull, Wyoming Game and Fish Department, personal communications). While depredating bears may often select younger cattle, they also can and will kill older age classes of livestock (Anderson et al. 2002). A change to yearlings may not appreciably reduce grizzly bear-livestock conflicts and the resulting bear mortalities. Rather grizzly bears could switch from preying on calves to preying on yearlings.

Second, whole ranch operations which are currently built on cow-calf operations would need to change to accommodate yearlings. This conversion in ranch operation would be economically costly with questionable reductions in grizzly bear-livestock conflicts and associated bear mortality. In addition, yearlings are more difficult to manage because they are unfamiliar with the allotment and trailing route, prone to evading herders, breach fences, are naïve about poisonous plants, and are inherently more curious and adventurous compared with calves. Calves learn trailing routes, grazing locations, and how to avoid poisonous plants and dangerous situations from their mothers. Yearlings typically use steeper terrain and better use entire pastures compared with cow-calf pairs. Thus the duration of livestock use can be extended with yearling operations because it typically takes longer to reach the allowable use level which triggers a move to the next pasture. However, yearlings may require more fencing because they travel more widely. Therefore, the likelihood of reducing livestock depredation by switching to yearlings is uncertain, but the economic and livestock management costs to the permittee would be substantial.

The Forest Service considered the use of guardian dogs to protect livestock and reduce grizzly bear-livestock conflicts. Guardian dogs are considered more effective in guarding sheep than cattle, because sheep are herded through allotments in relatively congregated bands and are penned at night when grizzly bear conflict is anticipated. Cattle are typically dispersed and unpenned. In addition, guardian dogs are aggressive and can pose a threat to recreationists and their dogs. The Upper Green River project area receives high public visitation during the summer especially along the Upper Green River corridor and Forest Service roads 600 and 650. This road, including 200 feet from the centerline, also serves as the livestock driveway where livestock enter the Upper Green River, Wagon Creek, Roaring Fork, and Noble Pastures allotments in the spring and exit the Forest in the fall each year. Therefore, the Forest Service concluded that the potential safety threat of guardian dogs for recreationists and their pets in this high use area outweighed the potential benefit of guardian dogs to reduce grizzly bear-cattle conflicts. Thus, an alternative implementing use of guardian dogs to reduce grizzly bear-cattle conflicts was considered but eliminated from detail study.

The Forest Service considered a design feature implementing close herding of livestock. Herders would keep a small band of cattle together as a tight unit in an effort to train the cattle to stay together. The assumption is that there is safety in numbers and in presence of humans. The concern with this approach is that grizzly bear attacks often occur at night or early morning. Close herding poses a safety concern to herders because of their reduced visibility in the dark and increased grizzly bear activity at this time. In addition, close herding can concentrate livestock effects on the land. This approach is experimental and is currently being tested in the Shoshone National Forest, Wyoming, where results are pending. Close herding will be reevaluated as a design feature when conclusions from this ongoing research can be drawn and applied to livestock management.

The Forest Service considered a design feature that required removal of cattle carcasses within 48 hours after the carcass is discovered and/or investigated by the Wyoming Game and Fish Department bear biologist. “Blasting” of carcasses with explosives by a certified blaster would be an optional means of carcass disposal. In theory this design feature might be effective if all carcasses could be discovered and removed in a timely manner and prior to extensive feeding by a depredating bear, or discovery by a scavenging, non-predatory grizzly bear. In practice, however, removal of all or most carcasses is very unlikely. Not all carcasses are discovered by permittees and few are discovered in a timely manner because the project area is large (170,643 acres), access is often difficult, and grizzly bears are efficient at locating carcasses. Thus, this measure is under consideration as a recommendation only.

The Forest Service considered these and additional design features but did not analyze a Bear-Friendly Alternative in detail because the effectiveness of the above design features was too uncertain. However, development of new grizzly bear-friendly conservation measures remains an ongoing process with the U.S. Fish and Wildlife Service, in cooperation with the livestock permittees in the project areas. The current U.S.

Fish and Wildlife Service's Grizzly Bear Conservation Measures and Terms and Conditions will be applied as part of all the grazing alternatives, if any are selected. New conservation measures may be added to the annual operating plans of permittees, as part of the Section 7 process. Therefore, the Bear-Friendly Alternative was considered but eliminated from detailed analysis.

Comparison of Alternatives

Table 18. Differences in livestock grazing management among action alternatives

Livestock management	Alternative 2- Current Management (Actual Use)	Alternative 2- Grazing as Currently Permitted	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
Allowable use in **riparian** and **meadows** areas that are meeting resource objectives	**30%** forage utilization in Badger, Beaver-Twin, Roaring Fork, and Upper Green allotments **50%** forage utilization in Noble and Wagon Creek allotments	**65%** maximum forage utilization in Noble, Roaring Fork (north of river), Wagon Creek and Upper Green allotments **55%** maximum forage utilization of key forage species in Badger, Beaver-Twin, and Roaring Fork (south of river) allotments	**50%** maximum forage utilization of key forage species for all six allotments **4-inch** stubble height minimum retained along greenline for all allotments	**35%** maximum forage utilization in Badger, Beaver-Twin, and Noble allotments and certain pastures in the Upper Green allotment **50%** maximum forage utilization in Wagon Creek allotment and certain pastures of the Upper Green allotment **4-inch** stubble height minimum retained along greenline for all allotments
Allowable use in **uplands** that are meeting resource objectives	**30%** forage utilization in four allotments **50%** forage utilization in two allotments	**60%** maximum forage utilization in Noble, Roaring Fork (north of river), Wagon Creek and Upper Green allotments **50%** maximum forage utilization in Badger, Beaver-Twin, and Roaring Fork (south of river) allotments	**50%** maximum forage utilization of key forage species in all allotments	**50%** maximum forage utilization of key forage species in all allotments
Number of livestock across the six allotments	6,192 (average number of livestock excluding non-use years)	9,089 (permitted)	8,819 (permitted)	8,819 (permitted)
Prescription in pastures, allotments, and areas of concern, including focus areas, that do not meet resource objectives and desired conditions	Stubble height retained along greenline for Tepee Creek focus area, Mosquito Lake, South Gypsum Creek, and electric fence on Wagon Creek focus area.	No prescription specified in FEIS, use of administrative action to implement changes to livestock management as necessary	Specific prescriptions tailored to meet or move range and riparian conditions towards objectives. Includes adjustments to: management system, number of livestock, allowable use, structural	Specific prescriptions tailored to meet or move range and riparian conditions towards objectives. Includes adjustments to: management system, number of livestock, allowable use, structural

Livestock management	Alternative 2- Current Management (Actual Use)	Alternative 2- Grazing as Currently Permitted	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
	Waterdog Lake focus area has prescription such that the focus area meets desired conditions. Other areas of concern not addressed.	subsequent to the Record of Decision. Exception: Waterdog Lake focus area has prescription such that the focus area meets desired conditions.	improvements and focus area prescriptions. Adaptive management used to address future areas not meeting or moving towards desired conditions (same as Alternative 4).	improvements and focus area prescriptions. Adaptive management used to address future areas not meeting or moving towards desired conditions (same as Alternative 3)
Structural improvements	Maintain existing fences, cattle guards, water developments. No proposed structural improvements.	Maintain existing fences, cattle guards, water developments. No proposed structural improvements.	Maintain existing fences, cattle guards, water developments. Construct 6.0 miles of permanent fence and 1.2miles of electric fence. Install culvert in Noble Pasture 3. Construct hardened water crossing and gate at Wagon Creek focus area.	Maintain existing fences, cattle guards, water developments. Construct 6.0 miles of permanent fence and 1.2miles of electric fence. Install culvert in Noble Pasture 3. Construct hardened water crossing and gate at Wagon Creek focus area.
Management system	Season-long grazing, deferred rotation, and rest rotation	Season-long grazing, deferred rotation, and rest rotation	Deferred grazing, deferred rotation, rest rotation, and variable entry date depending on allotment.	Deferred grazing, deferred rotation, rest rotation, and variable entry date depending on allotment.

Table 19. Summary of effects on resources by alternative.

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
Rangeland Vegetation					
Ground Cover	Sites not meeting desired conditions would remain stable or improve.	Sites not meeting desired conditions would remain stable or decline.	Some sites do not meet desired condition for ground cover.	Sites not meeting desired conditions would remain stable or improve at a slower rate than Alt. 1.	Same as Alternative 3.
Species Composition	Sites not meeting desired conditions would remain stable or improve.	Sites not meeting desired conditions would remain stable or decline.	Some sites do not meet desired condition for species composition.	Sites not meeting desired conditions would remain stable or improve at a slower rate than Alt. 1.	Same as Alternative 3.
Soils					
Percent Detrimental Disturbance	Percent Detrimental Disturbance (DD) would remain the same for the 2 year transition period. After that, DD would decrease gradually over a 10 to 20 year period to zero.	Percent DD would remain the same in all pastures.	Some sites exceed recommended DD thresholds.	Percent DD would decrease slightly overall across the project area. In some pastures percent DD would decrease substantially over time due to proposed fencing.	Same as Alternative 3
Compaction	Dissipates over time as grazing is phased out.	May increase on compaction prone soils at maximum utilization levels.	Some compacted areas exist.	Decreases overall compaction.	Decreases overall compaction, especially in riparian and meadow areas.
Erosion	Erosion decreases overtime as grazing is phased out.	May increase on soils prone to erosion at maximum utilization levels.	Some areas with bare soil are subject to erosion.	Decreases overall erosion.	Decreases overall erosion the most of the action alternatives
Soil Quality	Improves over time as grazing is phased out.	Declines over time at maximum utilization levels.	Soil quality is impaired in some areas.	Improves over time.	Improves over time the most for action alternatives.

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
Riparian Areas					
Stream Bank Stability and Water Quality	Current conditions would be maintained or would improve along all streams and riparian areas where livestock grazing is the primary source of direct and indirect impacts to these resources. Stream bank alteration would decrease on all stream reaches with the removal of livestock. Bank stability would increase over time. Water quality would improve at the Lower Tosi Creek, Raspberry Creek, Strawberry Creek, South Fork Fish Creek, Wagon Creek, and Tepee Creek over time via improved riparian and stream channel conditions.	Tosi Creek, South Fork Fish Creek, Klondike Creek, South Gypsum Creek, Strawberry Creek, Tepee Creek, and Wagon Creek stability ratings would likely remain below the 75-85% stability objective for their respective stream types. Tosi Creek, South Fork Fish Creek, Strawberry Creek, Raspberry Creek, Tepee Creek, Wagon Creek, Klondike Creek, and South Gypsum Creek would likely continue to not meet water quality standards. 65 % forage utilization in riparian areas would result in greater bank alteration and loss of ground cover which would result in lower bank stability.	Water quality standards and stream bank stability objectives are not met in some stream reaches.	The livestock grazing of riparian standard would be met. Over time, conditions would move towards meeting the stability guideline and water quality standard at Tosi Creek, Raspberry Creek, Fish Creek, Tepee Creek, Klondike Creek, Strawberry Creek, and Wagon Creek as stream channels and riparian areas improve in condition. In some areas this would occur at a slower rate than under Alt. 4. Fencing along Tepee and Klondike Creeks would enhance stream bank stability recovery compared with current management.	The livestock grazing of riparian standard would be met. Over time, conditions would move towards meeting the stability guideline and water quality standard at Tosi Creek, Raspberry Creek, Fish Creek, Tepee Creek, Klondike Creek, Strawberry Creek, and Wagon Creek as stream channels and riparian areas improve in condition. In some areas this would occur at a faster rate than under Alt. 3. Fencing along Tepee and Klondike Creeks would enhance stream bank stability recovery compared with current management at the fastest rate of action alternatives.
Riparian Function	Improves general riparian conditions, quickest recovery of focus areas.	Reduces general riparian conditions under maximum utilization levels; focus areas would remain below desired conditions.	Except for some focus areas, most riparian areas are currently functioning at desired conditions.	Maintain or improve areas currently functioning; improvement to focus areas; possible increase in riparian forage utilization.	Maintain or improve areas currently functioning; improvement to focus areas. Riparian forage utilization would remain similar to utilization under current management. Generally fewer impacts to stream and riparian conditions than under Alternatives 2 and 3.

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
Fisheries					
Fine Sediment	Reduces fine sediment delivery to streams.	Increases fine sediment delivery to streams.	Erosion related to grazing use is contributing some fine sediment to streams.	Slightly reduces fine sediment delivery; elevated delivery relative to natural levels.	Moderately reduces fine sediment delivery; fine sediment above natural levels.
Stream Temperature	Increases shade and improves channel form, which would improve buffering from temperature fluctuation	Reduces shade and channel complexity, which would result in increased summer stream temperatures	Some sites exhibit summer peak stream temperatures above desirable levels for trout streams due to reduced shade and reduced channel complexity.	Maintains current conditions	Maintains or modestly improves current conditions
Kendall Warm Spring dace (endangered)	*Not likely to adversely affect individuals or habitat. Some minor disturbance from grazing may benefit the species and its habitat.*	*Not likely to adversely affect individuals or habitat. Livestock would be excluded from grazing within the exclosure the species is found. Some minor disturbance from grazing may benefit the species and its habitat.*	*Not likely to adversely affect individuals or habitat. Livestock would be excluded from grazing within the exclosure the species is found. Some minor disturbance from grazing may benefit the species and its habitat.*	*Not likely to adversely affect individuals or habitat. Livestock would be excluded from grazing within the exclosure the species is found. Some minor disturbance from grazing may benefit the species and its habitat.*	*Not likely to adversely affect individuals or habitat. Livestock would be excluded from grazing within the exclosure the species is found. Some minor disturbance from grazing may benefit the species and its habitat.*
Colorado River cutthroat trout (sensitive and MIS species)	*No impact*: Improves habitats, but populations continue to decline.	*Will impact individuals or habitat with a consequence that the action may contribute to a trend towards federal listing or cause a loss of viability to the population or species.* Degrades habitats and increases declines in populations.	*May impact individuals or habitat but will not likely contribute to a trend towards federal listing or loss of viability to the population or species. Maintains or improves habitats, but populations continue to decline.*	*May impact individuals or habitat but will not likely contribute to a trend towards federal listing or loss of viability to the population or species*. Maintains or improves habitats, but populations continue to decline.	*May impact individuals or habitat but will not likely contribute to a trend towards federal listing or loss of viability to the population or species. Maintains or improves habitats, but populations continue to decline.*
Wildlife					
Grizzly bear (threatened and MIS species)	*May affect, not likely to adversely affect individual* grizzly bears. The elimination of livestock-related	*May affect, likely to adversely affect individual grizzly bears.* Some incidental take is authorized	Same as Alternative 2 Grazing as Currently Permitted.	Same as Alternative 2 Grazing as Currently Permitted.	Same as Alternative 2 Grazing as Currently Permitted.

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
	management removals and relocations of grizzly bears from the project area contribute positively to the existing growth or stability of the grizzly bear population in Western Wyoming and the Yellowstone Ecosystem. Less (cattle) carrion would be available.	by the USFWS in the current Biological Opinion. Allows for the continued recovery of the species, provides for a grizzly bear population that meets its demographic recovery criteria, and maintains population growth or stability.			
Gray wolf (experimental, non-essential)	*Not likely to jeopardize continued existence.* Supports recovery of the wolves by eliminating mortalities associated with livestock depredation in the project area. Would also provide beneficial, habitat-related effects on wolf prey by sustaining favorable range conditions.	*Not likely to jeopardize continued existence.* Wolf mortalities that result from livestock depredations would not affect the long-term persistence of wolves in the project area and would not impede the continued recovery of the wolf population in the Northern Rocky Mountain region.	Same as Alternative 2 *Grazing as Currently Permitted.*	*Not likely to jeopardize continued existence. Wolf mortalities that result from livestock depredations would not affect the long-term persistence of wolves in the project area and would not impede the continued recovery of the wolf population in the Northern Rocky Mountain region. Would also provide beneficial, habitat-related effects on wolf prey by sustaining favorable range conditions.*	Same as Alternative 3.
Canada lynx (threatened)	*May affect, not likely to adversely affect individual lynx or critical habitat.* Consistent with the Northern Rockies Lynx Management Direction and carries no adverse effects on the primary constituent elements lynx critical habitat. Contributes most favorably of all alternatives toward desired habitat conditions for	*May affect, likely to adversely affect individual lynx. May affect, not likely to adversely affect critical habitat.* Not consistent with the Northern Rockies Lynx Management Direction because two out of four grazing guidelines would not be met under conditions of maximum permitted use (65	*May affect, not likely to adversely affect individual lynx or critical habitat.* Consistent with the Northern Rockies Lynx Management Direction because the grazing objective and all four grazing guidelines for lynx management would be met. Provides for the recovery of lynx and maintains or improves lynx critical habitat.	*May affect, not likely to adversely affect individual lynx or critical habitat.* Consistent with the Northern Rockies Lynx Management Direction because the grazing objective and all four grazing guidelines for lynx management would be met. Provides for the recovery of lynx and maintains or improves lynx critical habitat.	*May affect, not likely to adversely affect individual lynx or critical habitat.* Consistent with the Northern Rockies Lynx Management Direction. Provides for the recovery of lynx and maintains or improves lynx critical habitat. Provides lynx habitat of action alternatives because

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
	snowshoe hares (lynx prey) and lynx in the project area.	percent forage utilization in riparian areas). Would not provide for the recovery of lynx and does not maintain or improve lynx critical habitat.	The current amount of actual grazing use is maintaining most riparian areas, aspen and willow stands which provide forage and cover for lynx prey species.		forage use by cattle is reduced to 35 % in riparian areas. This would not result in cattle browsing of willows, aspen, and other shrubs that provide habitat for snowshoe hares.
Wolverine (proposed)	*No effect.* Because no wolverine losses are expected to occur due to management actions in this alternative, there will be no negative effects on the local population or at the scale of the Greater Yellowstone Ecosystem.	*Not likely to jeopardize continued existence.* Small risk of incidental trapping resulting in harm or death of one or more wolverines as a result of livestock-related conflict-response management actions.	*Same as Alternative 2 Grazing as Currently Permitted.*	*Same as Alternative 2 Grazing as Currently Permitted.*	*Same as Alternative 2 Grazing as Currently Permitted.*
Amphibian - boreal toad (sensitive & MIS species)	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability*. Riparian health would improve relative to existing conditions. Focus areas: rapid improvement toward desired condition. Meets desired condition for riparian function. Estimated retention of herbaceous cover in key mesic meadows approaches 100 % due to the absence of cattle grazing. Meets desired condition for retention (70% retention objective would be met).	*Likely to result in a trend to federal listing or loss of viability'*. High forage use (55 - 65%) puts riparian function at risk, especially in areas currently in less than desired condition. Low expected stubble heights (< 3" at greenline) would trigger fall browsing on willows by cattle that is detrimental. Focus areas: Not in desired condition (at risk) due to lack of adjustments to grazing management. Estimated herbaceous retention is 42 - 50%. Would not meet retention objective of 70%. Strong negative effects on riparian function and habitat components that stem from heavy grazing would	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability.* Current management has resulted in relatively low-levels of utilization in riparian areas that would be similar to levels seen under Alternatives 3 and 4.	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability*. Riparian areas that are currently in desired condition remain so, but with less certainty than in Alternative 4. A 4-inch min stubble height (greenline) and moderate grazing use (50%) sustains riparian function. Some fall browsing on willows is expected. Application of adaptive management, design features & other adjustments in livestock management would improve riparian function where needed. Focus areas: Trend toward desired condition due to design features like a 6"	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability*. Riparian areas that are currently in desired condition remain so with high certainty. A 4-inch min stubble height (greenline) and light to moderate grazing use (35 - 50%) sustains riparian function. Fall browsing on willows is not expected. Application of adaptive management, design criteria, and other adjustments in livestock management improve riparian health in areas that are currently in less-than-desired condition. Focus areas: Trend toward

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
		contribute to declines in the project area and negatively affect a substantial proportion of the species breeding range on the Forest.		(greenline) stubble height & limits on bank alteration. Meets desired condition for riparian function. Estimated herbaceous retention is 54%. Would not meet retention objective of 70%.	desired condition due to designed features like a 6" (greenline) stubble height & limits on bank alteration. Meets desired condition for riparian function. Estimated herbaceous retention is 66% at 35% key forage use. Meets or nearly meets desired condition for retention, except at Noble Pastures and Wagon Creek allotments with a proposed 50% key forage use and estimated herbaceous retention of 54%.
Amphibian - Columbia spotted frog (sensitive species)	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability*. Riparian health would improve relative to existing conditions. Focus areas: rapid improvement toward desired condition. Meets desired condition for riparian function. Estimated retention of herbaceous cover in key mesic meadows approaches 100 % due to the absence of cattle grazing.	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability* because the species' broad distribution in the northern and southwestern portions of the Forest. Strong negative effects on riparian function and habitat components that stem from heavy grazing would contribute to declines in the project area.	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability.* This species and its breeding sites are well distributed on the Forest (Blackrock, Jackson, and Greys River Ranger Districts) and in adjacent Grand Teton National Park. Thus, a reduction in breeding in the project area through current grazing management would not substantially reduce population viability on the Forest.	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability*. This species and its breeding sites are well distributed on the Forest (Blackrock, Jackson, and Greys River Ranger Districts) and in adjacent Grand Teton National Park. Thus, a reduction in breeding in the project area through implementation of Alternative 3, would not substantially reduce population viability on the Forest.	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability*. Meets desired conditions for riparian function, and meets or nearly meets desired conditions for herbaceous retention.
Boreal chorus frog (MIS)	*Riparian health would improve relative to existing conditions. The positive effects of this alternative on riparian function and cover*	*Strong negative effects on riparian function and habitat components that stem from heavy grazing would*	*This species and its breeding sites are well distributed on the Forest. Thus, a reduction in breeding in the project*	*This species and its breeding sites are well distributed on the Forest. Thus, a reduction in breeding in the project area through implementation*	*Meets desired conditions for riparian function, and meets or nearly meets desired conditions for herbaceous retention.*

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
	contribute to maintaining populations that are stable, or at least not declining.	*contribute to population declines in the project area.*	*area through current grazing management would not substantially reduce population viability on the Forest.*	*of Alternative 3 will not likely result in declining frog populations and wetland habitat conditions on the Forest.*	*Thus, Alternative 4 does not contribute sufficient negative effects to cause a decline in the forest-wide population*
Greater sage-grouse (sensitive species)	*Beneficial Impact:* Provides suitable nesting and summer habitat. Provides the best nesting cover with tallest grass height and greatest herbaceous canopy cover. No livestock trampling of nests. Provides best summer habitat in terms of greatest riparian function with moderate availability of preferred forbs in riparian areas. Lowest potential for collision with fences.	*Likely to result in a trend to federal listing or loss of viability*. Provides unsuitable nesting and summer habitat. Provides the least amount of nesting cover, shortest grass height and lowest amount of herbaceous canopy cover. Greatest potential for nest trampling. Provides low quality summer habitat with reduced riparian conditions, herbaceous stubble height and availability of preferred forbs. Potential for collision with fences is the same as under existing conditions. High potential for additional administrative actions necessary to meet grazing guidelines (USFS 2015)	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability*. Provides high nesting cover with moderate to high grass height and herbaceous canopy cover. Low to moderate potential for nest trampling. Provides moderate quality summer habitat in terms of herbaceous stubble height, riparian conditions and availability of preferred forbs. The potential for collision with fences still exists. AOIs are being updated to comply with the Greater Sage-grouse Wyoming Plan Amendment including the grazing guidelines (USFS 2015).	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability.* Provides suitable nesting and summer habitat. Provides moderate nesting cover with moderate grass height and herbaceous canopy cover. Moderate potential for nest trampling. Provides moderate quality summer habitat in terms of riparian conditions and availability of preferred forbs. Slight increase in potential for collision with fences, offset by fence design to increase visibility. Moderate potential for additional administrative actions necessary to meet grazing guidelines (USFS 2015).	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability. Provides suitable nesting and summer habitat.* Provides moderate nesting cover with moderate grass height and herbaceous canopy cover. Moderate potential for nest trampling. Provides high quality summer habitat in terms of riparian conditions and availability of preferred forbs. Slight increase in potential for collision with fences, offset by fence design to increase visibility. Low potential for additional administrative actions necessary to meet grazing guidelines (USFS 2015).
Trumpeter swan (sensitive species)	*Beneficial Impact:* Provides the best protection to breeding and nesting swans and their habitat. Provides suitable nesting habitat with increased herbaceous cover reducing nest predation, improved water quality, and reduced nest trampling. Potentially fewer swans	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability'.* Provides the least protection to breeding and nesting swans and their habitat. Provides unsuitable nesting habitat with decreased herbaceous cover which potentially increases	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability'*. Provides moderate protection to breeding and nesting swans and their habitat.	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability'*. Provides moderate protection to breeding and nesting swans and their habitat. Provides suitable nesting habitat with moderate herbaceous cover, good water quality and	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability'.* Provides the greatest protection to breeding and nesting swans and their habitat of all action alternatives. Would improve wetland and riparian conditions

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
	would die as a result of collisions with fences as a result of substantial fence removal.	nest predation, reduced water quality and increased nest trampling.		decreased potential for nest trampling due to a 270 cattle reduction in Mosquito Lake rotation. New fencing in riparian areas is mitigated by wooden top rail which improves visibility and reduces swan injury.	which could improve or provide additional nesting sites with greater protection from predators and disturbances. New fencing in riparian areas is mitigated by wooden top rail which improves visibility and reduces swan injury.
Great gray owl, Bald eagle, Peregrine falcon and Northern goshawk (sensitive species)	*Beneficial Impact:* Provides suitable foraging habitat in meadow areas by retaining herbaceous vegetation for meadow voles. Meets objectives for riparian function, stream bank stability, herbaceous retention and species composition. Provides the best foraging habitat of all alternatives.	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability'.* Provides unsuitable foraging habitat in meadow areas by reducing habitat for voles. Would not meet objectives for riparian function, stream bank stability, and herbaceous retention, species composition, and structural characteristics of riparian habitat.	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability'.* Provides moderately suitable foraging habitat in meadow areas by retaining lesser amounts of herbaceous vegetation for meadow voles. The reduced cattle numbers associated with current vs permitted has resulted in meeting objectives for riparian function, stream bank stability, and species composition.	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability'.* Provides moderately suitable foraging habitat in meadow areas by retaining lesser amounts of herbaceous vegetation for meadow voles. Meets objectives for riparian function, stream bank stability, and species composition. Provides more foraging habitat than Alt. 2 but less than Alt. 4.	*May impact individuals but is not likely to cause a trend to federal listing or loss of viability'.* Provides suitable foraging habitat in meadow areas by retaining herbaceous vegetation for meadow voles. Meets objectives for riparian function, stream bank stability, herbaceous retention and species composition. Provides the best foraging habitat of action alternatives.
Elk, Mule Deer, Pronghorn and Moose (MIS)	Retains suitable and adequate amounts of forage for elk.	Although sufficient herbaceous forage would be remain across the project area, intensive grazing in riparian or focal areas may negatively impact the species; resulting in animals having to move farther to find suitable and adequate forage.	Retains suitable and adequate amounts of forage.	Retains suitable and adequate amounts of forage.	Retains suitable and adequate amounts of forage.

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
Brewer's sparrow (MIS)	Provides suitable nesting and foraging habitat. Sufficient sagebrush canopy cover provided. Upward trend in herbaceous species composition would benefit Brewer's sparrows by increasing the amount of nesting cover, seed production, and insect availability. Absence of cattle would reduce nest trampling and cowbird nest parasitism, resulting in improved nesting success for Brewer's sparrows.	Provides unsuitable nesting and foraging habitat. Sufficient sagebrush canopy cover provided. Downward trend in herbaceous species composition would result in a negative impact on nesting and foraging habitat due to reduction in nesting cover, seed production, and insect availability. Potential for trampling of nests by livestock and cowbird parasitism, resulting in reduced nesting success for Brewer's sparrows.	Provides suitable nesting and foraging habitat. Sufficient sagebrush canopy cover and herbaceous species composition provided. Potential for trampling of nests by livestock and cowbird parasitism, resulting in reduced nesting success for Brewer's sparrows.	Same as Alternative 2 – Current Management	Same as Alternative 2- Current Management
Migratory birds	No potential, with respect to livestock grazing, to contribute toward population declines of any migratory bird species. Contributes toward restoring riparian habitat and herbaceous species composition, returning fire to the landscape, retaining larger amounts of herbaceous vegetation in riparian areas and upland rangelands which would reduce the potential for nest depredation. Lower levels of nest loss due to the absence of trampling by cattle and large reduction in fences that pose a threat to birds.	Potential to negatively impact migratory birds to the highest extent of all alternatives, would provide benefits to a few migratory bird species that benefit from grazing, and would contribute to population declines of several species primarily due to cowbird nest parasitism, increased nest depredation due to removal of herbaceous cover, and nest trampling, as well as mortality due to striking fences and nest loss due to flood irrigation.	Negative impacts on migratory birds that would be similar to Alternatives 3 and 4. Would provide benefits to a few migratory bird species that benefit from grazing, and would have the potential to contribute negligibly toward population declines of several species primarily due to elevated cowbird nest parasitism, increased nest depredation in riparian and meadow communities due to removal of herbaceous cover, and relatively-high levels of nest trampling in riparian and meadow communities, as well as mortality due to striking fences and nest loss due to flood irrigation	Negative impacts on migratory birds that would fall between Alternatives 2 (Permitted) and 4. Would provide benefits to a few migratory bird species that benefit from grazing, and would have the potential to contribute negligibly toward population declines of several species primarily due to elevated cowbird nest parasitism, increased nest depredation in riparian and meadow communities due to removal of herbaceous cover, and relatively-high levels of nest trampling in riparian and meadow communities, as well as mortality due to striking	Potential to negatively impact migratory birds would be the lowest of action alternatives. Would provide benefits to a few migratory bird species that benefit from grazing, and may have the potential to contribute negligibly toward population declines of several species due to cowbird nest parasitism, and mortality due to striking fences and nest loss due to flood irrigation but all other risk factors would be sufficiently mitigated.

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
				fences and nest loss due to flood irrigation	
Botany					
Payson's milkvetch (Sensitive Species)	Low to No Impacts.	No change from effects described under current management.	Trampling and removal of plant biomass. May create habitat.	No change from effects under current management.	No change from effects under current management.
Boreal draba (Forest Plan MIS)	Low to No Impacts.	No change from effects described under current management.	May have moderate impacts from grazing activities, but will not lead to re-listing as a sensitive species.	No change from effects under current management.	No change from effects under current management.
Aspen (Ecological MIS)	Low to No Impacts.	No change from effects described under current management.	May have high impacts from grazing but the impacts will not pass the thresholds for understory cover or species composition.	No change from effects under current management.	No change from effects under current management.
Recreation and Related Resources					
Recreation and Related Resources	The effects described in Alternative 2, Current Management would not occur if livestock grazing was curtailed.	The additional number of cattle graining in this alternative would increase the effects expected in this alternative over those described in Alternative 2 - Current Management. However, best management practices would mitigate some effects. Cattle would be actively herded away from the Green River Forest boundary, Kendall Bridge, and Dollar Lake to minimize or avoid potential conflicts with Forest recreationists and visitors and address visual concerns. Restrictions	Livestock grazing is not affecting the provision of a spectrum of recreation opportunities or use at developed recreation sites. Conflict between dispersed camping and livestock within the project area is rarely reported. Some of the livestock fencing disrupts cross-country travel. Livestock carcasses located near dispersed recreation sites, trails, and roads pose a safety concern for recreationists throughout the project area. Reported conflict between outfitted use	Six miles of new fence are expected to increase the amount of disruption of cross country travel. Cattle would be actively herded away from the Green River Forest boundary, Kendall Bridge, and Dollar Lake to minimize or avoid potential conflicts with Forest recreationists and visitors and address visual concerns. Restrictions on salt placement would also result in improved visual quality and improved resource conditions affecting recreation use. Additional requirements concerning	Same as Alternative 3.

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
		on salt placement would also result in improved visual quality and improved resource conditions affecting recreation use. Additional requirements concerning livestock carcass removal would improve recreation user safety (grizzly bear hazard).	and domestic livestock grazing is extremely rare. Cattle congregating along roads cause hazardous conditions for motorists.	livestock carcass removal would improve recreation user safety (grizzly bear hazard).	
Reports of Visitor-Livestock Conflict & Human-Bear conflict associated with livestock carcasses, Recreation Opportunity Spectrum (ROS)	Human-livestock conflict and human-bear conflict associated with livestock carcasses would discontinue; Improved effect to dispersed recreation and developed recreation; No effect to ROS.	No change from effects described under current management.	Some human-livestock conflict and human-bear conflict associated with livestock carcasses occurs. Grazing causes minor negative effects to dispersed recreation and creates an expense at developed site for construction and maintenance of fences.	Human-bear conflict associated with livestock carcasses would be expected to remain low; minor effect to dispersed recreation; fences required to be retained for developed recreation; positive effect to ROS as physically closes unauthorized motorized route in Wagon Creek designated as Semi-primitive/non-motorized.	Same as Alternative 3
Wilderness, Wilderness Study Areas, and Wild and Scenic Rivers	Removal of domestic livestock in the Bridger Wilderness and Gros Ventre Wilderness and removal of the existing one-mile long fence within the Gros Ventre Wilderness would improve natural integrity, apparent naturalness, remoteness, solitude, and opportunities for primitive recreation within this wilderness. Concerning designated and eligible WSRs, conditions would improve at focus areas and	Wilderness character (i.e. natural integrity) of the Gros Ventre Wilderness would be slightly more compromised than under Alt. 2 Current Management because season-long grazing would continue in the Beaver-Twin Allotment and the allotment would be fully stocked. A fence located in the Gros Ventre Wilderness would remain, maintaining the current impact to Wilderness character. Locations in	Season-long grazing occurs in Beaver-Twin Allotment within the Gros Ventre Wilderness. The Wilderness character (i.e. natural integrity) has not been compromised because, under current management the allotment has not been fully stocked. Existing livestock management fences negatively affect wilderness character. There are no known effects to Wilderness or WSA	Rotational grazing would be implemented in Beaver-Twin Allotment, improving the natural integrity within the Gros Ventre Wilderness. The negative effect of the fence located in the Gros Ventre Wilderness would remain. Concerning designated and eligible WSRs, conditions would improve at focus areas and areas of concern where livestock grazing has adversely impacted resource conditions.	Rotational grazing would be implemented in Beaver-Twin Allotment, improving the natural integrity within the Gros Ventre Wilderness. The negative effect of the fence located in the Gros Ventre Wilderness would remain. Alternative 4 provides the most rapid improvement of riparian and wetland health which would be expected to improve conditions

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
	areas of concern where livestock grazing has adversely impacted resource conditions.	designated and eligible WSR segments or their tributaries where livestock grazing has created conditions that do not meet resource objectives would deteriorate at a greater rate than under Alternative 2 Current Management.	ecological or social conditions as a result of current livestock grazing. There are several site-specific locations where conditions caused by livestock grazing are not meeting resource objectives along segments of tributaries to designated and eligible Wild and Scenic Rivers.		related to Wilderness and Wild and Scenic Rivers.
Cultural Resources					
Green River Drift Trail (i.e., livestock driveway).	The Green River Drift Trail would disappear and cease to exist as a traditional cultural property. There would be no potential for removal of vegetation by livestock and no potential for trampling induced compaction that could lead to erosion. Decreased visibility of surface materials and unauthorized artifact collection. Potentially some beneficial effects to cultural resources because the lack of cattle grazing in the area would reduce the potential for cultural resources to be damaged by activities associated with grazing.	Continued use of the Green River Drift Trail will allow for traditional use of this historic driveway and maintain its significance. Livestock trailing and use is not expected to result in significant negative effects to cultural resources.	The Green River Drift Trail is a traditional cultural property. Removal of vegetation and trampling induced compaction create runoff that causes sheet erosion. The loss of vegetation causes the loss of artifact context through down slope transportation, stream bank destabilization, and increased visibility of surface materials and subsequent unauthorized artifact collection. Current livestock grazing within the allotments has not resulted in direct effects to cultural resources.	Same as Alternative 2.	Same as Alternative 2.

Indicator, Species or Resource	Alternative 1- No Livestock Grazing (No Action)	Alternative 2- Grazing as Currently Permitted	Alternative 2- Current Management (Actual Use)	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
Socio-Economic Resources					
Livestock grazing authorized?	NOT authorized	Authorized – highest numbers	Livestock grazing is authorized on all allotments; Permittees have grazed fewer cattle than they are permitted.	Authorized – moderate numbers	Same as Alternative 3
Relative feasibility for Permittee implementation of design features	Lowest feasibility of all alternatives	Highest feasibility to implement grazing requirements.	It is feasible to implement the design features required to graze livestock.	Moderate feasibility to implement required grazing requirements.	Lowest feasibility of action alternatives
Environmental benefits of changes in livestock grazing practices	Lowest risk of productivity loss	Highest risk of productivity loss	There are some grazing practices that pose a risk to environmental productivity.	Intermediate risk of productivity loss	Lowest risk of productivity loss for action (grazing) alternatives
Employment and income information at the county level	Limited effect	Limited effect	Employment and income related to this project, are limited in the context of county wide economy.	Limited effect	Limited effect
Traditional use of the project area	Highest risk to traditional uses	Least risk to traditional uses	Livestock grazing in the project area supports traditional uses.	Intermediate risk to traditional uses	Same as Alternative 3

Table 20. Comparison of the alternatives' ability to meet the purposes and need for the project and ability to address issues

Purpose & Need or Issue	Alternative 1 – No Livestock Grazing (No Action Alternative)	Alternative 2 - Grazing as Currently Permitted	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
Purpose & Need: Continue to authorize livestock grazing in a manner that will maintain or improve resource conditions	*Does not meet.* Livestock grazing would not be reauthorized, but most to all resource conditions affected by livestock grazing would meet or move towards desired conditions.	*Partially meets.* Livestock grazing would be reauthorized at current permitted levels. Actual livestock numbers and use under current management has been less than permitted levels. Resource conditions affected by livestock grazing, including areas of concern, would not meet desired conditions. Riparian and many wildlife desired conditions would not be met.	*Meets.* Livestock grazing would be reauthorized with slightly fewer cattle than currently permitted, but more than actual use under current management. Maximum allowable use would be lower than currently permitted and more than actual use. Most resource conditions would meet or move towards desired conditions, with possible exceptions for some wildlife species.	*Meets.* Livestock grazing would be reauthorized with slightly fewer cattle than currently permitted, but more than actual use under current management. Maximum allowable use in riparian/ meadow areas would be substantially lower than currently permitted, but similar to actual use levels under current management. Most to all resource conditions affected by livestock grazing would meet or move towards desired conditions.
Purpose & Need: Contribute toward achievement of Goal 1.1 of the Bridger-Teton Land and Resource Management Plan (Forest Plan) which directs the Bridger-Teton National Forest to support community prosperity (U.S. Forest Service 1990, p. 112).	*No Contribution*. Potential for 46,148 AUMs of livestock grazing in the project area are eliminated. Reduction in AUMs in opposition to the Forest Plan Objective 1.1(h) to provide forage for about 260,000 Animal Unit Months (AUMs) of livestock grazing annually Forest-wide.	*Greatest Contribution.* A maximum of 46,148 AUMs of livestock grazing could be provided in the project area. Maximum allowable use in areas meeting desired conditions ranges from 55 – 65% in riparian/meadow areas and 50-60% in upland areas. The maximum number of AUMs is greater than the average number of AUMs used under current management (5 year period) by about one-third.	*Moderate Contribution.* A maximum of 44,722 AUMs of livestock grazing could be provided in the project area. Maximum allowable use in areas meeting desired conditions is 50% in riparian/ meadow and uplands areas. The maximum number of AUM provided is more than the average number of AUMs used under current management.	*Least Contribution of action alternatives.* A maximum of 44,722 AUMs of livestock grazing could be provided in the project area. However, maximum allowable use in areas meeting desired conditions ranges from 35 – 50% in riparian/meadow areas and 50% in uplands which, in effect, reduces allowable grazing use or AUMs compared to Alternative 3. Alt. 4 may provide similar AUMs to current management.
Purpose & Need: Update the allotment grazing management to reflect the Forest Plan direction	Not applicable	*Does not meet* because season-long grazing would be permitted on the Badger, Beaver-Twin, Roaring Fork and Wagon Creek allotments.	*Meets* because season-long grazing would be changed to rotational grazing in all six allotments.	*Meets* because season-long grazing would be changed to rotational grazing in all six allotments.
Purpose & Need: Avoid unacceptable effects from	*Meets.* Unacceptable effects from livestock use would be	*Does not meet*. Does not address all areas not meeting	*Meets*. Implements livestock grazing strategies that	*Meets.* Implements livestock grazing strategies that addresses all areas

Purpose & Need or Issue	Alternative 1 – No Livestock Grazing (No Action Alternative)	Alternative 2 - Grazing as Currently Permitted	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
livestock use as outlined in Goal 4.7 of the Forest Plan which directs that grazing use of the National Forest sustain or improve overall range, soils, water, wildlife, and recreation values or experiences (U.S. Forest Service 1990, p. 120).	avoided on range, soils, water, wildlife, and most recreation values or experiences. The Green River Drift Trail would no longer be used by livestock and would cease to exist as a traditional cultural property. Meets Forest Plan standards and guidelines.	or moving towards upland and riparian desired condition. No additional design features are initiated to help move conditions toward desired conditions for upland and riparian areas currently in unsatisfactory condition. The potential to sustain negative environmental effects exists by implementing 60 – 65% forage utilization levels. Least likely to meet wildlife objectives. Does not meet some Forest Plan standards or guidelines for range, riparian area, fisheries, wildlife, and recreation.	addresses all areas not meeting or moving towards upland and riparian desired condition. Changes in design features are implemented to improve resource conditions in areas of concern. 50% forage utilization in uplands, riparian and meadow areas and 4-inch stubble height retained along streams is expected to maintain riparian and upland conditions in areas currently at desired conditions. Site-specific allowable use standards, structural improvements and adaptive management are implemented, as needed, to maintain or improve riparian and upland conditions toward desired conditions. Meets Forest Plan standards and guidelines.	not meeting or moving towards upland and riparian desired condition. Changes in design features are implemented to improve resource conditions in areas of concern. 50% forage utilization in uplands, and 35 to 50% forage utilization in riparian and meadow areas and 4-inch stubble height retained along streams is expected to improve or maintain riparian and upland conditions in areas currently at desired conditions. Site-specific allowable use standards, structural improvements and adaptive management are implemented, as needed, to maintain or improve riparian and upland conditions toward desired conditions. Meets Forest Plan standards and guidelines.
Issue 1: Effects on Threatened, Endangered, and Sensitive Species (TES), as well as Other Species of Concern	*Best addresses* Issue 1 of all alternatives, because the greatest amount of suitable forage and cover is provided in upland, riparian and wetland areas for wildlife. Grizzly bear mortalities & conflict associated with livestock grazing management would be nearly eliminated after a two-year period during which livestock grazing would be phased out. All upland and riparian areas of concern	Least likely to address Issue 1 of all alternatives, because the least amount of suitable forage and cover is provided in upland, riparian and wetland areas for wildlife. Grizzly bear mortalities & conflict associated with livestock grazing management would continue at similar rate to other action alternatives, but would not trend this threatened species from maintaining population stability or slow growth, and from achieving a	*Moderately addresses* Issue 1 of all action alternatives, because a moderate amount of suitable forage and cover is provided in riparian and wetland areas for wildlife. Grizzly bear mortalities & conflict associated with livestock grazing management would continue at similar rate under all action alternatives, but would not trend this threatened species from maintaining population stability or slow growth, and	*Best addresses* Issue 1 of all action alternatives, because the greatest amount of suitable forage and cover is provided in riparian and wetland areas for wildlife. Grizzly bear mortalities & conflict associated with livestock grazing would continue at similar rate under all action alternatives, but would not trend this species from maintaining population stability or slow growth, and from achieving a positive trajectory toward delisting. All upland and riparian areas of concern would be addressed.

Purpose & Need or Issue	Alternative 1 – No Livestock Grazing (No Action Alternative)	Alternative 2 - Grazing as Currently Permitted	Alternative 3- Modified Grazing Management	Alternative 4- Modified Grazing Management with Riparian Emphasis
	would be addressed. Complies with direction in applicable federal law and policy pertaining Sensitive and/or Management Indicator amphibians	positive trajectory toward delisting. Least likely to meet wildlife objectives and desired condition. Would not meet several Forest Plan standards, guidelines, or DFC prescription.	from achieving a positive trajectory toward delisting. All upland and riparian areas of concern would be addressed. Likely would not meet some wildlife objectives for desired conditions.	Would best meet wildlife objectives and desired conditions among action alternatives.
Issue 2: Riparian and Aquatic Conditions	Best addresses Issue 2 of all alternatives. Stream bank stability would increase over time due to the lowest amount of channel alteration and greatest amount of riparian vegetation of all alternatives. Riparian areas of concern would be addressed. Water quality would improve and meet water quality standards.	Least likely to address Issue #2 of all alternatives. Stream bank stability would decrease over time due to the greatest amount of channel alteration and lowest amount of riparian vegetation of all alternatives. Riparian areas of concern would not be addressed. Likely continue to not meet water quality standards in limited areas.	Effectively addresses Issue 2. Stream bank stability would be maintained or increased over time due to a moderate amount of channel alteration and riparian vegetation compared with other action alternatives. Riparian areas of concern would be addressed. Water quality would improve and meet water quality standards.	Best addresses Issue 2 of all action alternatives. Stream bank stability would be maintained or increased over time at a faster rate than under Alt. 3 due to a lower amount of channel alteration and greater amount of riparian vegetation. Riparian areas of concern would be addressed. Water quality would improve and meet water quality standards.
Issue 3: Social and Economic Impacts	Least likely to contribute because livestock grazing would not be authorized.	Most likely to contribute because the greatest number of livestock and the most liberal allowable use would be permitted.	Moderate contribution because 270 fewer livestock would be permitted than Alt. 2 and more conservative allowable use would be permitted.	Lowest contribution of action alternatives because 270 fewer livestock would be permitted than Alt. 2 (same as Alt. 3) and the most restrictive allowable use would be permitted.
Issue 4: Rangeland Function	Upland vegetation conditions in most areas would remain at desired conditions. Vegetation conditions in areas of concern would improve over time.	Upland vegetation in most areas would remain at desired conditions unless maximum allowable use (forage limits) were reached, then rangeland function could be at risk. Areas of concern would be unlikely to fully meet desired conditions. Restoration would not be planned for areas where the cumulative effects of a variety of activities have resulted in degraded conditions.	Upland vegetation in most areas would be expected to remain at desired conditions. Areas of concern would be expected to improve as a result of new grazing practices. Restoration projects would be planned for some degraded areas, and the areas would be expected to show improvement.	Upland vegetation in most areas would be expected to remain at desired conditions. Areas of concern would be expected to improve at a similar rate to Alt. 3 as a result of similar grazing practices. Restoration would be planned for some degraded areas, and the areas would be expected to show improvement.

Chapter 3. Affected Environment and Environmental Consequences

Introduction

This chapter summarizes the physical, biological, social, and economic environments of the project area and the effects of implementing each alternative on that environment. It also presents the scientific and analytical basis for the comparison of alternatives presented in Chapter 2. The information presented in this chapter was derived from more detailed specialist reports, survey reports, resource inventories, and other records that are on file in the Upper Green River Area Rangeland project record, located at the Pinedale Ranger District office in Pinedale, Wyoming.

This chapter is not an encyclopedic evaluation of each resource in the area. It focuses on the resource objectives and issues identified in Chapter 1, along with evaluations of effects of alternatives on resources to evaluate compliance with the Forest Plan (U.S. Forest Service 1990) and other relevant laws, regulations, and policies. This approach is consistent with National Environmental Policy Act (NEPA) regulations and the National Forest Management Act.

The following resources analyses are based on the four alternatives described in Chapter 2. Each resource analysis is shaped by the site-specific character of this project as it relates to the resource. Only proposed activities that may affect the resource in some manner are analyzed in detail.

Cumulative Effects

Appendix A lists the past, present, and reasonably foreseeable future actions considered for all resources in the cumulative effects analysis. For activities to be considered cumulative their effects need to overlap in both time and space with those of the proposed actions. In the Wildlife section, a larger cumulative effects area was used for analysis. Present and reasonably foreseeable future actions were projects listed on the Bridger-Teton National Forest's Schedule of Proposed Actions as well as projects and ongoing activities compiled by the interdisciplinary team (Appendix A). The existing conditions represent the effects of past actions (36 CFR 220), however, past actions were also included in Appendix A. Individual resource specialists may have examined specific past actions and natural events if relevant and necessary to determine environmental effects for their resource. Not every resource is affected by every action, so actions assessed in each resource analysis differ. For some resource areas, Alternative 1 (the No Action Alternative) has no direct or measureable indirect effect and therefore will have no cumulative effects.

Rangeland Vegetation

The Rangeland Vegetation section presents the issues and indicators addressed in this analysis, provides the existing condition of the affected environment, and discusses the environmental effects of each alternative on rangeland resources. Livestock management activities proposed for each alternative were evaluated to determine their potential effects on rangeland vegetation. Information in this section was summarized from the Rangeland Vegetation Resource Report (Booth and Hayward 2015). Adaptive management was referred to as "progressive design features" in this specialist report (Booth and Hayward 2015). The term "progressive design features" is synonymous with "adaptive management" and is described in this DEIS beginning on page 71 and 112 for Alternatives 3 and 4, respectively.

Overview of Issues Addressed

Issue 4: Rangeland Function

Livestock grazing may affect vegetation and soils, which are the components of overall rangeland function. Vegetation communities and watersheds that are not functioning properly provide less than optimum conditions for wildlife, rangeland health and productivity and soil stability.

Issue Indicators for Comparison of Alternatives

- ground cover (percent)
- plant species composition (seral status and trend)
- relative abundance of invasive plants
- shrub canopy cover

Affected Environment

Overview of Current Conditions

Most livestock grazing on National Forest System lands has occurred in the areas presently grazed, in a variety of forms, for over a hundred years. Typically during that time numerous grazing systems have been implemented along with accompanying range improvements. Stocking rates and seasons of use have been adjusted; the timing, intensity, frequency, and duration of grazing have been continually fine-tuned over time. More recently, further adjustments have been made on many allotments to provide for the needs of species listed under the Endangered Species Act of 1973, clean water, and archeological structures and artifacts.

The Upper Green River project area has been grazed by domestic livestock since the late 1800s. Fewer livestock are grazed today than after the turn of the 20th century. Analysis of available livestock forage was conducted in the 1950s to late 1960s. These range analyses indicated that enough forage was available for the number of livestock currently grazed, while leaving adequate forage for wildlife and residual biomass for watershed health. A potential shortcoming of these analyses were that livestock did not use all the foraging areas equally, and while criteria were built in to consider the fact that livestock were more likely to use the forage in gentle terrain near water, the areas and forage species most desirable to livestock could be overused before the livestock were forced to seek the other forage that was available to them.

In order to reduce this problem, range improvements are helpful to encourage livestock to use areas that they do not naturally seek out, or to concentrate livestock in smaller use areas in order to distribute the use more evenly. These efforts help, but may not be entirely successful in preventing overuse of more sensitive areas. More recent management actions such as implementing rotational grazing on most allotments, providing for periods of rest from grazing, establishing use limits on key species in key areas, and requiring livestock removal prior to exceeding use standards have been successful when range managers and livestock grazing permittees are diligent in following the use limits. With these management changes, environmental effects

are largely limited to the most sensitive sites such as the key and focus areas that have been defined and identified by resource specialists. Improved management of key and focus areas and restoration of some focus areas serves to mitigate environmental effects of livestock grazing. While most of the effects of livestock grazing are limited to these areas, effects were also considered that may occur outside of the areas judged capable of supporting livestock grazing by consulting with the public and subject matter experts regarding environmental concerns and affects within the entire project area, rather than just within those areas deemed suitable and capable for livestock grazing. We addressed livestock grazing impacts across the entire allotments commensurate with the amount of use expected to occur based on the area's capability.

Landscape Scale Vegetation Types

Vegetation types provide a general overview of the plant communities in the project area (Figure 38 and were derived from remote sensing data collected by Utah State University and summarized in the Idaho/Western Wyoming Landcover Classification, Report and Metadata. Landscape scale vegetation types are the result of past climatic regimes and disturbances, both natural and human-caused. Fire, timber harvesting, livestock grazing and other natural and human-caused disturbances have shaped existing conditions in this area. Domestic livestock grazing is not expected to cause substantial shifts in the extent of these vegetation types, as they are largely determined by elevation, substrate, and water availability. Livestock grazing is more likely to cause shifts in the ground cover, species composition, age class, and plant vigor within the vegetation types.

Vegetation within the project area was classified into eight vegetation types, of these, six vegetation types are more often associated with domestic livestock grazing due to the availability of forage as well as gentler topography preferred by domestic livestock. A description of these vegetation types follows. The coniferous forest types are not included because the effects of livestock grazing are mostly confined to the other vegetation types.

Shrubland. (Covers approximately 17 percent of the project area.) This formation consists of areas dominated by sagebrush. Vasey big sagebrush occurs below 9,000 feet. Idaho fescue usually dominates the understory, but Richardson's needlegrass may be dominant in some plant associations. Other common graminoids include slender wheatgrass, sedges, timber oatgrass, Columbia needlegrass, and prairie junegrass. Common forbs include sulphur buckwheat, lupine, rockcress, prairiesmoke, western yarrow, and northwest cinquefoil. Above 9,000 feet, subalpine big sagebrush is dominant

Herbland. (Covers approximately 17 percent of the project area.) This formation consists of perennial grasslands, dry meadows, and alpine tundra. Idaho fescue dominates the grasslands at lower elevations. At higher elevations, Drummond's rush is dominant. Other common graminoids include spike trisetum, Cusick's bluegrass, alpine bluegrass, timber oatgrass, alpine timothy, and slender wheatgrass. Common forbs in the grassland types include pale agoseris, western yarrow, Stanley's whitlowgrass, flowery phlox, milkvetch, and lupines. Varileaf cinquefoil and creeping sibbaldia are common at higher elevations.

Tundra. (Covers less than1 percent of the project area.) The Tundra formation includes four broad vegetation types. From dry to moist they are cushion plant communities, sedge-grass turf, geum-sedge turf, and dwarf willow communities. Cushion plant communities include moss campion, pussytoes, Rocky mountain nailwort, and common spikemoss. Sedge-grass turf is dominated by Payson's sedge. Geum-sedge turf is characterized by alpine avens, American bistort, alpine bluegrass, varileaf cinquefoil, and northern singlespike sedge. Arctic and snow willow dominate the dwarf willow communities.

Aspen. (Covers approximately 8 percent of the project area.) This species type is deciduous woodland dominated by quaking aspen. Aspen occurs mostly on south, west, and east aspects. It occurs only occasionally on north-facing slopes in the project area. Common associated shrubs include Utah mountain

snowberry, rose, and creeping Oregon grape. Common graminoids include Idaho fescue, slender wheatgrass, Wheeler's bluegrass, and spike trisetum. Common forbs include sticky geranium, Fendler's meadowrue, western yarrow, asters, lupine, and strawberry. Subalpine fir, Engelmann spruce, lodgepole pine, limber pine, and whitebark pine occur mostly as incidental seedlings and saplings.

Riparian. (Covers approximately 9 percent of the project area.) This type includes areas dominated by willows, mountain silver sagebrush, shrubby cinquefoil, sedges, and tufted hairgrass.

Tall Forb. Tall forb communities cover less than 1 percent of the Upper Green project area and were grouped with the Herbland communities (Figure 38). The tall forb vegetation type has been deemed “at risk” in the 1997 Bridger-Teton Forest Properly Functioning Condition Report (U.S. Forest Service 1997b). Typically this type occurs at elevations between 6,300 and 11,000 feet where yearly precipitation ranges between 30 to 40 inches and soils are greater than 18 inches deep. Some tall forb and mixed forb/grass areas are found in upper Gypsum Creek and the Twin Creek area. Common species are numerous and can include sticky geranium, fernleaf licoriceroot, Indian paintbrush, lupine, tall larkspur, and arrowleaf balsamroot. In general, cattle avoid these areas for grazing as they prefer grass species. More commonly, tall forb areas will be used for domestic sheep grazing as is found in the Elk Ridge complex, adjacent to the Upper Green project area.

Grazing Capability and Suitability

Domestic livestock grazing is usually confined to areas that provide forage and water for livestock and is located on terrain that is gentle enough to be used by livestock. Livestock grazing effects are expected in areas that are suitable for, and capable of supporting livestock grazing. Environmental effects of livestock grazing in places outside of capable and suitable areas were investigated, but none were identified.

Grazing capability is a biological identification of lands that are capable of supporting long-term grazing use. Grazing suitability determines whether livestock grazing is an appropriate use within a particular area when combined with other considerations such as management activities, permitted uses, and wildlife requirements. The Forest Plan determination of grazing suitability is based on a two-step process, including: (1) Identification of lands potentially capable of supporting authorized livestock grazing; (2) Identification of potentially capable grazing lands from which Forest Plan management prescriptions can be met through authorized livestock grazing (Forest Plan Decision). Approximately 44 percent or 74,263 acres of the 170,643-acre project area was determined to be capable and suitable to support livestock grazing (Figure 39). This determination is the same for all action alternatives; Table 3, Table 5 and Table 12 provide capable and suitable acres by allotment for Alternatives 2, 3 and 4, respectively.

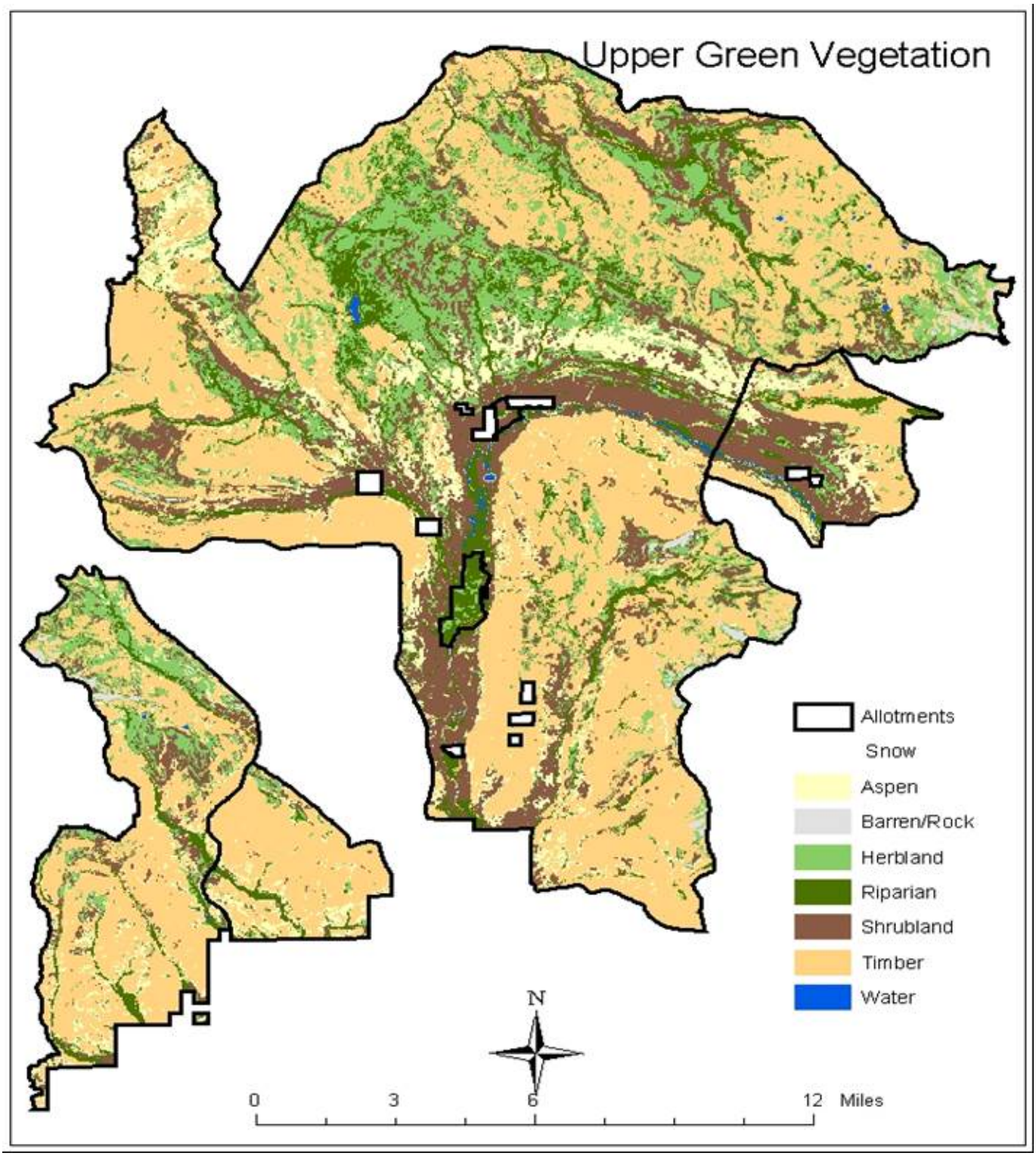

Figure 38. Existing vegetation types in the Upper Green River project area

Capable and suitable lands were first determined at a broad level for the Bridger-Teton National Forest in 2008 and then evaluated and modified at the project level. The criteria for capable and suitable rangeland was based on the Intermountain Region (Region 4) recommended criteria for Rangeland Capability and

Suitability Determinations for Forest Plan Revisions (Revised 2/20/98): The determinations were made considering the whole of the criteria rather than any one criterion alone.

Determination of Capable Range for Livestock

National Forest System lands that meet the following criteria are considered capable based on Region 4 recommended criteria:

- Areas with less than 30 percent slopes for cattle.
- Areas producing more than or having the potential to produce an average of 200 lbs. of forage/acre on an air dry basis over the planning period
- Areas with naturally resilient soils (Not unstable or highly erodible soils).
- Areas where ground cover (vegetation, litter, rock > 3/4 in.) is sufficient to protect soil from erosion. The minimum percentage cover will be 60 percent.
- Areas accessible to livestock (without such factors as dense timber, rock or other physical barriers).
- Areas within 1 mile of water or where the ability to provide water exists.

Initial identification of livestock capable range within the Upper Green project area was based on the 2008 Bridger Teton Forest-wide Range (GIS) Capability Layer. Approximately 74,572 acres were considered capable in the project area based on this analysis. Acreage included in this Forest-wide layer met the following criteria:

- Slope does not exceed 30 percent (threshold for cattle)
- Distance to perennial surface water does not exceed 1 mile
- Canopy cover of conifer vegetation does not exceed 30 percent
- Adequate vegetation cover exists to classify the area as belonging to one of the following vegetation types:
    - Conifer with less than 30 percent canopy cover
    - Aspen (aspen and aspen/conifer mix)
    - Sagebrush (all sagebrush species)
    - Mountain brush (mountain mahogany and mountain shrubland other than sagebrush)
    - Dry meadow and grassland (grassland / forbland and alpine)
    - Perennial forb (tall forbland)
    - Wet meadow (all riparian / wetland)
- All non-vegetated areas, sparsely vegetated areas (less than 10 percent canopy cover of all vascular plants), and areas with greater than 30 percent canopy cover of conifer species were excluded from capable range.
- Exclusion of areas with greater than 30 percent canopy cover of conifer species is assumed to adequately screen out areas producing less than an average of 200 lbs. forage/acre, and areas where dense timber may prevent livestock access.

Project level verification of capable range for the Upper Green Allotment Complex then involved consideration of additional information as follows:

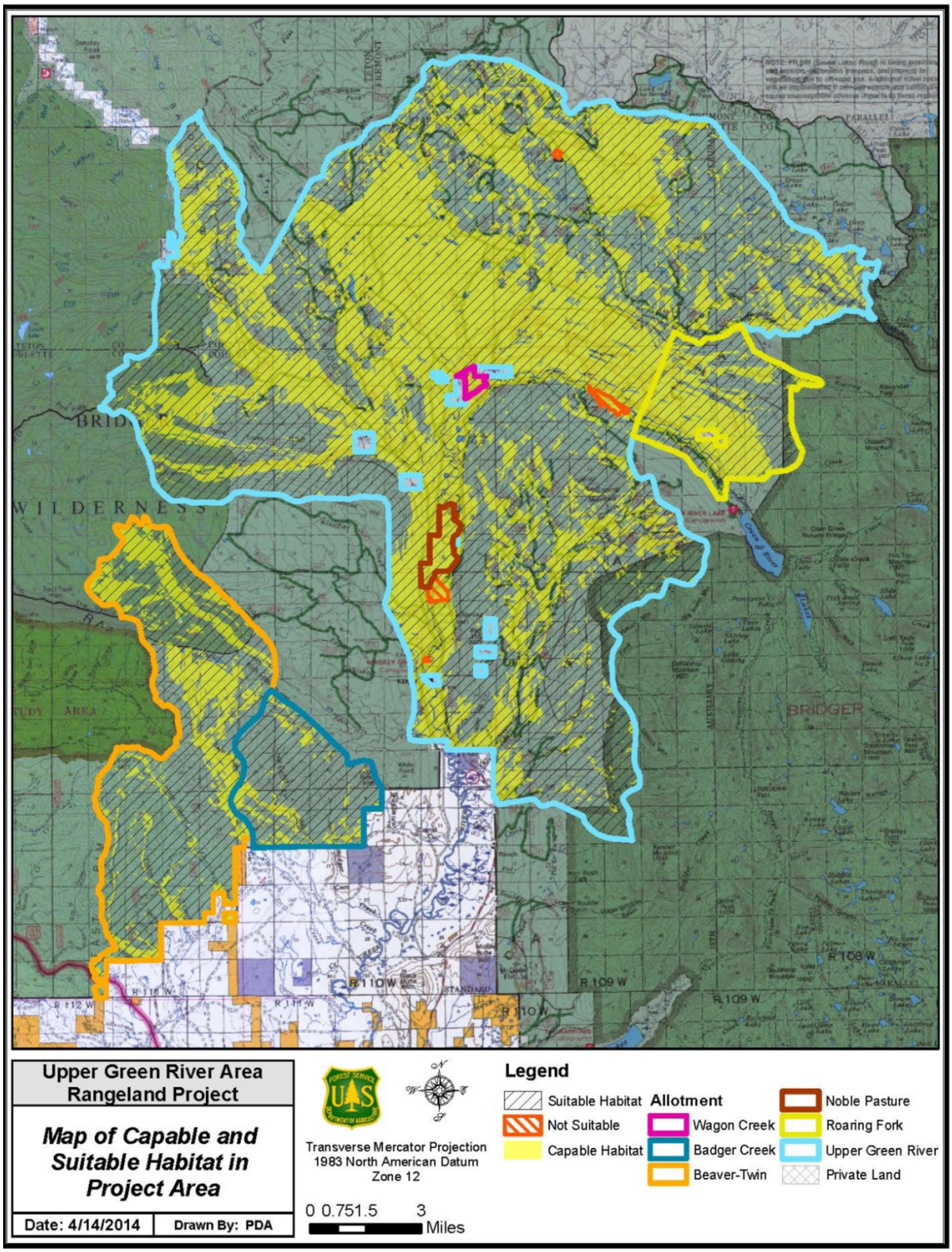

Figure 39. Lands considered capable, suitable and not suitable for livestock grazing in the Upper Green River project area.

- Forage production estimates based on clipped and weighed herbage data from 121 sites within the Upper Green Allotment Complex were reviewed to verify that none estimated forage production below 200 lbs. / acre. The lowest estimate found was for 300 lbs. / acre in an area of naturally low production potential.
- A map was generated depicting areas within the Upper Green Allotment Complex where capable range (as shown in the 2008 Bridger Teton Forest-wide Range Capability Layer) intersects with soils of high erosion potential. The Soils Specialist reviewed this map and determined that soil erosion is not occurring at levels of concern in the areas of intersection. Therefore, though the areas have high erosion potential, the absence of erosion concerns under existing livestock management indicates that they need not be removed from capable acreage based on this single criterion.
- Ground cover monitoring observations from ongoing allotment inspections, along with transect data and field notes collected specifically for this project were reviewed to determine the location and extent of areas where ground cover does not meet standards, and is not expected to meet standards for the duration of the project. No such areas were identified within the project area.
- Range Management Specialists with extensive knowledge of landscape features and livestock grazing patterns within the Upper Green Allotment Complex reviewed allotment maps overlain with the Forest GIS capability layer to determine whether any additional areas should be removed from capable acreage based on topographic features or other factors which would preclude livestock access.

Project level verification resulted in the same number of capable acres compared to the 2008 Bridger Teton Forest-wide Range Capability Layer.

Criteria Considered in Identifying Livestock Suitable Range

The following were evaluated to determine lands within the project area that were not suitable for livestock grazing based on Region 4 recommended criteria:

- Developed recreation sites or special use sites. The Whiskey Grove and Green River Lake campgrounds were considered not suitable for livestock grazing.
- Special area designations such as Research Natural Areas. None in the project area.
- Administrative sites and research facilities or study sites. Kendall and Fish Creek Guard stations were considered not suitable for livestock grazing.
- Key wildlife habitat areas (such as winter ranges). Upper Green River elk feedground was considered not suitable for livestock grazing.
- Important habitats for TES species (viability considerations). Kendall Dace Exclosure was considered not suitable for livestock grazing. .
- Noxious weed infestations where forage is not used by livestock or use would contribute to increase of the infestation. None identified.
- Unique habitats such as bogs, fens, jurisdictional wetlands, or rare plant communities. None identified.
- Areas where livestock grazing is impracticable due to economic considerations, either from a permittee or agency standpoint. None identified.
- Transitory range created by timber harvest activities where the associated mitigation costs to protect timber resource values is excessive. None identified.
- Areas where the social consequences and values foregone are not acceptable. None identified.

It was determined that 338 acres where not suitable in the project area and the remainder of the project area was administratively suitable for livestock grazing. This reduction was due to removal of acreage inside campgrounds, grazing exclosures, administrative sites and private land parcels as well as possible acreage changes due to mapping capabilities and upgrades of geographic information systems. Acreage modification does not necessitate changes in grazing management, because while 309 acres were included in the previous calculations of capable rangeland, livestock were not actually grazing the areas under current management. In summary, 74,263 acres, or approximately 44 percent of the project area, was determined to be capable and suitable to support livestock grazing and this acreage is the same for Alternatives 2, 3 and 4.

Capacity

Grazing capacity is defined as the maximum amount of livestock grazing that can be sustained on a land unit for a specific period of time without causing damage to vegetation or related resources. The most basic question is whether there is enough forage available for the permitted numbers of livestock to graze for the permitted season of use and to meet the forage needs for big-game wildlife species. Two approaches were used to determine whether enough forage was available within the project area to meet livestock and big-game species forage needs.

The first approach was estimating forage production for the six allotments and comparing that with the estimated forage needs for livestock and big-game wildlife species. An analysis was conducted to determine if the six allotments could sustain the permitted number of livestock for the season of use, at the authorized allowable use levels and provide adequate forage for big-game wildlife species (Wilmot 2015, Booth and Hayward 2015). This analysis was conducted at the project area scale because elk use could not be predicted at the allotment scale. Under existing conditions, there is approximately 104 million pounds of herbaceous vegetation produced annually on capable and suitable lands in the project area. A portion of this herbaceous vegetation is available as forage. Approximately 60 percent of herbaceous vegetation in uplands and 65 percent in riparian areas are available for livestock and big-game as forage, based on current permitted forage utilization levels, or 63.4 million pounds of grass and forbs is available as forage within the project area. Permitted livestock (9,089 cow/calf pairs) consume approximately 37 million pounds of forage during the permitted season of use. About 1,089 elk would consume 2.5 million pounds of forage and all big-game species combined would consume approximately 6.8 million pounds of forage. This is a high-end (maximum) estimate because some big-game species are browsers rather than grazers. Livestock and big-game species would conservatively consume 43.7 million pounds of forage annually and there is an estimated 63.4 million pounds available. Therefore, there is sufficient herbaceous forage available for livestock, elk, mule deer, moose, and pronghorn with approximately 19.7 million pounds of herbaceous vegetation remaining under grazing as currently permitted.

A second approach in determining whether enough forage is available was based on actual livestock and wildlife forage use in the allotments in light of resource conditions. This analysis demonstrates that ample forage exists for both livestock and wildlife while maintaining resource conditions. Grazing capacity may be “firmed up” by determining whether current management is causing damage to vegetation or related resources. This may be determined by measuring whether enough forage remains after both livestock and wildlife have used an area, or by determining whether long-term vegetation measures are indicating that vegetation health is being sustained under the livestock and wildlife use that is occurring. For the most part, ranges are by their nature too variable for estimated grazing capacity to be reliable, thus “firming up” capacity is a much more reliable method of determining livestock numbers (Blaisdell et al. 1982).

Table 21 is an estimate of available forage used by livestock at full permitted numbers and season of use. This table demonstrates that at full permitted numbers, livestock would be expected to use half or less of the available forage. These figures are based on the forage produced in areas where cattle are expected to graze, thus forage in areas outside of livestock accessible areas is not counted as available. All of the forage outside

the livestock accessible areas is left for wildlife and watershed health. In addition, the productions of plants that are relatively unpalatable, annual plants, noxious weeds, plants that do not occur frequently enough to be considered a significant part of the plant community, and plants that are not suited to withstanding grazing are not included in the production figures. These figures are thus relatively conservative; this is borne out by the relatively low degree of use that has been measured when monitoring livestock use on the Upper Green. This is one example of "firming up" capacity rather than basing capacity on forage production estimates.

Table 21. Actual forage utilization at permitted livestock numbers and season of use

Allotment	Percent of available forage used by livestock under current permitted numbers and season of use	Year data collected
Badger	10	1989
Beaver-Twin	26	1986
Roaring Fork	18	1968
Wagon Creek	32	1964
Upper Green	32	1964

Noble pastures allotment was not included in Table 21 because it is a very small allotment (760 acres or less than 1 percent of the 170,000-acre project area), that was sold to the United States. The previous owners hold a term grazing permit. A majority of the 760 acres has been converted from upland vegetation to more mesic species because it is irrigated and thus more productive than most of the project area. Further analysis of this pasture was conducted by the Natural Resource Conservation Service, because they specialize in irrigated pasture management (Booth and Hayward 2015, Appendix 10). The pasture rated out as the highest condition category described in the methodology used to evaluate the pasture. The guide for this methodology concludes that well managed pastures do no harm to soil, water and air quality.

Methodology and Assumptions

A variety of vegetation monitoring techniques were used to characterize vegetation condition and forage utilization including rooted nested frequency, line point intercept, permanent photo points, cover by life form transects, greenline stubble height transects, and forage utilization estimates using the utilization gauge or wheel method. Protocols for these monitoring techniques can be found in Interagency Technical Reference (1996a and1996 b), Wyoming Range Service Team (2001) and Region 4 Forest Service Handbook 2209.21 (2005). Additional protocols and data used in this analysis were Bridger-East Ecological Unit Inventory (U.S. Forest Service 1997a) and the Interior West Forest Inventory Analysis conducted by the US Forest Service, Rocky Mountain Forest and Range Experiment Station (U.S. Forest Service 2001 and O'Brien et al. 2003). Acres of shrub canopy cover were determined using the 2007 vegetation map developed for the Bridger-Teton National Forest. Range vegetation monitoring was conducted by the Forest Service and Wyoming Game and Fish with assistance from the Upper Green River Cattle Association and the University of Wyoming in the collection of permanent photo points, cover by life form transects, greenline stubble height transects, and forage utilization data in the Upper Green River Allotment.

Ocular assessment and estimation for species composition was used in reexamining past Ecological Unit Inventory plots. We were unable to relocate exact plot locations because locations were not permanently marked; rather locations were mapped. Due to a shortage of species composition data within the analysis area, these areas were revisited and examined in order to assess vegetation condition using the best data available. One of the strengths of this methodology is that it provides a determination of seral stage in species composition at one point in time. Additionally, although sites were not exactly relocated, sites were comparable because they were located in the same vegetation type, soil type, precipitation zone, elevation and general location. However, the data is limited in determining trend in species composition among years.

Professional judgment was used in accounting for potential site differences rather than changes in species composition over time. Finally, a degree of variability exists among observers collecting any monitoring data; this variability was assumed to account for only minor differences among years.

Key Areas

In order to describe the existing vegetation condition in sufficient detail to evaluate the effects of domestic livestock grazing, the interdisciplinary team focused on key areas. Key areas are representative areas defined as a relatively small portion of rangeland which because of its location, grazing or browsing value, and/or use, serves as a monitoring and evaluation site. A key area guides the general management of the entire area of which it is a part and will reflect the overall acceptability of current grazing management over the range.

At least one key area was selected for every pasture in the project area. The key areas were selected, based on professional judgment of the range specialists and permittees knowledge of sites that are indicative of the level of domestic livestock use that occurs within each pasture. This knowledge of the area and how cattle use it was supplemented and validated with an expected-use model to predict areas of livestock congregation. The model takes into consideration landscape features that govern the expected congregation locations of domestic cattle on rangelands without active herding (Guenther et al. 2000). These physical landscape features include distance to water, vegetation types, and slope.

Once the key areas were selected, they were overlaid with coverage of point data which was collected by the Forest Service in preparation for the Bridger-East Ecological Unit Inventory (EUI). Most of the vegetation data for this particular inventory was collected from 1991 through 1995, although fieldwork continued through 1997. By overlaying the key areas with the EUI point data, the interdisciplinary team was able to select specific key sites for each key area. A key site is a sampling site within the key area. Twenty-six key sites were identified by the interdisciplinary team. Additional data from randomly located vegetation surveys, Ecological Unit Inventory (U.S. Forest Service 1997a) and Forest Inventory Analysis (U.S. Forest Service 2001), were also used to analyze vegetation conditions and trends. A shortcoming in randomly locating sampling points is that the locations may not be representative of livestock use. Therefore only randomly located sites that fell within suitable and capable grazing areas were used for sampling sites. However, the location of the Ecological Unit Inventory or Forest Inventory Analysis monitoring sites still contained samples that were located near a fence line or livestock salting site which would have higher livestock use compared to the pasture in general. In addition, old range analysis data were also used; these data were not necessarily located on sites that would be considered key areas today.

Because key areas are meant to be representative of a larger area and to be indicative of the level of livestock use, a change in livestock management may result in the need to choose a new key area or site. The interdisciplinary team chose the location of the key sites. If a key site needs to be relocated in order to reflect a change in livestock use or management, an interdisciplinary process would be used to select the new site. The interdisciplinary team would solicit input from permittees or others that are familiar with the area; however, the final location would be determined by the District Ranger.

Focus Area

A focus area is an area in need of special management consideration due to its unique characteristics or sensitivity to disturbance. Focus areas do not currently meet desired conditions for one or more resources and the causative factors vary. Focus areas do not represent the entire pasture or allotment. There are seven focus areas within the project area: Waterdog Lake focus area, Tosi Creek focus area, Klondike focus area, Roaring Fork focus area, Fish Creek focus area, Wagon Creek focus area, and Tepee Creek focus area (Figure 3).

Summary of Existing Conditions by Indicator

Forest Service guidance (FSH2209.22.1) recommends a minimum of four indicators be considered when determining the functionality of upland range sites: ground cover, species composition, the presence or spread of non-native invasive species and shrub cover. These four indicators were assessed for analysis.

Ground Cover

Desired conditions

Region 4 of the U.S. Forest Service recommends minimum ground cover thresholds for upland plant communities in the intermountain region (Table 22). Ground cover was defined as basal vegetation, litter, moss/lichen, or rock greater than ¾-inch diameter. These ground cover thresholds are used to indicate proper functioning rangeland (watershed) condition. Functionality was defined as keeping soil/watershed physical components intact to provide for long-term sustainability and recoverability.

Table 22. Comparison of ground cover objectives for Region 4

Vegetation types	Region 4 ground cover thresholds	O'Brien et al. (2003) ground cover thresholds (GTR-104)	Ground cover objectives established for the project
Alpine (Herblands)	≥90% cover	90%	
Tall forb	≥65% cover	80%	80%
Mountain big sagebrush (Shrublands)	≥70% cover	85%	85-90%
Aspen	≥80% cover	95%	
Riparian and irrigated pasture			95%

Ground cover thresholds that are more reflective of the conditions and capabilities in the project area were developed by O'Brien et al. (2003). Rangeland in the project area is capable of supporting higher ground cover when compared to other parts of the intermountain region. These higher thresholds for ground cover were used to establish desired conditions and ground cover objectives for rangeland vegetation in the project area. In some instances, the interdisciplinary team established more stringent ground cover objectives than the thresholds recommended by O'Brien et al. (Table 22). In these cases, the reason for changing the objective was that ground cover measurements in that key area were higher than the minimum needed for proper functionality. The interdisciplinary team decided that since higher percent ground cover was possible, and was achieved in the presence of current and historic grazing impacts, it was desirable to maintain additional ground cover. In other instances, the key site did not fit well into the vegetation cover type used by O'Brien et al. (2003) in the GTR-104 (i.e. riparian and irrigated pasture); in those instances site visits were made by an interdisciplinary team to determine the ground cover objective. For example, on some sites containing shrubby cinquefoil, which indicates a high water table, the interdisciplinary team set a higher ground cover objective (95 percent for riparian and irrigated pasture) than for the sagebrush-shrubland vegetation type (85 percent).

Pastures not meeting the ground cover objective

Key sites are monitoring sites selected within key areas that are representative of the pasture and allotment. Twenty-six key sites were monitored for ground cover across the six allotments and these key sites were used to determine if pastures and allotments meet the ground cover objective. In addition, supplemental monitoring sites exist in some pastures; these supplemental monitoring sites provide additional information on range condition. Monitoring results indicate that 24 of 26 key sites met the ground cover objective. Five

allotments in the project area met the ground cover objective; these allotments were the Badger, Noble Pastures, Roaring Fork, Wagon Creek and Upper Green River allotments. Two key sites located in the Beaver-Twin Allotment (Twin Creeks Pasture) were determined to not meet the ground cover objective.

Species Composition

Desired Condition

Species composition is a determination of which plant species, in relative abundance, occupy a site in comparison to a desired mix of species (range condition) or in comparison to the mix of species that would be expected without disturbances such as livestock grazing (ecological condition). One way of evaluating cattle grazing impacts on species composition is to determine whether the relative abundance of the preferred forage species for cattle is declining, increasing, or stable. Livestock grazing can cause a decline in abundance of the most preferred forage species. Therefore, desired condition for species composition is defined as a stable or increasing abundance of preferred species, as well as an absence of noxious weeds. Additionally, a mix of species that indicated a high level of disturbance or “early seral” condition is not desirable, as this condition indicates a lack of range functionality.

In order to assess species composition, trends or changes in species composition over time are identified. In cases where there is only data for one point in time, trend in species composition could not be determined. In these cases, existing species composition was compared to a mix of species that would be expected without livestock grazing to determine the ecological status of the site. In order to meet Forest Plan direction to improve range that is in less than satisfactory condition, desired condition was defined in terms of condition and trend of species composition. The desired condition for species composition calls for plant communities in mid-seral or higher ecologic status with stable or upward ecological trend.

Pastures/Focus Area Not Meeting Species Composition Objective

Of the twenty six pastures in the project area, two pastures in one allotment, and one focus area did not meet the species composition objective. Mosquito NW Pasture and Mosquito SW did not meet the species composition objective and livestock grazing influences the recovery of these pastures. The Beaver-Twin Allotment (proposed Twin Creeks Pasture under Alternative 3) and the Roaring Fork focus area did not meet the species composition objective but the causative factor is primarily not due to livestock management.

Invasive Plants

Desired Condition

The desired condition regarding invasive plant species is to maintain or reduce invasive plants’ distribution and abundance across the project area.

Existing Condition

Invasive plants are present in the project area but are limited in distribution and abundance. Known occurrences occupy approximately 137 acres or less than 0.1 percent of the project area and are generally located near roads, campgrounds, trailheads, trails and in old timber sales. Specific areas of known invasive plant infestations include along the Green River Lakes Road, Green River Lakes Campground and trailhead, the Green River elk feedground, Whiskey Grove Campground, Beaver-Twin Creeks area, and along the Moose Creek-Gypsum Creek Road. While these incidental observations have resulted in most of the invasive plant locations identified to date, they do not constitute a systematic effort to identify infestations and correlate them to current grazing practices.

Three hundred eighteen Ecological Unit Inventory (EUI) plots were sampled in the project area of which 12 plots (4 percent) included an observation of invasive plants. Only two plots contained 5 percent or more

absolute cover of an invasive plant species, and the remaining ten plots contained just a trace. Canada thistle comprised ten of the twelve occurrences; the other two were quackgrass. The occurrence of Canada thistle fluctuates with canopy closure; therefore "risk" may not be indicated just by its presence (O'Brien et al. 2003). Some plots with invasive plants located during EUI sampling currently do not contain infestations.

No invasive plants were found in the project area as a result of the large scale Forest Inventory Analysis (FIA, O'Brien et al. 2003) nor on key sites within key areas; however, these methods are not designed to detect new and spreading invasive plant populations. The sampling intensity for FIA plots are one field plot every 5,000 meters. Key areas are selected to represent areas with livestock grazing and are not randomly distributed. As such it is unlikely that monitoring at the key areas will pick up new or expanding populations of invasive species, which are known to be highly localized and difficult to detect early on in the invasion process. Because of this, it is difficult to determine the degree to which cattle grazing influences the presence, distribution and abundance of invasive species; however, it is likely not a substantial factor in the presence and distribution in the project area Portions of the Green River Lakes Road serve as the cattle drive way and driving cattle through invasive species could serve to transport invasive plants, primarily Canada thistle, throughout the project area.

Several of the invasive plants found in the project area are designated as noxious by the State of Wyoming (Wyoming Weed and Pest Control Act, Designated List). In addition to those listed for the State, other non-native invasive plants, specifically cheatgrass and smooth brome, are considered in this analysis. Cheatgrass and smooth brome have been observed in the project area in very small proportion to native species and are not considered a problem because they remain a minor component of the total vegetation.

Most known invasive plant infestations are in readily accessible areas near roads, campgrounds, and trailheads which are easiest to survey. Areas not completely inventoried include closed roads, roadless areas, old timber sale areas, trails, wilderness areas, riparian corridors, and dispersed recreation sites.

Currently a Memorandum of Understanding between the Bridger-Teton National Forest and Sublette County Weed and Pest Control District is in place for the annual treatment of invasive plants as authorized under the Bridger-Teton Management of Noxious Weeds (U.S. Forest Service 2005). The Bridger-Teton National Forest uses an integrated noxious weed management approach to treat invasive plants. Control methods include chemical treatment, release of biological control agents on Canada thistle and musk thistle, and mechanical treatment (e.g. hand pulling). If populations of invasive plants are found to be associated with livestock grazing, integrated pest management techniques will be used to manage them as directed by Forest Service Manual 2900.

Shrub Cover

Desired Condition

Shrub canopy cover was assessed at the landscape level within the project area rather than at the pasture or allotment level because the desired classes of canopy cover are expected to occur across larger areas than the pasture or allotment scale. The desired mix of canopy cover classes for sustainable and functional sagebrush ecosystems as identified in the Forest Service Handbook 2209. 21.22 .1 (U.S. Forest Service 2005a) is:

- 10 percent of the sagebrush area has 0-5 percent shrub canopy cover.
- 50 percent of the sagebrush area has 6-15 percent shrub canopy cover.
- 40 percent of the sagebrush area has greater than15 percent shrub canopy cover.

Existing Condition

The existing mix of cover classes is approximately:

- 8 percent of sagebrush area has less than 10 percent shrub canopy cover.
- 31 percent of sagebrush area has 10-25 percent shrub canopy cover.
- 61 percent of sagebrush area has greater than 25 percent shrub canopy cover.

In general, the sagebrush communities within the Upper Green River project area are skewed toward mature stands with high canopy cover. Although the breakoff of sagebrush canopy cover classes differ slightly between the desired and existing condition data sets, the data indicates that there currently is an overabundance of sagebrush with high canopy cover in the Upper Green River project area compared to the desired condition. Of the 50,614 acres of sagebrush habitat within the project area, the majority of the sagebrush canopy cover (more than 61 percent) is in excess of 15 percent. Shrub cover also indicates a lower than desired percent of sagebrush in the moderate shrub canopy cover class.

Livestock grazing has been associated with long term increases in cover of woody species. The mechanism is apparent in that excessive livestock grazing increases the cover of *Artemisia* in many systems by reducing the competition from other plants (Whisenant 1990, Daddy 1988). Information on species composition and utilization of desirable grasses and forbs indicate that most of the project area contains desirable assemblages of these plants. It is therefore improbable that current livestock grazing is related to frequency of sagebrush within the project area. Once shrub cover density exceeds 15 percent, the area can be returned to a desired level through re-introduction of fire or other mechanical treatment. Additionally, shrub cover is a landscape level indicator that is not useful on a small scale. Because shrub cover doesn't respond to grazing management once it's established (INT-GTR-134, 1982) (Winward 1991) and because it's not useful on a small scale such as key areas, it does not constitute a key issue with regard to rangeland vegetation.

Existing Conditions by Allotment or Rotation

Badger Creek Allotment

Ground Cover: In 2011, existing ground cover was 93 percent which meets the ground cover objective of 85 percent. The Badger Creek Allotment is at desired condition based on this indicator.

Species Composition: Species composition was monitored in 2011. The plant community was determined to be at mid-seral status. Because this is a first reading of the plant composition, trend is undetermined. The Badger Creek Allotment meets the species composition objective and is at desired condition based on the species composition indicator.

Based on ground cover and species composition monitoring, this allotment is meeting objectives related to rangeland vegetation.

Beaver-Twin Allotment

Ground Cover: Under Alternative 2 the Beaver-Twin Allotment is one pasture; under Alternatives 3 and4, the allotment would be divided into three pastures. Existing conditions are presented for the three proposed pastures. Two key sites failed to meet ground cover objectives; these key sites were located in the Twin Creeks Pasture. The ground cover objective was met in the Rock Creek and North Beaver Pastures.

The Twin Creeks pasture had two key sites that were below objective. One key site was monitored in 2011 in a tall forb vegetation type and is located in relatively steep terrain. Existing ground cover was 68 percent and the objective is 80 percent. Low ground cover at this key area is likely not due to cattle grazing because steep

terrain typically inhibits cattle use of the area. Loss of tall forb communities across the Bridger-Teton National Forest has been associated with sheep grazing, rather than cattle grazing (U.S. Forest Service 1997), and this is more likely the cause of low ground cover at this site. There is considerable diet overlap with domestic sheep, elk, and mule deer in the tall forb communities, but minimal overlap with cattle. Another possible factor influencing low ground cover is grazing by summering elk. The second site in the Twin Creeks Pasture was measured in 2002 which predates implementation of the current management (2009-2013). This site had 64 percent ground cover with an 85 percent objective. The trend is not known for either of these two key sites because both have only one measurement to date. Two additional monitoring sites in the Beaver-Twin Allotment met the ground cover objective. One site was monitored in 1992 to 1994, and the other site was monitored in 2011. The 2011 site had 86 percent ground cover with an 85 percent objective.

Species Composition: The Twin Creeks Pasture failed to meet the species composition objective. There are two nested frequency studies within this pasture; while one site was in an upward trend, the other indicated a downward trend. The site trending upward is in a location that is quite steep, and is occupied by tall forb vegetation that is not typically preferred by cattle. A majority of the loss of tall forb vegetation communities on the Bridger-Teton National Forest is associated with sheep grazing (U.S. Forest Service 1997), rather than cattle grazing. It appears that the other nested frequency site which is in a declining trend is more representative of existing livestock grazing effects because it is located in a site that is preferred by cattle.

Waterdog Lake Focus Area: This site is in a tall forb community type with low ground cover and high utilization by pack stock associated with outfitters, hunters and campers in addition to livestock. Ingestion of poisonous plants has caused livestock mortality at the focus area. Increased ground cover and a decrease in livestock mortality have resulted under current management. For further discussion of this focus area, refer to the Recreation section.

Noble Pastures Allotment

Ground Cover: Ground cover at a key site in Noble Pasture 1 was 94 percent compared to the objective of 95 percent. This does not constitute a significant departure from the ground cover objective and, therefore, the pasture is considered at objective. This key site was last measured in 2002. Within the pasture there is also an upland key site measured in 2011 that meets the ground cover objective. Further analysis of this pasture was conducted by the Natural Resource Conservation Service (Appendix 9 of the Range Specialist Report, Booth and Hayward 2015), because they specialize in irrigated pasture management. The analysis showed that the pasture rated out as the highest condition category which was described as a well-managed pasture that does not harm soil, water, and air quality. However, impacts to soils were noted by the Forest Service Soils Specialist (Soils section, Winthers 2015). In 2002, Noble Pastures #2, 3, and 4 had ground cover of 100 percent which meet the ground cover objective of 95 percent. The allotment is at desired condition based on this indicator.

Species Composition: Species composition was monitored in 2011 in Pasture #1. The plant community was determined to be at mid-seral ecological status. Monitoring conducted in Pasture #1 was assumed to represent the other three Noble Pastures because they are relatively homogenous, irrigated pastures. The Noble Pastures Allotment meets the species composition objective and is at desired condition based on the species composition indicator.

Therefore, based on ground cover and species composition monitoring, this allotment is meeting objectives related to rangeland vegetation.

Tosi Creek and Klondike Creek Focus Areas: See Riparian Area section for description of existing conditions.

Roaring Fork Allotment

Ground Cover: In 2011, existing ground cover was 96 percent which meets the ground cover objective of 85 percent. The Roaring Fork Allotment is at desired condition based on the ground cover indicator.

Species Composition: In mid seral condition based on site visits and comparison of allotment to the Roaring Fork focus area monitoring site. The Roaring Fork focus area monitoring site indicated only a slight downward trend in species composition and was more heavily used than the allotment in general. Therefore based on a low stocking ratio, site visits and professional judgment, the Roaring Fork Allotment was determined to meet the species composition objective.

Based on ground cover and species composition monitoring, this allotment is meeting objectives related to rangeland vegetation.

Roaring Fork Focus Area: This focus area is located on a south facing slope near the Upper Green River elk feedground. The area is heavily used by elk; it was noted to have an abundance of elk pellets in the area. Species composition was monitored in 2011. Monitoring indicated a slight declining trend in species composition which is due primarily to elk congregating at this site.

Wagon Creek Allotment

Ground Cover: Ground cover at a key site was 93 percent in 2002 compared to the objective of 95 percent. This does not constitute a significant departure from the ground cover objective and, therefore, the pasture is considered at desired condition but may warrant further livestock management consideration to ensure that the allotment continues to meet the objective. Within the allotment there is also an upland ground cover site measured in 2011 that meets the ground cover objectives. Ground cover in the upland key site was measured in 2011 at 94 percent; the desired condition is 85 percent. Therefore the pasture is meeting the desired upland ground cover.

Species Composition: This is a site where trend cannot be established due to a single reading of species composition. The site is in mid-seral ecological status and is meeting the species composition objective and desired condition.

Based on ground cover and species composition monitoring, this allotment is meeting objectives related to rangeland vegetation.

Upper Green River Allotment

Mud Lake/Fish Creek Rotation

<u>Mud Lake East Pasture</u>
Ground Cover: In 2011, existing ground cover was 98 percent which meets the ground cover objective of 90 percent. The pasture is at desired condition based on the ground cover indicator.

Species Composition: Species composition was last monitored in 2014. The plant community was determined be in mid seral ecological status with a stable trend. This site was an EUI site, not a key site, and therefore not representative of the entire pasture because it was located on an existing cattle salting area. The Forest Service will establish a new key site for long term monitoring of ground cover and species composition in this pasture.

Based on species composition monitoring, this allotment is meeting objectives related to rangeland vegetation.

Mud Lake West Pasture
Species Composition: Species composition was monitored in 2011 and revisited in 2013. The plant community was determined be in mid seral ecological status with a stable trend. The pasture meets species composition objective.

Fish Creek Pasture
Ground Cover: In 2011, existing ground cover was 89 percent which meets the ground cover objective of 85 percent. The pasture is at desired condition based on the ground cover indicator.

Species Composition: Species composition was last monitored in 2011. The plant community was determined be in mid seral ecological status with a stable trend. The pasture meets the species composition objective.

Fish Creek Focus Area: See the Riparian Areas section for description of existing conditions

Mosquito Lake Rotation

Based on cover by life form data (cooperative monitoring data), all upland sites in the Mosquito Lake Pastures are either stable or trending upward with an increase in ground cover and preferred grasses and a decrease in mat forming forbs. As a result of livestock management efforts (forage utilization of less than 30 percent in the uplands and stubble heights ranging from 4.4 to 13.3 inches along the greenline of the creek), improvements in upland and riparian conditions have been documented. There is an upward trend with better overall ground cover, increased grass production and decreased forb production on upland sites. Riparian sites saw increased bank stability with increased willow production and recruitment with additional Carex production on point bars.

Mosquito SW Pasture
Ground Cover: Ground cover at a key site in the Mosquito SW Pasture was 89 percent compared to the objective of 90 percent. This is not a significant departure from the objective; however, the ground cover has declined since 1999 with a more recent upward trend since 2003. Therefore, the pasture is considered at desired condition but may warrant further livestock management consideration to ensure that the pasture meets the objective.

Species Composition: In 1959, 8,890 acres of sagebrush were sprayed in the Mosquito Lake area which likely had a negative effect on species composition. Mosquito NW and SW Pastures did not meet desired species composition conditions as the species composition trend declined slightly from 1996 to 2011. Cover by life-form and ground cover readings taken on a more regular interval in these pastures indicate that a downward trend was evident between 1999 and 2002. For example, on site SWMP-4 ground cover dropped from 95 percent to 87 percent and on site SWMP-2 ground cover dropped from 99 percent to 67 percent. However, since 2002, these pastures have demonstrated an upward ground cover trend. Species composition likely exhibited the same declining trend between 1999 and 2002. It is likely that species composition is in an upward trend since 2002 as well, based upon annual monitoring and photo point evaluation of ground cover that took place on a more frequent basis than evaluation of species composition.

Mosquito SE Pasture
Ground Cover: In 2009, existing ground cover was 98 percent which meets the ground cover objective of 85 percent. The pasture is at desired condition based on the ground cover indicator.

Species Composition: Species composition was last monitored in 2011. It was determined that the ecological trend was stable and late seral species were increasing. The pasture meets the species composition objective.

Mosquito NE Pasture
Stable conditions in the uplands and upward trends (improved conditions) in riparian areas were apparent by increased bank stability and increased willow production and recruitment.

Ground Cover: In 2011, existing ground cover was 99 percent which meets the ground cover objective of 85 percent. The pasture is at desired condition based on the ground cover indicator.

Species Composition: Species composition was last monitored in 2011. It was determined that the ecological trend was stable and late seral species were increasing. The pasture meets the species composition objective.

Mosquito NW Pasture
Stable conditions in the uplands and upward trends (improved conditions) in riparian areas apparent by increased bank stability and increased willow production and recruitment, and increased sedge production on point bars.

Ground Cover: In 2004 ground cover was 100 percent which meets the ground cover objective of 85 percent.

Species Composition: Conditions exist here as described in Mosquito SW Pasture. The pastures did not meet the species composition objective as the species composition trend declined slightly from 1996 to 2011. Cover by life-form and ground cover readings taken on a more regular interval in these pastures indicate that a downward trend was evident between 1999 and 2002. However, since 2002, the Mosquito NW and SW Pastures have demonstrated an upward ground cover trend. Species composition likely exhibited the same declining trend between 1999 and 2002. It appears likely that species composition is in an upward trend since 2002 as well, based upon annual monitoring and photo point evaluation of ground cover that took place on a more frequent basis than evaluation of species composition.

Wagon Creek Focus Area: See Riparian Areas section for description of existing conditions

Figure 40. Photo comparison of Wagon Creek in 1996 (left) and 2009 (right)

In 2009 (right photo), the creek has narrowed in stream channel width and contains more riparian vegetation along the stream bank, indicating improved stream bank stability and riparian function compared to the same creek in 1996 at a different time of the year (left photo)

Tosi Creek/Tepee Creek/Kinky Creek Rotation

Lower Tepee Creek Pasture
Ground Cover: Ground cover at a key site in the Lower Tepee Creek Pasture was 90 percent in 2011 compared to the objective of 85 percent. This meets the ground cover objective and, therefore, the pasture is considered at desired condition.

Species Composition: In 2011, this key site had a stable trend which meets our objective for species composition.

Upper Tepee Pasture
Ground Cover: This was last read in 2011and was 94 percent with an 85 percent objective. The pasture is at desired condition based on the ground cover indicator.

Species Composition: Species composition was last monitored in 2011 with a stable ecological trend. The pasture meets the species composition objective.

Tosi Creek Pasture
Ground Cover: Ground cover was monitored in 2011. Ground cover was 90 percent with an 85 percent objective. The pasture is at desired condition based on the ground cover indicator.

Species Composition: Species composition was last monitored in 2011. It was determined that the ecological condition was stable. The pasture meets the species composition objective.

Tepee Creek Focus Area
In 1956, 1,240 acres of sagebrush were spray in Lower Tepee Creek Basin to reduce sagebrush cover. Unfortunately, windy conditions caused drift of the herbicide, resulting in aspen and willow mortality along Tepee Creek. Currently, willow establishment is lower than expected along Tepee Creek which may be a result of this past herbicide application.

In 1982, Tepee Creek lacked adequate riparian vegetation along the stream and stream banks were unstable. From 1982 to 2011, an upward trend in stream bank stability, increases in willow production and density, and increases in sedge production on point bars has been documented over the years, and is moving slowly towards the desired condition. Improvement in the riparian condition of Tepee Creek is a result of livestock management efforts including forage utilization of less than 30 percent in the uplands and stubble heights of 6 inches along the greenline of the creek. See the Riparian Areas section for further description of existing conditions.

Kinky Creek Pasture
Ground Cover: Ground cover was monitored in 2011 and was 93 percent with an 85 percent objective. The pasture is at desired condition based on the ground cover indicator.

Species Composition: Species composition was last monitored in 2011. It was determined that the ecological condition was mid-seral; therefore, the pasture meets the species composition objective.

Gypsum Creek Rotation

Upper Gyp Pasture
Ground Cover: In 2011, the existing ground cover was 93 percent which meets the ground cover objective of 85 percent. The pasture is at desired condition based on the ground cover indicator.

Species Composition: Species composition was last monitored in 2011. The plant community was determined to have a stable trend. The pasture meets the species composition objective.

Based on ground cover and species composition monitoring, this allotment is meeting objectives related to rangeland vegetation.

Lower Gyp Pasture
Ground Cover: In 2011, existing ground cover was 95 percent which meets the ground cover objective of 90 percent. The pasture is at desired condition based on the ground cover indicator.

Species Composition: Species composition was last monitored in 2011. The plant community was determined to have a stable trend. The pasture meets the species composition objective.

This allotment is meeting objectives related to rangeland vegetation.

South Gypsum Creek
Based on photos taken from 1999 to 2009, the apparent trend of South Gypsum Creek is stable with increased ground cover and willow production. Improvement in the riparian condition is partly a result of livestock management efforts including forage utilization which ranged from 10 to 35 percent with average stubble height of 8.7 inches compared to an ungrazed height at 11.2 inches.

Comparison of South Gypsum Creek in 1999 (left photo) to the same stream segment in 2009 (right photo). Comparison of the stream section in the bottom right of pictures indicates narrowing of stream channel and increase in woody riparian vegetation.

River Bottom Pasture/ Livestock Driveway

See the Riparian Areas section for a description of existing conditions.

Environmental Consequences

Issue 4: Rangeland Function

Livestock grazing may affect vegetation and soils, which are the components of overall rangeland function. Vegetation communities and watersheds that are not functioning properly provide less than optimum conditions for wildlife, rangeland health and productivity and soil stability.

Effects Indicators for Comparison of Alternatives

Indicators: Percent ground cover; plant species composition ecological status and/or trend; relative abundance of invasive plants; and potential change in shrub canopy cover. Soil resource indicators are listed in the Soils section.

Spatial and Temporal Context for Effects Analysis

The spatial context for rangeland vegetation is the project area. Since the purpose of this analysis is to describe the expected environmental effects of livestock grazing, the areas scrutinized most closely are those where livestock use is evident or probable. These include areas considered not capable because of highly erodible soils but which in practice support livestock grazing without any identified resource concerns. The temporal context for effects on ground cover and species composition includes short term effects that can occur annually and long-term effects (relevant to meeting desired condition) that can take 20 years or more to

achieve. Long-term trends are typically assessed at five to ten year intervals. This spatial and temporal context was used also for the cumulative effects analysis.

Alternative 1 – No Livestock Grazing (No Action Alternative)

Summary of Direct and Indirect Effects

Ground Cover and Species Composition

Vegetation in most areas is currently meeting ground cover and species composition objectives and would continue to meet resource objectives and remain in properly functioning condition. Ground cover and species composition is expected to remain at or above objective in these areas under Alternative 1. The vegetation conditions on all key areas that are in less than desired condition would be expected to move rapidly towards desired condition as the effects of livestock grazing would not occur. Current impacts to ground cover and species composition made by big game species (elk, pronghorn, mule deer and moose) would continue to occur. Lowering the total levels of combined livestock and big game use, by eliminating livestock grazing, would reduce the use of grasses and forbs in the uplands and woody species and sedges in riparian areas. Ground cover and species composition would be expected to increase in these areas and reach objective at a more rapid rate under this alternative than under either Alternative 2, 3 or 4. Vegetation conditions in focus areas and identified problem areas would be expected to rapidly recover from livestock grazing impacts, although negative effects from uses other than livestock grazing would continue (recreation trailing, vehicle crossings). Restoration of the focus areas, to the extent that they rely on reducing the environmental effects from livestock grazing, would be expected.

Structural improvements

Removing approximately 75 miles of fence using vehicles to access and remove fences would have minor short term negative effects due to vehicles crushing plants and reducing plant vigor in the current growing season. Ground cover and species composition may decrease slightly along the fence line in the short term. Long-term impacts would be negligible.

Invasive Plants

Under Alternative 1, invasive plants would continue to be managed under the Bridger-Teton National Forest Integrated Invasive Species Management Strategy. The distribution and abundance of invasive plants would remain similar to that described in the existing conditions (approximately 137 acres) because livestock grazing is not considered the primary mode of transport and spread.

Livestock can disperse seeds of invasive plants and increase the potential of invasive plant establishment by increasing the area of bare ground, and by selectively grazing native plants. Therefore, the elimination of livestock grazing could result in a slight decrease in the spread of invasive plants in areas such as the livestock driveway, although no evidence of the spread of invasive plants by livestock has been noted in the project area.

Shrub Cover

Sagebrush cover is not expected to directly change as the result of the elimination of livestock grazing and would remain as described in Chapter 1 (not meeting the shrub cover objective and desired condition). Indirectly, the amount of grass and forbs in the sagebrush understory would increase with the elimination of livestock grazing which would result in an increase in fine fuels that could carry a wildfire, should one occur. The increased potential for the sagebrush community to carry a wildfire would result in increases in sagebrush in the 0-5 percent shrub canopy cover and eventually increases in the 6-15 percent shrub canopy cover as sagebrush reestablished. Alternative 1 would result in the greatest amount of grass and forbs in the

sagebrush understory compared to the action alternatives and therefore would have the greatest potential to carry a wildfire and reduce shrub canopy cover over the largest area. Increased grass/forb presence and competition for water and nutrients in the understory would tend to decrease the rate at which woody species cover increases over time; although this effect would probably be incremental and difficult to measure in the short term.

Direct and Indirect Effects by Allotment or Rotation

Badger Creek Allotment

Ground cover and species composition are meeting the objective (desired condition). Under Alternative 1- No Livestock Grazing, there would be a slight increase in herbaceous vegetation as livestock are currently using approximately 30 percent of the forage. Ground cover and species composition objectives would continue to be met under this alternative.

Beaver-Twin Allotment

Under Alternative 1, there would generally be a slight increase in ground cover and improvement in species composition. The exception to this is in the tall forb communities where ground cover is below objective and is expected to remain so because of the low site potential of these tall forb communities. Under current management, cattle avoid these steep terrain sites. Removal of livestock would likely not improve ground cover at these tall forb sites (see Soils Section for more discussion). With removal of livestock, species composition would be expected to improve (move toward objective) on the proposed Twin Creek Pasture.

Waterdog Lake Focus Area: Under current management, livestock use is discouraged, and such use that does occur is incidental in nature. Under Alternative 1, removal of livestock grazing would result in a slight reduction of forage utilization when compared to current management. Therefore, species composition and ground cover would be expected to improve slightly. These indicators would be expected to move towards objectives at a slightly higher rate than expected under Alternatives 2, 3, or 4.

Noble Pastures Allotment

Existing condition is meeting ground cover and species composition objectives. This is expected to continue under Alternative 1 because the Forest Service would continue to irrigate the pastures.

Tosi Creek Focus Area and Klondike Creek Focus Area: Effects to these areas are disclosed under the Riparian Areas section.

Roaring Fork Allotment

Under current management ground cover and species composition are meeting objectives. Under Alternative 1- No Livestock Grazing, there would be a slight increase in herbaceous vegetation as livestock are currently using approximately 30 percent of the forage. Ground cover and species composition objectives would continue to be met under this alternative.

Roaring Fork Focus Area: With removal of livestock, changes in species composition and ground cover would not be expected or may improve only slightly because current impacts are due primarily to elk concentration and grazing associated with the Upper Green River elk feedground. Impacts of the elk feedground were analyzed in the Final Environmental Impact Statement Long Term Special Use Authorization for Wyoming Game and Fish Commission to Use National Forest System Land for their Winter Elk Management Activities (U.S. Forest Service 2008b). This document reported that natural vegetation at and near (1 mile radius) the feedground sites would be affected by elk browsing on shrubs, trees, grass, and forbs, by increased fertilization of vegetation from concentrated elk feces, suppression of

vegetation by accumulation of litter, and by soil compaction and erosion (U.S. Forest Service 2008b p. v). Species diversity indices indicated differences between feedground and reference sites on the Upper Green River such that increased levels of disturbance resulted in decreased plant species diversity (U.S. Forest Service 2008b p. 38). Therefore, this focus area would likely fail to meet the species composition objective under this alternative.

Wagon Creek Allotment

Under current management and existing conditions, ground cover and species composition are meeting objectives. Under Alternative 1- No Livestock Grazing, there would be an increase in herbaceous vegetation as livestock are currently using approximately 50 percent of the forage. Ground cover and species composition objectives would continue to be met under this alternative.

Upper Green River Allotment

Mud Lake/Fish Creek Rotation

Under current management and existing conditions, ground cover and species composition are meeting objectives. Under Alternative 1- No Livestock Grazing, there would be a slight increase in herbaceous vegetation as livestock are currently using approximately 30 percent of the forage. Ground cover and species composition objectives would continue to be met under this alternative.

Fish Creek Focus Area: Effects to this area are disclosed under the Riparian Areas section.

Mosquito Lake Rotation

Under Alternative 1, ground cover would slightly increase or remain stable and the upward trend towards meeting the ground cover objective would continue at the fastest rate compared to Alternatives 2, 3, and 4. Species composition is expected to improve under Alternative 1 and move towards the species composition objective again at the fastest rate compared to Alternatives 2, 3, and 4.

Wagon Creek Focus Area: Effects to this area are disclosed under the Riparian Areas section.

Tosi Creek/Tepee Creek Rotation

Under current management and existing condition, ground cover and species composition are meeting the objectives. Under Alternative 1- No Livestock Grazing, there would be a slight increase in herbaceous vegetation as livestock are currently using approximately 30 percent of the forage. Ground cover and species composition objectives would continue to be met under this alternative.

Tepee Creek Focus Area: Effects to this area are disclosed under the Riparian Areas section.

Kinky Creek

Generally ground cover and species composition would remain unchanged because under current management, no livestock grazing occurs in this pasture with the exception of the small pasture associated with Darwin Ranch. Under Alternative 1, grazing by 27 horses season-long in the small pasture would be discontinued resulting in an increase in herbaceous vegetation, ground cover and species composition.

Gypsum Creek Rotation

Under current management and existing conditions, ground cover and species composition are meeting objectives. Under Alternative 1, there would be a slight increase in herbaceous vegetation as livestock are currently using approximately 30 percent of forage. Ground cover and species composition objectives would continue to be met under this alternative.

South Gypsum Creek: Effects to this area are disclosed under the Riparian Areas section.

River Bottom Pasture/ Livestock Driveway

Under Alternative 1, there would be a slight increase in herbaceous vegetation especially within the livestock driveway. Increased ground cover and species composition would be expected.

Cumulative Effects for Alternatives 1, 2, 3 and 4

The interdisciplinary team identified past, present and reasonably foreseeable future activities which were considered for this cumulative effects analysis (see Appendix A). The spatial context for rangeland vegetation is the project area. The temporal context for effects on ground cover and species composition includes long-term effects that can take 20 years or more to achieve. Long-term trends are typically assessed at 5 to 10 year intervals. This spatial and temporal context was used for the cumulative effects analysis.

Historical grazing practices resulted in more environmental effects to vegetation including effects on ground cover, species composition, invasive plants and shrub cover than do present grazing practices because historical numbers of livestock were higher and management considerations were not focused on high use areas, such as riparian areas. However the effects of historic livestock grazing have already been considered in the existing conditions assessment and therefore do not require further consideration for the purposes of this analysis. Likewise, effects of past noxious weed treatments, dispersed recreation, and elk feeding at the Upper Green River elk feedground have negatively affected ground cover, species composition, invasive plants and sagebrush cover, but these effects are incorporated into the existing condition and /or are disclosed in other analyses.

Ground Cover and Species Composition

Current and future recreationists including dispersed campers, picnickers, hikers, fishermen, hunters, and all-terrain vehicle users may reduce ground cover, degrade species composition, reduce stream bank stability and adversely affect riparian function, especially in areas of concentrated use such as along the Upper Green River. The proposed Green River Corridor Recreation Planning Project will examine existing use along the Upper Green River and propose management aimed at reducing negative impacts to resources. Implementation of decisions arising from this project would have beneficial effects by managing recreationists and their impacts on ground cover, species composition, and invasive plants in the project area.

Continued authorization of the Upper Green River elk feedground would likely result in continued trampling of soils and vegetation, increased bare ground, deteriorated species composition, and increased potential for invasive plant establishment (U.S. Forest Service 2008). Negative effects are greatest at the elk feedground with decreasing effects associated with increasing distance from the feedground.

The cumulative effect on ground cover and species composition of these activities combined with each alternative would likely not reach the threshold of unacceptable impact. A minimum of 60 percent ground cover is the threshold established for this analysis based on Forest Service Region 4 direction (Forest Service Handbook 2209.21). Sixty percent ground cover is required for limiting water erosion to acceptable levels. A minimum of a mid-seral ecological status or a 50 percent similarity in plant species to a potential natural community is the established threshold for species composition developed for this analysis. Cumulative effects may cause declines in ground cover and/or species composition in isolated areas resulting in these areas not meeting the project resource objectives or desired conditions for ground cover and species composition. The extent of the cumulative effects would be small areas, minor in scale, such as dispersed camping areas and areas near the elk feedground. The cumulative effect of these activities and Alternative 1 would result in the lowest net negative effect compared to Alternatives 2, 3 and 4. Cumulative effects associated with past, present and reasonably foreseeable future activities and Alternatives 3 or 4 would be slightly lower than cumulative effects associated with Alternative 2. This is because Alternative 3 and 4

addresses areas currently not meeting ground cover and species composition objectives associated with livestock management.

Invasive Plants

Invasive plant**s** would continue to be managed under the Bridger-Teton National Forest Integrated Invasive Species Management Strategy. The effect of this strategy is to reduce the distribution and abundance of invasive plants and improve species composition within the project area in the long term. Minor short term negative effects can result when herbicide is unintentionally applied to non-target plants. Roads, vehicles, hunter hay/feed, and logging are the primary vectors of invasive plants. These activities would likely continue to contribute to invasive plant dispersal.

Under Alternative 1, the current rate of spread associated with vehicles, hay for elk and recreationists' stock, and past logging activities would continue with a potential slight decrease in spread of invasive plants primarily along the livestock driveway due to the removal of livestock. The cumulative effect of livestock grazing and past, present and future activities would be slightly below the existing conditions of 137 acres of invasive plants (primarily Canada thistle) with a continued neutral to slow rate of spread. This meets the invasive plant species objective and desired condition for this indicator.

Under Alternative 2- Grazing as Currently Permitted, the current distribution and rate of spread of invasive plants associated with livestock grazing in addition to vehicles, hay for elk, recreationists' stock, and past logging activities would continue as described in the existing condition section; approximately 137 acres of invasive plants with a neutral to slow rate of spread due to effective integrated invasive plant management strategy and the fact that no invasive species have been identified in long-term monitoring transects for areas representing the effects of livestock grazing. The cumulative effect of these activities on invasive plants would be a continuation of existing conditions. The cumulative effects under Alternative 2-Current Management would be greater than Alternative 1 and similar to Alternatives 3 and 4. All would likely meet the invasive plant objective and desired condition.

Under Alternative 2, the cumulative effect would potentially be greater than under current management and Alternatives 1, 3, and 4. The potential for increase in invasive plants would be associated with areas not meeting ground cover and species composition objectives. However, the rate of spread is expected to be slow and only a minor increase over existing condition. Integrated management would still be expected to effectively control invasive plants. Therefore, the cumulative effect under permitted numbers and allowable use would likely meet the invasive plant species objective and desired condition for this indicator.

Under Alternatives 3 and 4, the current distribution and rate of spread of invasive plants associated with livestock grazing in addition to vehicles, hay for elk, recreationists' stock, and past logging activities would continue similarly to that described in the existing condition section, approximately 137 acres of invasive plants with a neutral to slow rate of spread due to effective integrated invasive plant management strategy and the fact that no invasive species have been identified in long-term monitoring transects for areas representing the effects of livestock grazing. The cumulative effect of these activities on invasive plants would be slightly lower (better) than the existing conditions because areas not meeting ground cover and species composition objectives would be addressed.

Shrub Canopy Cover

Past fire management was largely confined to fire suppression. The primary effect of historical fire suppression on rangeland vegetation was to increase shrub canopy cover and reduce the diversity of age classes in the sagebrush overstory. This is incorporated into the existing condition assessment for this project. In 2004, Forest Plan fire management standards and guidelines were amended (U.S. Forest Service 2004). Currently, fires on the Bridger-Teton National Forest are managed to accomplish resource management

objectives which can benefit age class diversity of vegetation. For example, in 2013, the Green Fire burned approximately 1,066 acres of coniferous forest and sagebrush vegetation types in the Roaring Fork Allotment. The effect of this fire was to reduce the sagebrush and forest canopy cover in the burn area, increase grasses and forbs, and improve age class diversity by converting stands in the mature age class to stands in the young age class – a beneficial long-term effect to shrub canopy cover. In the short term, fires reduce ground cover and increase erosion potential until the area is revegetated.

Pinyon Osborn Vegetation Treatments Project is a future project that proposes to burn approximately 20,000 acres in the Mud Lake/Fish Creek rotation of the Upper Green River Allotment and the Roaring Fork Allotment. This project would have a beneficial effect by reducing shrub and forest canopy cover and enhancing age class diversity.

Sagebrush canopy cover would remain stable for all alternatives and would remain greater than the desired condition. Should a fire occur, Alternative 1 would indirectly result in the greatest amount of grass and forbs in the sagebrush understory compared to Alternatives 2, 3 and 4 and therefore would have the greatest potential to carry a wildfire and reduce shrub canopy cover over the largest area. Alternatives 3 and 4 would have a slightly greater amount of grass and forbs in the sagebrush understory compared to Alternative 2-Grazing as Permitted because areas currently not meeting the ground cover objective would be expected to meet the objective under Alternatives 3 and 4. Cumulative effects associated with Alternatives 1, 2, 3 or 4 and past, present, and foreseeable future activities on shrub canopy cover are below the level of concern.

In summary, the cumulative effects of Alternative 3 or 4 combined with effects of past, present, and foreseeable future activities would be less than cumulative effects of Alternative 2 and these other activities because areas currently not meeting desired conditions would improve under Alternatives 3 and 4. Alternative 1 and past, present, and foreseeable future activities would be expected to cumulatively result in slightly more benefits in ground cover, species composition, invasive plants and shrub cover compared to cumulative effects associated with Alternatives 3 and 4, however Alternative 1 would not contribute to the purposes of the project (authorization of livestock grazing). The magnitude and extent of environmental effects, considered cumulatively, are not expected to exceed the capacity of the rangeland resource to sustain itself and are expected to be below a threshold of concern for all alternatives.

Ability to Address Issue #4: Rangeland Function.

Vegetation in most areas would be expected to remain in properly functioning condition. Vegetation conditions in identified problem areas would be expected to improve over time.

Effects of Livestock Grazing Applicable to Action Alternatives (Alternative 2, 3 and 4)

The effects analysis for Alternatives 2, 3 and 4 are based on the following research findings and discussion of livestock grazing in terms of timing, intensity, frequency and duration and utilization levels.

Assumptions

In order to estimate and compare the environmental effects of the alternatives, a couple of assumptions must be made:

- Effective compliance with design features and allowable use.
- Effective placement of key areas that reflect changes in vegetation.

Direct and Indirect Effects

Livestock grazing has contributed to changes in vegetation in the project area. The vegetation changes caused by livestock grazing are generally limited to ground cover, species composition and invasive plant changes

within vegetation communities rather than broad changes in landscape scale vegetation types discussed in the affected environment. Undesirable changes in vegetation may be lessened or avoided by addressing or limiting the intensity of livestock grazing. This may be done by limiting the amount of vegetation that is used by livestock. This may be accomplished by establishing proper use standards and removing livestock from an area prior to exceeding these standards. For the purposes of this analysis, proper use is defined as a degree of utilization of current year's growth, which, if not exceeded, will help to achieve management objectives to maintain or improve the long-term productivity of rangelands. Alternatives 2, 3, and 4 propose three approaches to manage for proper use. Direct, indirect and cumulative effects predicted for a specific alternative are discussed below beginning. Paragraphs immediately below describe effects associated with livestock grazing in general.

Effects of livestock use include displacement of soil and vegetation in relatively small areas of the allotment, areas such as those around stream crossings, fence lines (especially in corners), water developments, and salting sites.

Timing, Intensity, Frequency, and Duration of Livestock Grazing

The alternatives that authorize grazing are described in terms of their prescribed timing, frequency, duration, and intensity. Timing of grazing is important because when plants are defoliated (grazed) at the same time of year, every year, they are more likely to lose a competitive advantage to plants that are dormant or less palatable at that time of year. Timing is generally addressed by prescribing rotational grazing. Timing may also be addressed by avoiding grazing too early in the spring, before desirable plants have time to develop enough photosynthetic leaf area to replenish the root reserves.

Intensity refers to the amount of leaf area that is removed by grazing. It is an important consideration because as more leaf area of a plant is removed, less is left to carry on photosynthesis and replenish the roots of a plant. Intensity may be measured as utilization or stubble height remaining. Issues related to intensity may be addressed by limiting utilization or prescribing a fixed height of remaining plant stubble.

Frequency refers to how often a plant is defoliated. The more often plants are defoliated, the more root reserves are used to replenish the leaf area that must again build up the roots of the plant. Issues related to frequency may be addressed by limiting the amount of time that livestock are allowed in a certain area. When grazing systems are set up to divide an area into pastures and require that livestock remain in distinct pastures for limited periods of time, frequency is addressed.

Duration of grazing refers to the length of time that forage plants are available for defoliation by livestock. Duration is often directly related to frequency as forage species can be grazed more than once in pastures where substantial vegetative regrowth occurs prior to livestock removal. Studies have shown that effects on plants may be greater when plants are defoliated for long periods of time without sufficient opportunity to recover. Periods of rest from grazing are useful for plant recovery. Issues related to duration may be addressed by limiting the amount of time livestock remain in a given pasture, and by providing adequate periods of rest between defoliation events.

Timing and frequency of grazing may also be addressed by grazing systems. Properly designed grazing strategies provide forage species with adequate periods of time to recover from grazing induced stress.

Permitted Season of Use

The permitted season of use stipulates dates within which livestock grazing can occur on an allotment. The actual season of use is further constrained by range readiness, which determines the livestock on-date, and attainment of forage utilization standards, which determines the livestock off-date. Use of range readiness in determining on dates has beneficial effects on ground cover and species composition because primary

consideration is given to precipitation and plant phenology when establishing the on-date for livestock grazing. Considerations given for range readiness to occur are soils, thereby minimizing trampling, compaction and disturbance of soil and vegetation by cattle, and plant phenology. Plant phenology is timed to allow foliar development and photosynthesis at levels adequate to withstand grazing impacts. Extending the season of use by one week prior to the permitted season of use would be granted when plant phenology progresses earlier than typical and range readiness considerations are met. Extending the season of use by one week following the permitted season of use would have effects described for forage utilization because extensions would be dependent upon actual use being below or equal to the maximum use allowed.

Utilization Interpretation

A guidance document for planning livestock grazing in riparian areas on National Forests in the Intermountain Region suggests that the level of utilization occurring on a site is the most important consideration in grazing management (Clary and Webster 1989). The level of forage utilization and residue measurements are useful tools in rangeland monitoring and land management. When used with other monitoring information, utilization can be employed to design and evaluate management decisions. These measurements can be used as an aid in interpreting cause and effect relationships for observed changes in resource conditions such as ground cover and species composition. Utilization and residue measurements are not management objectives. They are tools to be used with other information in evaluating whether desired resource conditions are being achieved. These uses of utilization are consistent with the scientific literature and experience of the range management profession (Smith et. al. 2007).

Proper utilization on uplands is a subject of much research with various results. There are no universally applicable proper use standards for uplands or riparian areas. This is due to the many variables that exist in public land management, such as differing objectives, resource conditions, grazing systems, and plant species. Maximum limits on utilization are specified in the Forest Plan (Forage Utilization Standard, US Forest Service 1990, p. 127-128).

A literature review of 25 grazing studies in primarily arid landscapes (Holecheck 2004) defined moderate grazing as a degree of utilization that allows palatable species to maintain themselves, and light grazing as a degree of utilization that allows palatable species to maximize their herbage producing abilities. In this review, moderate grazing averaged 43 percent and light grazing averaged 32 percent. Heavy grazing averaged 57 percent and resulted in reduction in forage production, reduced forage production in drought years, declines in species composition, declines in livestock weights, and declines in livestock reproduction rates. He also illustrated that runoff and soil loss increases under heavy grazing. He cited a finding that plant diversity increases as grazing intensity decreases. He also asserted that there is circumstantial evidence that heavy grazing can be a factor in the decline of endangered rangeland wildlife species. Many of these studies were conducted in semi-arid and arid lands under a variety of grazing systems, some of which did not provide rotation or rest. In addition the average use figures were just that, an average rather than a maximum amount as specified in the design features of the action alternatives. Based on this review and moister conditions found in the project area, effects of 60 percent forage utilization on key forage species in the Upper Green River project area is expected to result in a decreased ability for palatable plant species to maintain themselves, resulting in decreases in ground cover and a downward trend in species composition. Effects of 50 percent utilization on key forage species is expected to result in palatable species that are able to maintain themselves, resulting in stable ground cover and species composition trends. Effects of 40 to 30 percent utilization on key forage species is expected to allow palatable species to maximize herbage producing abilities, resulting in increasing ground cover and improved long-term trends in species composition.

On site implementation of 30 percent forage utilization in many allotments within the project area has resulted in increased ground cover and improved trends in species composition, which meet ground cover

and species composition objectives and therefore desired conditions. Fifty percent forage utilization in Noble Pastures (an irrigated pasture system) and Wagon Creek Allotment has resulted in ground cover and species composition meeting objectives. These site specific findings are consistent with scientific findings reported in the literature.

Scientific literature supports use of a 4 to 6-inch end-of-season stubble height to maintain or improve condition of riparian areas. Clary and Webster (1989) recommended that 4 to 6 inches of stubble vegetation remain on all streamside areas at the end of the growing season to provide sufficient herbaceous forage biomass to meet the requirements of plant vigor, bank protection and sediment entrapment. They drew a relationship between stubble height and percent utilization in riparian areas. Average utilization levels of 24 to 32 percent were associated with a 6-inch stubble height, 37 to 44 percent when grazed to 4-inch, and 47 to 51 percent use when grazing to 3-inch stubble height. Special situations, such as critical fisheries or easily eroded stream banks, may require stubble heights of greater than 6 inches; although more recent information suggests that in situations where stream banks need additional protection beyond that provided by limiting use to a stubble height of 6-inch, monitoring of stream bank alteration in addition to residual stubble height would be appropriate (Clary and Webster 1989). Therefore, stream bank alteration limits are included in selected areas under the proposed action following Clary and Webster's recommendation.

Clary and Leininger (2000) recommended a 10-centimeter (approximately 4-inch) residual stubble height as a starting point for improved riparian grazing management. Clary and Kinney 2002 concluded that there were no differences between the no-grazing and moderate-grazing (designed to represent the total impact the cattle would have while grazing foliage to a 10-centimeter height) treatments for change in stream width, bank angle, bank retreat, or root biomass. In another study Clary concluded that most measurements of streamside variables moved closer to those beneficial for trout fisheries when pastures were grazed to a 10-centimeter stubble height. Virtually all measurements improved when pastures were grazed to a 14-centimeter (approximately 5 ½-inch) stubble height (Clary 1999). Elmore (1988) suggested that 3 to 4-inches of stubble height would maintain plant vigor, provide stream bank protection, and aid in deposition of sediments to rebuild degraded stream banks. Myers (1989) evaluated 34 grazing systems in place for 10-20 years. Vigorous woody plant growth and at least 6 inches of residual herbaceous plant height at the end of the growing/grazing season typified the riparian areas in excellent, good, or rapidly improving condition. This residual plant cover appeared to provide adequate stream bank protection and sediment entrapment during high streamflow periods.

On site implementation of retaining a 6-inch stubble height has resulted in increased stream bank stability, willow production and sedge production at South Gypsum Creek and Tepee Creek, indicating improved riparian condition.

Based on the literature and results within the project area, effects of retaining a 4-inch stubble along the green line in the project area is expected to result in sufficient herbaceous forage biomass to meet the requirements of plant vigor, bank protection and sediment entrapment, resulting in the maintenance of current stream bank stability, stream temperature and riparian function. Effects of retaining a 6-inch stubble along the green line is expected to increase the herbaceous forage biomass and enhance plant vigor, bank protection and sediment entrapment, potentially resulting in increases in stream bank stability, reduced stream temperature, and enhanced riparian function. Effects of implementing a 20 percent stream bank alteration allowable use on riparian areas is expected to enhance plant vigor, bank protection and sediment entrapment based on Clary and Webster (1989) and Simon (2008).

Grazing System

Timing of grazing and frequency of grazing may also be addressed by grazing systems. When livestock grazing systems incorporate periods of time when plants are protected from being grazed, this allows the plants additional time to recover from grazing induced stress.

Alternative 2 - Grazing as Currently Permitted and Current Management

Summary of Direct and Indirect Effects

As discussed in the Effects of Livestock Grazing Applicable to Action Alternatives section, the primary environmental effects of livestock grazing on vegetation are due to the utilization that takes place as a result of livestock consuming forage. Under Alternative 2, the permittees are currently managing their livestock in such a way that grazing use is well below the maximum amount of forage use that is allowed (permitted). However, it is possible that these permittees, or their future counterparts, would choose to manage their livestock in such a way that they reach the maximum allowable use permitted. Thus, for this alternative, we have analyzed the maximum allowable use (Alternative 2- Grazing as Currently Permitted) and the existing use (Alternative 2- Current Management).

Ground Cover and Species Composition

Allowable Use: Under current management (30-50 percent utilization), monitoring conducted in the project area indicates that current grazing use is meeting resource management objectives in most cases. However, monitoring has identified some instances where objectives may not have been achieved. Effects for each allotment and rotation are discussed below.

The vegetation conditions on the six key areas that are in less than desired condition related to rangeland functionality would be expected to improve or remain in their current condition unless the permittees chose to use the maximum amount of forage available to them within the utilization limits of this alternative. Should maximum use limits be reached (50-60 percent in uplands, 55-65 percent in riparian areas), a downward trend in these sites would be expected. The vegetative conditions on 21 key areas of the allotment that are essentially at, or exceeding desired future condition would remain in desired condition if the livestock grazing management that resulted in those conditions were not altered. Again, should maximum use limits be reached, a downward trend in these sites may result. No progress toward restoration of focus areas and the one tall forb area that has been identified as at-risk would be expected as a result of implementing this alternative, since restorative design features such as range improvements, hardened crossings, and removal of livestock from some focus areas are not a part of this alternative.

Grazing Management System: Under Alternative 2, season-long livestock grazing would continue to be permitted in Badger Creek, Beaver-Twin Creeks and Roaring Fork allotments. However, season-long grazing does not comply with the Forest Plan Forage Utilization Standard (U.S. Forest Service 1990) which requires rotational grazing. Season-long grazing allows a longer duration grazing period in which livestock typically use only preferred areas. By comparison, rotational grazing improves livestock distribution and forces livestock to use less preferred areas. Season-long grazing systems provide increased opportunity for defoliation of plants (i.e. increased opportunity for repeated grazing of plants) without sufficient opportunity for plants to recover. The period when plants are defoliated (grazed) occurs at the same time of year, every year. Therefore, highly palatable plants are more likely to suffer competitive disadvantage to plants that are dormant or less palatable at that time of year. Depending on the number of livestock and the season of use, this can result in plant communities with downward trends in species composition and consequently an early seral status. The increase duration allowed for in season-long grazing increases the intensity of grazing and can decrease ground cover, again depending on the number of livestock and the season of use. Under current management the Beaver-Twin and the Roaring Fork allotments are in effect managed in most years as a

rotational grazing system using herding and salting to improve livestock distribution. Rotational grazing is practiced in the Noble Pastures and Upper Green River allotments and season-long grazing in the Badger Creek, Beaver-Twin Creeks and Roaring Fork allotments. The Wagon Allotment is one pasture managed with adjacent pastures on private land and in effect is managed as a rotational grazing system.

Under Alternative 2, a deferred rotation system would continue for the Mud Lake/Fish Creek rotation, Tosi Creek/Tepee Creek rotation, and the Gypsum Creek rotation of the Upper Green River Allotment. In comparison to season-long grazing, a deferred rotation system increases vigor and prevalence of highly palatable species (key forage species and "decreaser" species), reduces livestock grazing intensity and duration on palatable species in preferred areas, and increases litter accumulation. Rotating the order in which pastures are grazed annually (different timing) allows for periodic plant seed set in each pasture. A rest rotation system would continue for the Mosquito Lake rotation of the Upper Green River Allotment under Alternative 2. A rest rotation system has similar beneficial effects to ground cover and species composition as deferred rotation, with added benefit to the pasture rested for the season, off-set by increased grazing duration and intensity on the remaining pastures in any given year.

Structural Improvements: Maintenance and reconstruction of existing structural improvements would maintain the current distribution of livestock. Therefore, existing conditions for ground cover and species composition would not be expected to change. Ground cover and species composition would continue to be negatively impacted along fence lines and near water developments where livestock tend to congregate. Such impacts would be limited to relatively small areas and would not preclude overall attainment of desired conditions. In contrast to Alternatives 3 and 4 which proposes new structural improvements that would reduce livestock grazing impacts to certain riparian areas, existing structural improvements do not address riparian areas currently in unsatisfactory condition.

Invasive plants

Under Alternative 2-Current Management, invasive plants distribution and abundance would remain similar to that described in the existing conditions, approximately 137 acres with a low rate of spread associated with livestock. Cattle herded through the livestock driveway and/or moving through other invasive plant locations could potentially spread seeds from invasive plants into uninfected areas. However, because key areas which represent livestock grazing effects in pastures do not contain invasive plants, livestock are not considered a primary vector in the spread of invasive plants within the project area. Invasive plants would continue to be effectively managed under the Bridger-Teton National Forest Integrated Invasive Species Management Strategy.

Under Alternative 2-Grazing as Currently Permitted, the potential for invasive plant establishment and spread would be greater in areas that are below ground cover and species composition objectives. Up to 60 percent forage utilization in uplands and 65 percent in riparian areas would increase the potential of invasive plant establishment. Native plants would be more stressed with a potential decrease in foliar area, decrease in ground cover and downward trend in species composition. This would allow for invasive plant establishment and spread.

Shrub Cover

Sagebrush cover is not expected to directly change as the result of livestock grazing and would remain as described in Chapter 1. Livestock grazing reduces the amount of grass and forbs in the sagebrush understory which results in a reduction in fine fuels that would carry a wildfire. Livestock grazing in effect enhances fire suppression and high shrub cover in the six allotments. The reduced potential for the sagebrush community to carry a wildfire results in the continued overabundance of sagebrush cover under this alternative compared to Alternative 1.

Direct and Indirect Effects by Allotment or Rotation

Badger Creek Allotment

The Badger Creek Allotment is managed under a season-long grazing system which results in livestock often grazing the most palatable plants unrestricted within the entire allotment for the entire season of use. This causes physiological stress on the most palatable plants and could result in negative impacts to ground cover and species composition. However, existing conditions are at desired conditions primarily for two reasons. First, under current management, the herd averages 66 percent of the permitted number of cattle and actual use is 30 percent of the available forage. Grazing intensity is light (30 percent utilization with two years of rest from grazing) which offset the negative impacts season-long grazing can cause and allows for improving condition and increases in ground cover and species composition. Second, under current management, the permittee herds the cattle and uses salt placement to achieve better livestock distribution, resulting in reduce physiological stress on palatable plants. The effect is that the allotment currently meets ground cover and species composition objectives. This approach addresses timing of grazing; however it relies heavily on intuitive planning rather than a planned deferment of livestock grazing proposed under Alternative 3.

Under grazing as currently permitted, allowable use in the uplands would be 50 percent and 55 percent in the riparian areas for season-long livestock grazing. This would result in the maintenance of ground cover and species composition and stable trends with little to no change in existing condition, although trends would be more likely to decline than if grazed at lower utilization levels.

Beaver-Twin Creeks Allotment

The Beaver-Twin Allotment is managed under a season-long grazing system which results in livestock often grazing the most palatable plants unrestricted within the entire allotment for the entire season of use. This causes physiological stress on the most palatable plants, resulting in negative impacts to ground cover and species composition. Under the existing season-long use, livestock tend to spend the majority of the grazing season in the Twin Creeks Pasture which resulted in ground cover that is below objective and species composition that is in a downward trend as measured in 1996, 2002, and 2011. This allotment was rested four out of the five years between 2009 and 2013. In 2012, 496 cow/calf pairs (71 percent of permitted) were grazed in the allotment with an actual use of 30 percent forage utilization of key forage species. This has resulted in upward trends in ground cover and species composition and movement towards desired conditions. Recovery in the riparian areas is discussed in the Riparian Areas section. Should these levels of stocking and periods of rest continue, improvement in vegetation condition would likely continue because low livestock numbers and actual use decreases grazing intensity on palatable plants. Ground cover and species composition would be expected to continue to increase and move towards desired conditions unless livestock were to congregate at the Twin Creeks Pasture. Timing of grazing would occur at the same time every year but low livestock numbers and use would likely allow for seed set of palatable plants.

Under grazing as currently permitted, 700 cow/calf pairs would be grazed season-long in the allotment with a maximum of 50 percent forage utilization. The expected effect on ground cover and species composition would be downward trends. Timing of grazing would occur at the same time every year negatively affecting palatable plants. No structural improvements would be proposed to enhance livestock distribution and increase use of the other two proposed pastures. Therefore, the allotment would likely experience a decline in ground cover and species composition in the proposed Twin Creeks Pasture and the allotment would not meet desired conditions under season-long grazing at full numbers.

Waterdog Lake Focus Area: Under current management this tall forb site is expected to continue increasing in ground cover at a slower rate than Alternative 1 and similar rate to Alternatives 3 and 4. Under grazing as currently permitted, 55 percent forage utilization would maintain unsatisfactory conditions at this focus area, specifically low ground cover and high livestock mortality associated with ingestion of poisonous plants.

Noble Pastures Allotment

Current management is similar to grazing as permitted in this allotment; actual use is 82 percent of permitted use. Effects of a two to three times over rotation grazing system on the Noble Pastures Allotment would be expected to maintain the current conditions and trend of ground cover and species composition. Current conditions and trends are generally satisfactory in the upland portions of the irrigated pastures. Riparian conditions within the allotment (Klondike Creek and Tosi Creek focus areas) are in unsatisfactory condition and are discussed in the Riparian Areas section. Currently the four irrigated pastures are typically grazed one to two weeks and ungrazed for four to eight weeks in a rotation such that each pasture would be grazed two to three times over an annual season of use. Employees of the Natural Resources Conservation Service reviewed the management of the Noble Pastures Allotment and determined that the allotment met the Natural Resource Conservation Service's requirements for a prescribed grazing system on irrigated pasture. No change in management was recommended (Natural Resource Conservation Service: Hayward and Klause's letter dated Sept. 14, 2012). The reliable water source from Tosi Creek, Klondike Creek and irrigation ditches provide the necessary moisture to prolong plant growth, maintain plant vigor and replenish root reserves throughout the grazing season. The Noble Pastures currently meet resource objectives. See the Soils section for additional discussion.

Tosi Creek and Klondike Creek Focus Areas: Effects to these areas are disclosed under the Riparian Area section.

Roaring Fork Allotment

The permitted grazing system on the Roaring Fork Allotment is season-long grazing which often results in livestock grazing the most palatable plants within the entire allotment for the duration of the season of use, causing physiological stress on the most palatable plants and potentially resulting in negative impacts to ground cover and species composition. Under current management a grazing rotation is commonly accomplished by starting the livestock on the east side of the allotment and moving them west as the grazing season progresses, followed by a west to east direction in grazing the next year. This allows the plants time to recover from grazing induced stress and time to set seed every other year which benefits plant species composition in the allotment. The area south of the Upper Green River is grazed early in years when first (every second year on average) and rested in the off years, which allows the plants time to recover from grazing induced stress and time to set seed. The effect is that the allotment currently meets ground cover and species composition objectives.

Roaring Fork Focus Area: Under Alternative 2- Current Management, changes in species composition and ground cover in this area is not expected because these impacts are due primarily to elk use associated with the Upper Green River elk feedground. This focus area would likely continue to not meet the species composition objective under this alternative.

Under grazing as permitted, this allotment is understocked and would not be expect to reach 60 percent forage utilization as a result of livestock in the focus area. This focus area would likely continue to not meet the species composition objective because of elk use associated with the elk feedground.

Wagon Creek Allotment

Under Alternative 2- Current Management, 26 cow/calf pairs or yearlings are authorized to graze for a 45-day period, with a variable entry date within the July 15th to October 15th grazing season. Forage utilization is 50 percent. This allotment is currently being grazed in conjunction with adjacent private lands and livestock are rotated between the two. Under current management the Wagon Creek allotment is meeting resource objectives for ground cover and species composition. It is probable that species composition and ground cover would remain stable under current management.

Under Alternative 2- Grazing as Permitted, the livestock could remain on the allotment for the entire 90 day period under season-long grazing until a 50 percent forage utilization of key forage species is reached. The expected effect on ground cover and species composition would be downward trends because grazing intensity would likely be high in the Wagon Creek Allotment. Timing of grazing would occur at the same time every year which would negatively affect palatable plants.

Upper Green River Allotment

Mud Lake/Fish Creek Rotation

Under current management, (forage utilization of less than 30 percent in the uplands and riparian areas) and a deferred rotation system, improvements in ground cover and species composition would be expected.

Under grazing as permitted, 60 percent forage utilization in the uplands and 65 percent in the riparian, herbaceous vegetation would decrease and declines in ground cover and species composition would be expected.

Fish Creek Focus Area: Effects to this area are disclosed under the Riparian Areas section.

Mosquito Lake Rotation

Under current management, (forage utilization of less than 30 percent in the uplands and stubble heights ranging from 4 to 15 inches along the greenline of Wagon Creek), improvements in upland and riparian conditions would be expected to continue.

Under grazing as permitted (60 percent forage utilization in the uplands and 65 percent in the riparian) herbaceous vegetation would decrease and declines in ground cover and species composition would be expected.

The Mosquito Lake rotation is currently a rest rotation system. If environmental conditions were the same in all four pastures, this would be the preferred grazing system. However, there is a large elevation difference between the southern and northern pastures which causes the snow to stay longer on the two northern pastures on some years. When this occurs, overall forage production in the northern pastures can be decreased, causing the early departure of livestock. Under current management, cattle enter the SW Mosquito Pasture and rotate clockwise or enter the SE Mosquito Pasture and rotate counter-clockwise through the four pastures. Therefore, the rest rotation system is not as ideal as the deferred grazing system (with the option of a rest rotation) proposed under Alternatives 3 and 4.

Wagon Creek Focus Area: Effects to this area are disclosed under the Riparian Areas section.

Tosi Creek/Tepee Creek Rotation

Under current management, (forage utilization of less than 30 percent in the uplands and stubble heights ranging from 5 to 16 inches along the greenline of the Tepee Creek), improvements in upland and riparian conditions would be expected to continue.

Under grazing as permitted, 60 percent forage utilization in the uplands and 65 percent in the riparian, herbaceous vegetation would decrease and declines in ground cover and species composition would be expected.

*Tepee Creek Focus Area: I*mprovement in the riparian condition of Tepee Creek focus area is a result of livestock management efforts under current management. Forage utilization of less than 30 percent in the uplands and stubble heights of 6 inches or greater along the greenline of the creek has resulted in increases in stream bank stability, willow production and density, and sedge production on point bars. Improvement in

riparian condition and movement towards desired condition are expected to continue under current management. Effects to this area are further discussed under the Riparian Areas section.

Gypsum Creek Rotation

Under current management, (forage utilization of less than 30 percent in the uplands and stubble heights ranging from 6 to 8.7 inches along the greenline of the South Gypsum Creek), improvements in upland and riparian conditions would be expected to continue.

Under grazing as permitted, 60 percent forage utilization in the uplands and 65 percent in the riparian, herbaceous vegetation would decrease and declines in ground cover and species composition would be expected.

South Gypsum Creek: Under current management, improved riparian conditions on South Gypsum Creek evident from increased ground cover and willow production is partly a result of livestock management efforts. These include low forage utilization which ranged from 10 to 35 percent with average stubble height of 8 inches compared to an ungrazed height of 11 inches. Effects to this area are disclosed under the Riparian Areas section.

River Bottom Pasture/ Livestock Driveway

Under grazing as permitted, 60 percent forage utilization in the uplands and 65 percent in the riparian, herbaceous vegetation would decrease and declines in ground cover and species composition would be expected.

Cumulative Effects

See discussion of cumulative effects under Alternative 1.

Ability to Address Issue #4: Rangeland Function.

Under Alternative 2, the forage available is sufficient to provide livestock and wildlife forage (Booth and Hayward 2015, Appendix 10). Forage utilization standards would be implemented to assure that forage remains available for wildlife. Under Alternative 2-Grazing as Currently Permitted, ground cover and species composition is expected to decline or remain stable and may trend downward away from objectives and desired condition. Under Alternative 2 - Current Management, ground cover and species composition is expected to remain the same as existing conditions with similar trends. Therefore areas meeting ground cover and species composition objectives would remain at desired condition. Areas moving towards resource objectives would continue in an upward trend and areas not meeting resource objectives would remain below desired conditions.

Summary of Direct and Indirect Effects

Ground Cover and Species Composition

The vegetation conditions on six key areas that are in less than desired condition would be expected to move towards desired condition as each of those areas has design features to move towards attainment of desired condition. The vegetation conditions on 21 key areas of the allotment that are essentially meeting or exceeding the ground cover or species composition objectives would be expected to remain in desired condition and a monitoring plan would be implemented to ensure this. Restoration of focus areas and the one tall forb area that has been identified as at-risk would be expected as a result of implementing this alternative. This is because restorative design features such as range improvements, hardened crossings, and removal of livestock from some focus areas are a part of this alternative.

The design features associated with this alternative include range improvements that are designed to reduce livestock grazing in sensitive areas or to assist with implementation of rotation grazing strategies. In addition, forage utilization or stream bank trampling standards would be implemented in order to improve ground cover or stream bank characteristics.

With these recommendations and findings in mind, vegetation on all key sites should improve, because the design features associated with this alternative have been studied, designed and proven effective in similar situations at improving vegetation as well as hydrologic and stream function. Focus areas would be expected to improve because of reduced livestock use and efforts to restore damaged areas. Improvement would be more rapid than under Alternative 2, and less rapid than under Alternatives 1 and 4.

Allowable Use: Permitted maximum of 50 percent forage utilization of key forage species in uplands and riparian areas and a minimum of a 4-inch stubble height along the greenline of streams is expected to maintain vegetation conditions in terms of ground cover and species composition. A reduction in forage utilization to 40 or 30 percent and an increase in stubble height to 6-inches are expected to increase ground cover and species composition in the uplands and stream bank stability and riparian function along streams.

Adaptive Management: If future monitoring was to indicate a decline in vegetation condition below the resource objective and attributed to livestock grazing, then adaptive management would be implemented such that forage utilization would decrease by 10 percent to a minimum of 30 percent or stubble height would increase to a 6-inch stubble height. Either of these measures would likely positively address any ground cover, species composition, and/or invasive plant concerns and move vegetative conditions towards the desired condition.

Grazing System: Rotational Grazing: The Forest Plan requires that allotments that have season-long grazing systems (as proposed under Alternative 2) be changed to rotation grazing systems as Allotment Management Plans are revised (footnote to the Forest Plan Forage Utilization Standards). Rotation grazing systems are developed to address some aspects of the timing of grazing, as described in

Effects of Livestock Grazing Applicable to Action Alternatives (Alternative 2, 3 and 4). Rotation grazing is designed to alter the timing of grazing induced stress to plants. This change in timing reduces physiological stresses on the most palatable plants because different plants or species of plants may be more desirable at different times of the year, and because deferring the use period allows plants additional time to capture and use nutrients needed to restore plant health. Some rotations may also facilitate recurrent seed set and cast for some plant species.

When compared to season long grazing system, implementation of a deferred rotation system would be expected to result in increased vigor and prevalence of highly palatable species (key forage species and “decreaser” species), reduced adverse effects of livestock grazing intensity and duration on palatable species in preferred grazing areas, and increased litter accumulation. Rotating the order in which pastures are grazed annually (different timing) would ensure periodic plant seed set in each pasture and enhance overall vigor of palatable plants.

Effects of a rest rotation system would be similar to those of a deferred rotation system except that plants would periodically receive a full growing season without livestock grazing to regain vigor and complete a full life cycle (i.e. growth, seed development, seed cast, and late season translocation of nutrients to root reserves). Plant seed set would be virtually guaranteed during the year of rest, and this in turn would enhance ground cover and species composition. In any given year, this would be off-set to some degree by increased grazing intensity and duration on the remaining grazed pastures. For example, in a three pasture rest rotation only two pastures are grazed each season, whereas in a three pasture rotational deferment, all three pastures are grazed for a shorter duration. Resting a pasture annually would decrease the total area of the allotment

grazed in a given year which would result in the forage utilization level being reached sooner in grazed pastures than under other grazing systems. However, impacts to ground cover and species composition in the grazed pastures would be related primarily to the utilization level and the associated effects described.

Under Alternative 3, deferred rotation with an option to implement rest rotation would be implemented in all allotments.

Capacity: Under Alternative 3, the forage available is sufficient to provide livestock and forage for big-game wildlife species (Wilmot 2015, Booth and Hayward 2015, Appendix 10). Forage utilization standards would be implemented to assure that forage remains available for wildlife. The three allotments (Badger, Beaver-Twin and Roaring Fork allotments) that do not currently employ rotational or deferred grazing system would be changed to incorporate rotation and the Allotment Management Plans would reflect this.

Structural Improvements: Alternatives 3 and 4 propose new structural improvements that would reduce livestock grazing impacts to upland and riparian areas and improve resource conditions. Maintenance and reconstruction of existing structural improvements would maintain the current distribution of livestock in other areas and ground cover and species composition at objective. Ground cover and species composition would continue to be negatively impacted along fence lines and near water developments where livestock tend to congregate. Such impacts would be limited to relatively small areas and would not preclude overall attainment of desired conditions.

Invasive plants

Invasive plants would continue to be managed under the Bridger-Teton National Forest Integrated Invasive Species Management Strategy.

Roads, vehicles, hunter hay/feed, and logging are the primary vectors of invasive plants in the project area and cattle are not a primary vector. The areas we have identified as being most representative of livestock grazing effects (key areas) do not contain many (if any) invasive species. Since invasive plants are indicators that, if present, signal a lack of functionality, it is consistent with our other indicators that while there may be areas that are functioning at risk, there are no identified rangeland areas that are not functioning as a result of livestock grazing impacts. This alternative calls for utilization standards that preclude levels of impact associated with establishment and expansion of noxious weed populations. The achievement of reduced levels of invasive plants is outside the scope of this analysis and such efforts would take place as a result of management programs unrelated to this project.

Shrub Cover

Sagebrush cover is not expected to directly change as the result of livestock grazing and would remain as described in Chapter 1. Livestock grazing reduces the amount of grass and forbs in the sagebrush understory which results in a reduction in fine fuels that would carry a wildfire. Livestock grazing in effect enhances fire suppression and high shrub cover in the six allotments. The reduced potential for the sagebrush community to carry a wildfire would be greater under this alternative than Alternative 1. Alternative 3 would have moderately more grass and forb cover in the uplands compared to Alternative 2- Grazing as Currently Permitted and similar grass and forb cover to Alternative 4. Therefore, Alternative 3 would have a moderate ability to carry a wildfire through sagebrush communities compared with the other alternatives because it would support a moderate amount of grass and forb cover in the uplands.

Direct and Indirect Effects by Allotment or Rotation

Badger Allotment

A deferred livestock entry date into the allotment in one of four years would ensure that palatable plants have an opportunity to set seed every four years which in turn ensures that species composition would continue to meet objective. At full livestock numbers, season of use with an allowable use of a maximum of 50 percent utilization in the uplands and 4-inch stubble minimum along the greenline of streams, the allotment would be expected to continue to meet the ground cover and species composition objectives. Therefore under Alternative 3, the Badger Allotment would be at desired condition.

Adaptive Management: If, however, monitoring indicated a decline in vegetation condition below the resource objectives, then adaptive management would be implemented such that forage utilization would decrease by 10 percent to a minimum of 30 percent or stubble height would increase to a 6-inch stubble height along the greenline. Either of these measures would positively address any ground cover, species composition, and/or invasive plant concerns and move vegetative conditions towards the desired condition.

Beaver-Twin Allotment

Under Alternative 3, the Beaver-Twin Allotment would be divided into three pastures that would be managed in a deferred rotation grazing system. Changing to a deferred rotation system would be expected to result in long-term vegetation improvements because of improved timing and decreased duration of livestock grazing in the Twin Creeks Pasture as a result of improved distribution. Implementing a rotation grazing system alters the timing of grazing, reducing the physiological stresses on the most palatable plants, and allowing for seed set to occur in years that the pasture receives deferred grazing. Different species of plants may be more palatable at different times of the year. Implementing a rotation grazing system would decrease the time livestock graze a particular area, thereby allowing plants additional time to capture nutrients and replenish root reserves.

Compared with season-long grazing, the benefits of implementing a deferred rotation system would include increased vigor and prevalence of highly palatable species (key forage species and “decreaser” species), reduced livestock grazing intensity and duration on palatable species in preferred areas, and increase litter accumulation. Rotating the order in which pastures are grazed annually (different timing) would allow for periodic plant seed set before livestock grazing occurs. Therefore, implementing a rotation grazing system is expected to increase ground cover and species composition in the long-term.

Construction of the proposed fences would create a three pasture system which would improve livestock distribution and effectively increase livestock grazing over a larger area. This effect in turn would increase ground cover and enhance species composition in the allotment. Although there may not be improvement in ground cover or species composition in the tall forb community because of poor site potential (Soils section, Winthers 2015) and the steep terrain generally inhibits cattle grazing currently.

Grazing full numbers of livestock, 700 cow/calf pairs, at a maximum of 50 percent forage utilization in the uplands and 4-inch stubble height along the greenline, conditions are expected to remain stable, in terms of ground cover and species composition and at desired condition.

Adaptive management would positively address any ground cover, species composition, and/or invasive plant concerns and move vegetative conditions towards the desired condition.

Waterdog Lake Focus Area: Under Alternative 3 this tall forb site is expected to continue increasing ground cover at a slower rate than Alternative 1 and similar rate to Alternative 2.

Noble Pastures Allotment

At full livestock numbers, season of use with an allowable use of a maximum of 40 percent in Pasture 1 with a 6-inch stubble height, and maximum stream bank alteration, paired with a 50 percent maximum utilization level in the remaining pastures, the allotment would be expected to continue to meet the ground cover, species composition and invasive plant objectives. Therefore under Alternative 3, the allotment would be at desired condition.

Adaptive Management: If future monitoring was to indicate a decline in vegetation condition below the resource objective, then adaptive management would be implemented such that forage utilization would decrease by 10 percent to a minimum of 30 percent or stubble height would increase to a 6-inch stubble height. Either of these measures would likely positively address any ground cover, species composition, and/or invasive plant concerns and move vegetative conditions towards the desired condition.

Tosi Creek and Klondike Creek Focus Areas: See the Riparian Areas section.

Roaring Fork Allotment

At full livestock numbers, season of use with an allowable use of a maximum of 50 percent utilization in the uplands and 4-inch stubble minimum on the greenline, the allotment would be expected to continue to meet the ground cover, species composition and invasive plant objectives. Therefore under Alternative 3, the allotment would be at desired condition.

Adaptive Management: If future monitoring was to indicate a decline in vegetation condition below the resource objective, then adaptive management would be implemented such that forage utilization would decrease by 10 percent to a minimum of 30 percent or stubble height would increase to a 6-inch stubble height. Either of these measures would likely positively address any ground cover, species composition, and/or invasive plant concerns and move vegetative conditions towards the desired condition.

Under Alternative 3, the area would be changed to a deferred rotation system, and may be expected to benefit from improved timing, frequency, and duration aspects of the grazing treatment. However, previous grazing treatment often accomplished this deferment, so additional protection was designed.

Roaring Fork Focus Area: If elk use was high (50 percent) in the focus area prior to cattle grazing, cattle would be required to avoid the West Pasture and the grazing season would likely be reduced.

Wagon Creek Allotment

At full livestock numbers, season of use with an allowable use of a maximum of 50 percent utilization in the uplands and 4-inch stubble height minimum in the riparian areas, the allotment would be expected to continue to meet the ground cover, species composition and invasive plant objectives. Therefore under Alternative 3, the allotment would be at desired condition.

Adaptive Management: If future monitoring was to indicate a decline in vegetation condition below the resource objective, then adaptive management would be implemented such that forage utilization would decrease by 10 percent to a minimum of 30 percent or stubble height would increase to a 6-inch stubble height. Either of these measures would likely positively address any ground cover, species composition, and/or invasive plant concerns and move vegetative conditions towards the desired condition.

Upper Green River Allotment

Mud Lake/Fish Creek Rotation

At full livestock numbers, season of use with an allowable use of a maximum of 50 percent utilization in the uplands and 4-inch height stubble minimum in the riparian areas, the allotment would be expected to continue to meet the ground cover, species composition and invasive plant objectives. Therefore under Alternative 3, the allotment would be at desired condition.

Adaptive Management: If future monitoring was to indicate a decline in vegetation condition below the resource objective, then the adaptive management would be implemented such that forage utilization would decrease by 10 percent to a minimum of 30 percent or stubble height would increase to a 6-inch stubble height. Either of these measures would likely positively address any ground cover, species composition, and/or invasive plant concerns and move vegetative conditions towards the desired condition.

Fish Creek Focus Area: See the Riparian Areas section.

Mosquito Lake Rotation

At full livestock numbers, season of use with an allowable use of a maximum of 50 percent utilization in the uplands and 4-inch stubble minimum in the riparian areas for the SE and NE Pastures, the allotment would be expected to continue to meet the ground cover, species composition and invasive plant objectives. In the SW and NW Pastures, an average of 30 percent forage utilization over five year period with a maximum of 50 percent in any given year and a 4-inch stubble height would be expected to continue positive movement towards the species composition objective. Thirty percent forage utilization under current management has resulted in improving trends in upland and riparian vegetation and condition and this would be expected to continue. Therefore under Alternative 3, the allotment would be at desired condition.

The pastures are currently managed under a rest rotation system. Since this area is already receiving relatively light utilization, graze fewer cattle would graze in this rotation. It is expected that a reduction in livestock numbers from 1,800 to a maximum of 1,530 and a change to a deferred rotation will result in upward trends in ground cover and species composition.

The Mosquito Lake rotation is currently in a rest rotation system. If the environmental conditions were the same in all four of these pastures this would be the preferred grazing system. However, there is a large elevational difference between the four pastures which causes the snow to stay longer on the two northern pastures in some years. When this occurs the overall forage production can be decreased and cause the early removal of livestock. Therefore, the preferred strategy is to implement a deferred grazing system with the option of a rest rotation system. Additionally, a design feature reducing cattle numbers from 1,800 head to a maximum of 1,530 would be implemented to address the downward species composition trend in Mosquito NW and SW Pastures. In addition, an average of 30 percent utilization over a five year period with a maximum of 50 percent allowable use in any given year as well as a minimum 4-inch stubble height would be implemented. These management actions would result in reduced livestock grazing intensity, improved conditions, and upward trends in species composition.

Adaptive Management: If future monitoring was to indicate a decline in vegetation condition below the resource objective, then adaptive management would be implemented such that forage utilization would decrease by 10 percent to a minimum of 30 percent and/or stubble height would increase to a 6-inch stubble height. Implementation of a 6-inch stubble height along the greenline would reduce livestock use in the riparian areas where livestock typically spend more time. This in effect would reduce the duration of livestock presence in the pasture, and therefore the time they spend in the uplands. Either of these measures

would likely positively address any ground cover, species composition, and/or invasive plant concerns and move vegetation communities toward desired conditions.

Wagon Creek Focus Area: Effects to this area is disclosed under the Riparian Area section.

Tosi Creek/Tepee Creek/ Kinky Creek Rotation

At full livestock numbers, season of use with an allowable use of a maximum of 50 percent utilization in the uplands and 4-inch stubble minimum in the riparian areas and addition of the Kinky Creek Pasture into the rotation, the allotment would be expected to continue to meet the ground cover, species composition and invasive plant objectives. Therefore under Alternative 3, the allotment would be at desired condition.

Adaptive Management: If future monitoring was to indicate a decline in vegetation condition below the resource objective, then adaptive management would be implemented such that forage utilization would decrease by 10 percent to a minimum of 30 percent or stubble height would increase to a 6-inch stubble height. Either of these measures would likely positively address any ground cover, species composition, and/or invasive plant concerns and move vegetative conditions towards the desired condition.

Under Alternative 3, another pasture (South Kinky Creek Pasture) would be added to this rotation without adding any livestock numbers. The increased forage available for grazing resulting in reduced grazing pressure is expected to generally benefit ground cover and species composition in the rotation.

Tepee Creek Focus Area: Under current management, upward trend in stream bank stability, increases in willow production and density, and increases in sedge production on point bars has been documented over the years, although the focus area does not meet desired conditions. Improvement in the riparian condition of Tepee Creek is a result of livestock management efforts including forage utilization of less than 30 percent in the uplands and stubble heights of 6 inches retained along the greenline of the creek. For further discussion of the Tepee Creek focus area see the Riparian Areas section.

Gypsum Creek Rotation

At full livestock numbers, season of use with an allowable use of a maximum of 50 percent utilization in the uplands and 4-inch stubble height minimum in the riparian areas, the allotment would be expected to continue to meet the ground cover, species composition and invasive plant objectives. Therefore under Alternative 3, the allotment would be at desired condition.

Adaptive Management: If future monitoring was to indicate a decline in vegetation condition below the resource objective, then adaptive management would be implemented such that forage utilization would decrease by 10 percent to a minimum of 30 percent or stubble height would increase to a 6-inch stubble height. Either of these measures would likely positively address any ground cover, species composition, and/or invasive plant concerns and move vegetative conditions towards the desired condition.

South Gypsum Creek: See Riparian Areas section.

River Bottom Pasture/ Livestock Driveway

At full livestock numbers, season of use with an allowable use of a maximum of 50 percent utilization in the uplands and 4-inch stubble height minimum in the riparian areas, the allotment would be expected to continue to meet the ground cover, species composition and invasive plant objectives. Therefore under Alternative 3, the pasture would be at desired condition.

Adaptive Management: If future monitoring was to indicate a decline in vegetation condition below the resource objective, then adaptive management would be implemented such that forage utilization would decrease by 10 percent to a minimum of 30 percent or stubble height would increase to a 6-inch stubble

height. Either of these measures would likely positively address any ground cover, species composition, and/or invasive plant concerns and move vegetative conditions towards the desired condition.

Cumulative Effects

See discussion of cumulative effects under Alternative 1.

Ability to Address Issue #4: Rangeland Function

Under Alternative 3, vegetation in most areas would be expected to remain in properly functioning condition. Vegetation conditions in identified areas of concern would be expected to improve as a result of new grazing management practices. Restoration projects would be planned for some degraded areas, and those areas would be expected to show improvement.

Alternative 4 - Modified Grazing Management with Riparian Emphasis

Direct and Indirect Effects

Ground Cover and Species Composition

The vegetation conditions on six key areas that are in less than desired condition would be expected to move towards desired condition as each of those areas has design features to move towards attainment of desired condition. The vegetative conditions on 21 key areas of the allotment that are essentially meeting or exceeding the ground cover or species composition objectives would be expected to remain in desired condition and a monitoring plan would be in place to ensure this. Restoration of focus areas and the one tall forb area that has been identified as at-risk would be expected as a result of implementing this alternative, since restorative design features such as range improvements, hardened crossings, and removal of livestock from some focus areas are a part of this alternative.

The design features associated with this alternative include range improvements that are designed to reduce livestock grazing in sensitive areas or to assist with implementation of rotational grazing strategies. In addition, forage utilization or stream bank trampling standards would be implemented in order to improve ground cover or stream bank characteristics.

With these recommendations and findings in mind, vegetation on all key sites should improve, because the design features associated with this alternative have been studied, designed and proven effective in similar situations at improving vegetation as well as hydrologic and stream function. Focus areas would be expected to improve because of reduced livestock use and efforts to restore damaged areas. Improvement would be more rapid than under Alternatives 2 and 3, less rapid than under Alternative 1.

Allowable Use: Permitted maximum of 50 percent forage utilization of key forage species in uplands, a minimum of a 4-inch stubble height along the greenline of streams, and a maximum of 35 percent forage utilization of key forage species in riparian and meadow areas is expected to maintain vegetation conditions in uplands and maintain or improve conditions in the riparian areas. A forage utilization of 40 or 30 percent and an increase in stubble height to 6-inches are expected to increase ground cover and species composition in the uplands and stream bank stability and riparian function along streams.

Adaptive Management: If future monitoring was to indicate a decline in vegetation condition below the resource objective attributed to livestock grazing, then adaptive management would be implemented such that forage utilization would decrease by 10 percent to a minimum of 30 percent or stubble height would increase to a 6-inch stubble height. Either of these measures would likely positively address any ground cover, species composition, and/or invasive plant concerns and move vegetative conditions towards the desired condition.

Grazing System: Rotational Grazing: The Forest Plan requires that allotments that have season-long grazing systems (as proposed under Alternative 2) be changed to rotation grazing systems as Allotment Management Plans are revised (footnote to the Forest Plan Forage Utilization Standards). Rotation grazing systems are developed to address some aspects of the timing of grazing, as described in Effects of Livestock Grazing Applicable to Action Alternatives (Alternative 2, 3 and 4). Rotation grazing is designed to alter the timing of grazing induced stress to plants. This change in timing reduces physiological stresses on the most palatable plants because different plants or species of plants may be more desirable at different times of the year, and because deferring the use period allows plants additional time to capture and use nutrients needed to restore plant health. Some rotations may also facilitate recurrent seed set and cast for some plant species.

When compared to a season long grazing system, implementation of a deferred rotation system would be expected to result in increased vigor and prevalence of highly palatable species (key forage species and "decreaser" species), reduced adverse effects of livestock grazing intensity and duration on palatable species in preferred grazing areas, and increased litter accumulation. Rotating the order in which pastures are grazed annually (different timing) would ensure periodic plant seed set in each pasture and enhance overall vigor of palatable plants.

Effects of a rest rotation system would be similar to those of a deferred rotation system except that plants would periodically receive a full growing season without livestock grazing to regain vigor and complete a full life cycle (i.e. growth, seed development, seed cast, and late season translocation of nutrients to root reserves). Plant seed set would be virtually guaranteed during the year of rest, and this in turn would enhance ground cover and species composition. In any given year, this would be off-set to some degree by increased grazing intensity and duration on the remaining grazed pastures. For example, in a three pasture rest rotation only two pastures are grazed each season, whereas in a three pasture rotational deferment, all three pastures are grazed for a shorter duration. Resting a pasture annually would decrease the total area of the allotment grazed in a given year which would result in the forage utilization level being reached sooner in grazed pastures than under other grazing systems. However, impacts to ground cover and species composition in the grazed pastures would be related primarily to the utilization level and the associated effects described.

Under Alternative 4, deferred rotation with an option to implement rest rotation would be implemented in all allotments.

Capacity: Under Alternative 4, the forage available is sufficient to provide livestock and forage for big-game wildlife species (Wilmot 2015, Booth and Hayward 2015, Appendix 10). Forage utilization standards would be implemented to assure that forage remains available for wildlife. The three allotments (Badger, Beaver-Twin and Roaring Fork allotments) that do not currently employ rotational or deferred grazing system would be changed to incorporate rotation and the Allotment Management Plans would reflect this.

Structural Improvements: Alternatives 3 and 4 propose new structural improvements that would reduce livestock grazing impacts to upland and riparian areas and improve resource conditions. Maintenance and reconstruction of existing structural improvements would maintain the current distribution of livestock in other areas and ground cover and species composition at objective. Ground cover and species composition would continue to be negatively impacted along fence lines and near water developments where livestock tend to congregate. Such impacts would be limited to relatively small areas and would not preclude overall attainment of desired conditions.

Invasive Plants

Invasive plants would continue to be managed under the Bridger-Teton National Forest Integrated Invasive Species Management Strategy.

Roads, vehicles, hunter hay/feed, and logging are the primary vectors of invasive plants in the project area and cattle are not a primary vector. The areas identified as being most representative of livestock grazing effects (key areas) do not contain many (if any) invasive species. Since invasive plants are indicators that, if present, signal a lack of functionality, it is consistent with other indicators that while there may be areas that are functioning at risk, no rangeland areas have been identified that are functioning at risk as a result of livestock grazing impacts. This alternative calls for utilization standards that preclude levels of impact associated with establishment and expansion of noxious weed populations. The achievement of reduced levels of invasive plants is outside the scope of this analysis and such efforts would take place as a result of management programs unrelated to this project.

Shrub Cover

Sagebrush cover is not expected to directly change as the result of livestock grazing and would remain as described in Chapter 1. Indirectly, livestock grazing reduces the amount of grass and forbs in the sagebrush understory which results in a reduction in fine fuels that would carry a wildfire. Livestock grazing in effect enhances fire suppression and high shrub cover in the six allotments. The reduced potential for the sagebrush community to carry a wildfire would be greater under this alternative than under Alternative 1. Alternative 4 would have moderately more grass and forb cover in the uplands compared to Alternative 2-Grazing as Currently Permitted and similar grass and forb cover to Alternative 3. Therefore, Alternative 4 would have a moderate ability to carry a wildfire through sagebrush communities compared with the other alternatives because it would support a moderate amount of grass and forb cover in the uplands.

Direct and Indirect Effects by Allotment or Rotation

Badger Allotment

A deferred livestock entry date into the allotment in one of four years would ensure that palatable plants have an opportunity to set seed every four years which in turn ensures that species composition would continue to meet the objective. At full livestock numbers, season of use with an allowable use of a maximum of 50 percent utilization in the uplands, 4-inch stubble height minimum on the greenline, and 35 percent maximum forage utilization in the riparian areas, the allotment would be expected to continue to meet the ground cover and species composition objectives. Therefore under Alternative 4, the Badger Allotment would be at desired condition.

Adaptive Management: If future monitoring was to indicate a decline in vegetation condition below the resource objectives, then adaptive management would be implemented such that forage utilization would decrease by 10 percent to a minimum of 30 percent or stubble height would increase to a 6-inch stubble height along the greenline. Either of these measures would positively address any ground cover, species composition, and/or invasive plant concerns and move vegetative conditions towards the desired condition.

Beaver-Twin Allotment

At full livestock numbers, season of use with an allowable use of a maximum of 50 percent utilization in the uplands, 4-inch stubble height minimum on the greenline, and 35 percent maximum forage utilization in the riparian areas, the allotment would be expected to continue to meet the ground cover and species composition objectives. Therefore under Alternative 4, the allotment would be at desired condition.

Adaptive Management: If future monitoring was to indicate a decline in vegetation condition below the resource objective, then adaptive management would be implemented such that forage utilization would decrease by 10 percent to a minimum of 30 percent or stubble height would increase to a 6-inch stubble height. Either of these measures would likely positively address any ground cover, species composition, and/or invasive plant concerns and move vegetative conditions towards the desired condition.

Ground Cover and Species Composition: Under Alternative 4, the Beaver-Twin Allotment would be divided into three pastures that would be managed in a deferred rotation grazing system. Changing to a deferred rotation system would be expected to result in long-term vegetation improvements because of improved timing and decreased duration of livestock grazing in the Twin Creeks Pasture as a result of improved distribution. Implementing a rotational grazing system alters the timing of grazing reducing the physiological stresses on the most palatable plants and allows for seed set to occur in years that the pasture receives deferred grazing. Different species of plants may be more palatable at different times of the year. Implementing a rotational grazing system would decrease the time livestock graze a particular area, thereby allowing plants additional time to capture nutrients and replenish root reserves.

Compared with season-long grazing, the benefits of implementing a deferred rotation system would include increased vigor and prevalence of highly palatable species (key forage species and "decreaser" species), reduced livestock grazing intensity and duration on palatable species in preferred areas, and increase litter accumulation. Rotating the order in which pastures are grazed annually (different timing) would allow for periodic plant seed set before livestock grazing occurs. Therefore, implementing a rotation grazing system is expected to increase ground cover and species composition in the long-term.

Construction of the proposed fences would create a three pasture system which would improve livestock distribution and effectively increase livestock grazing over a larger area. This effect in turn would increase ground cover and enhance species composition in the allotment, although there may not be improvement in ground cover or species composition in tall forb community because of poor site potential (Soils section, Winthers 2015) and the steep terrain generally inhibits cattle grazing currently.

Grazing full numbers of livestock, 700 cow/calf pairs, at a maximum of 50 percent utilization in the uplands, 4-inch stubble height minimum on the greenline, and 35 percent maximum forage utilization in the riparian areas, it is expected that conditions would remain stable or trend upward, in terms of ground cover and species composition.

Waterdog Lake Focus Area: Under Alternative 4, this tall forb site is expected to continue increasing ground cover at a slower rate than Alternative 1 and similar rate to Alternative 2 and Alternative 3.

Noble Pastures Allotment

At full livestock numbers, season of use with an allowable use of a maximum of 40 percent in Pasture 1 with a 6-inch stubble height, and maximum stream bank alteration, paired with a 50 percent maximum utilization level in the remaining pastures, the allotment would be expected to continue to meet the ground cover, species composition and invasive plant objectives. Therefore under Alternative 4, the allotment would be at desired condition.

Adaptive Management: If future monitoring was to indicate a decline in vegetation condition below the resource objective, then adaptive management would be implemented such that forage utilization would decrease by 10 percent to a minimum of 30 percent or stubble height would increase to a 6-inch stubble height. Either of these measures would likely positively address any ground cover, species composition, and/or invasive plant concerns and move vegetative conditions towards the desired condition.

Tosi Creek Focus Area: See the Riparian Areas section.

Klondike Creek Focus Area: Under Alternative 4, Klondike Creek would be fenced and grazing could be allowed within the exclosure to prevent thatching. The exclosure would be constructed to improve woody vegetation along the edges of the stream and would result in streamside improvements similar to Alternative 3 and more rapid than Alternative 2. See also the Riparian Areas section for more discussion of effects.

Roaring Fork Allotment

At full livestock numbers, season of use with an allowable use of a maximum of 50 percent utilization in the uplands, 4-inch stubble height minimum on the greenline, and 35 percent maximum forage utilization in the riparian areas, the allotment would be expected to continue to meet the ground cover and species composition objectives. Therefore under Alternative 4, the allotment would remain at desired condition.

Adaptive Management: If future monitoring was to indicate a decline in vegetation condition below the resource objective, then adaptive management would be implemented such that forage utilization would decrease by 10 percent to a minimum of 30 percent or stubble height would increase to a 6-inch stubble height. Either of these measures would likely positively address any ground cover, species composition, and/or invasive plant concerns and move vegetative conditions towards the desired condition.

Under Alternative 4, the area would be changed to a deferred rotation system, and may be expected to benefit from improved timing, frequency, and duration aspects of the grazing treatment. However, previous grazing treatment often accomplished this deferment, so additional protection was designed.

Roaring Fork Focus Area: If elk use was high (50 percent) in the focus area prior to cattle grazing, cattle would be required to avoid the West Pasture and the length of the grazing season would likely be reduced.

Wagon Creek Allotment

At full livestock numbers, season of use with an allowable use of a maximum of 50 percent utilization in the uplands and 4-inch stubble height minimum in the riparian areas, the allotment would be expected to continue to meet the ground cover, species composition and invasive plant objectives. Therefore under Alternative 4, the allotment would remain at desired condition.

Adaptive Management: If future monitoring was to indicate a decline in vegetation condition below the resource objective, then adaptive management would be implemented such that forage utilization would decrease by 10 percent to a minimum of 30 percent or stubble height would increase to a 6-inch stubble height. Either of these measures would likely positively address any ground cover, species composition, and/or invasive plant concerns and move vegetative conditions towards the desired condition.

Upper Green River Allotment

Mud Lake/Fish Creek Rotation

At full livestock numbers, season of use with an allowable use of a maximum of 50 percent utilization in the uplands, 4-inch stubble height minimum on the greenline, and 35 percent maximum forage utilization in the riparian areas, the allotment would be expected to continue to meet the ground cover and species composition objectives. Therefore under Alternative 4, the allotment would be at desired condition.

Adaptive Management: If future monitoring was to indicate a decline in vegetation condition below the resource objective, then adaptive management would be implemented such that forage utilization would decrease by 10 percent to a minimum of 30 percent or stubble height would increase to a 6-inch stubble height. Either of these measures would likely positively address any ground cover, species composition, and/or invasive plant concerns and move vegetative conditions towards desired condition.

Fish Creek Focus Area: See the Riparian Areas section.

Mosquito Lake Rotation

At full livestock numbers, season of use with an allowable use of a maximum of 50 percent utilization in the uplands, 4-inch stubble height minimum on the greenline, and 35 percent maximum forage utilization in the

riparian areas, for the Southeast and Northeast Pastures, the allotment would be expected to continue to meet the ground cover, species composition and invasive plant objectives. In the Southwest and Northwest Pastures, an average of 30 percent forage utilization over a five year period with a maximum of 50 percent in any given year and a 4-inch stubble height would continue positive movement towards the species composition objective. Thirty percent forage utilization under current management has resulted in improving trends in upland and riparian vegetation and condition and this would be expected to continue. Therefore under Alternative 4, the Mosquito Lake rotation would move toward desired condition.

The pastures are currently managed under a rest rotation system. Since this area is already receiving relatively light utilization, fewer cattle would be grazed in this rotation. It is expected that a reduction in livestock numbers from 1,800 to a maximum of 1,530 and a change to a deferred rotation would result in upward trends in ground cover and species composition.

The Mosquito rotation is currently in a rest rotation system. If the environmental conditions were the same in all four of these pastures this would be the preferred grazing system. However, there is a large elevational difference between the four pastures which causes the snow to stay longer on the two northern pastures in some years. When this occurs the overall forage production can be decreased and cause the early removal of livestock. Therefore, the preferred grazing system is to implement a deferred grazing system with the option of a rest rotation system as proposed under Alternative 4. A design feature reducing cattle numbers from 1,800 head to a maximum of 1,530 would be implemented to address the downward species composition trend in Mosquito Northwest and Southwest pastures. In addition, an average of 30 percent utilization over a five year period with a maximum of 50 percent allowable use in any given year as well as a minimum 4-inch stubble height would be implemented. These management actions would result in reduced livestock grazing intensity, improved conditions, and upward trends in species composition.

Adaptive Management: If future monitoring was to indicate a decline in vegetation condition below the resource objective, then adaptive management would be implemented such that forage utilization would decrease by 10 percent to a minimum of 30 percent and/or stubble height would increase to a 6-inch stubble height. Implementation of a 6-inch stubble height along the greenline would reduce livestock use in the riparian areas where livestock typically spend more time which in effect would reduce the duration livestock are in the pasture and spend in the uplands. Either of these measures would likely positively address any ground cover, species composition, and/or invasive plant concerns and move vegetative conditions towards the desired condition.

Wagon Creek Focus Area: Effects to this area is disclosed under the Riparian Areas section.

Tosi Creek/Tepee Creek/ Kinky Creek Rotation

At full livestock numbers, season of use with an allowable use of a maximum of 50 percent utilization in the uplands, 4-inch stubble height minimum on the greenline, and 35 percent maximum forage utilization in the riparian areas, the allotment would be expected to continue to meet the ground cover and species composition objectives. Therefore under Alternative 4, the allotment would be at desired condition.

Adaptive Management: If future monitoring was to indicate a decline in vegetation condition below the resource objective, then adaptive management would be implemented such that forage utilization would decrease by 10 percent to a minimum of 30 percent or stubble height would increase to a 6-inch stubble height. Either of these measures would likely positively address any ground cover, species composition, and/or invasive plant concerns and move vegetative conditions towards the desired condition.

Under Alternative 4, another pasture (South Kinky Creek Pasture) would be added to this rotation without adding any livestock numbers. The increased forage available for grazing resulting in reduced grazing pressure is expected to generally benefit ground cover and species composition in the rotation.

Tepee Creek Focus Area: Under current management, an upward trend in stream bank stability, increases in willow production and density, and increases in sedge production on point bars has been documented over the years. Although the focus area does not meet desired conditions, improvement in the riparian condition of Tepee Creek is a result of livestock management efforts including forage utilization of less than 30 percent in the uplands and stubble heights of 6 inches retained along the greenline of the creek. For further discussion of the Tepee Creek focus area see the Riparian Areas section.

Gypsum Creek Rotation

At full livestock numbers, season of use with an allowable use of a maximum of 50 percent utilization in the uplands, 4-inch stubble height minimum on the greenline, and 35 percent maximum forage utilization in the riparian areas, the allotment would be expected to continue to meet the ground cover and species composition objectives. Therefore under Alternative 4, the allotment would be at desired condition.

Adaptive Management: If future monitoring was to indicate a decline in vegetation condition below the resource objective, then adaptive management would be implemented such that forage utilization would decrease by 10 percent to a minimum of 30 percent or stubble height would increase to a 6-inch stubble height. Either of these measures would likely positively address any ground cover, species composition, and/or invasive plant concerns and move vegetative conditions towards the desired condition.

South Gypsum Creek: See Riparian Areas section.

River Bottom Pasture/ Livestock Driveway

At full livestock numbers, season of use with an allowable use of a maximum of 50 percent utilization in the uplands, 4-inch stubble height minimum on the greenline, and 35 percent maximum forage utilization in the riparian areas, the allotment would be expected to continue to meet the ground cover and species composition objectives. Therefore under Alternative 4, the pasture would be at desired condition.

Adaptive Management: If future monitoring was to indicate a decline in vegetation condition below the resource objective, then adaptive management would be implemented such that forage utilization would decrease by 10 percent to a minimum of 30 percent or stubble height would increase to a 6-inch stubble height. Either of these measures would likely positively address any ground cover, species composition, and/or invasive plant concerns and move vegetative conditions towards the desired condition.

Cumulative Effects

See discussion of cumulative effects under Alternative 1.

Ability to Address Issue #4: Rangeland Function.

Under Alternative 4, vegetation in most areas would be expected to remain in properly functioning condition. Vegetation conditions in identified areas of concern would be expected to improve as a result of new grazing management practices. Restoration projects would be planned for some degraded areas, and those areas would be expected to show improvement.

Riparian Areas

The Riparian Areas section presents the issues and indicators addressed in this analysis and the existing condition of the affected environment, and discusses the environmental effects of each alternative on the riparian and wetland system. Information provided in this section was summarized from the Hydrology Specialist Report (Robertson 2016). Adaptive management was referred to as "progressive design features" in this specialist report (Robertson 2016). The term "progressive design features" is synonymous with "adaptive management" and is described in this DEIS beginning on page 71 and 112 for Alternatives 3 and 4, respectively.

Overview of Issues Addressed

Issue 2: Riparian and Aquatic Conditions

The concern is that livestock grazing may affect riparian areas, riparian vegetation, fisheries and overall stream function and health.

Issue Indicators for Comparison of Alternatives

- Riparian function
- Stream bank stability (percent)
- Stream bank alteration (current year stream bank trampling)

Affected Environment

Methodology and Data Sources

Methodology for determining stream bank stability and alteration was the Multiple Indicator Monitoring (MIM) protocol (Burton et al. 2008, 2011). The MIM designated monitoring areas were selected according to the 2008 protocol (Burton et al. 2008). Although the site selection methods changed in the 2011 protocol (Burton et al. 2011), the original sites were retained to allow a more robust analysis of those sites and provide an indication of trend over time. Data collection at the sites followed the 2008 protocol in 2009 (Burton et al. 2008) and the 2011 protocol in 2012 (Burton et al. 2011). There are minor changes to the methodology of site data collection, but the field methodology and analysis are similar enough that they provide a valid comparison between the two sampling events.

MIM designated monitoring areas represented areas used by livestock. Stream reaches within the project area where vegetation was not a controlling factor or the gradient was more than 4 percent were avoided. Areas of localized concentration such as water gaps and fence lines were avoided because these areas are not representative of the use over the entire allotment. Sixteen MIM monitoring sites were established in the project area (Figure 41). Six of the 16 MIM monitoring sites were established in five focus areas to monitor trends in these areas of concern.

Simon (2008) provided guidance for implementing the Stream Bank Stability Guideline and provided a method of determining the amount of current-year stream bank trampling that would allow stream channels to function. Rosgen stream types (Rosgen 1996) are stratified by sensitivity to disturbance and their recovery potential. From this stratification, a determined allowable percent bank alteration was assigned to these stream types (Table 23). A 20 percent allowable alteration was given to streams that have not been assigned a Rosgen type.

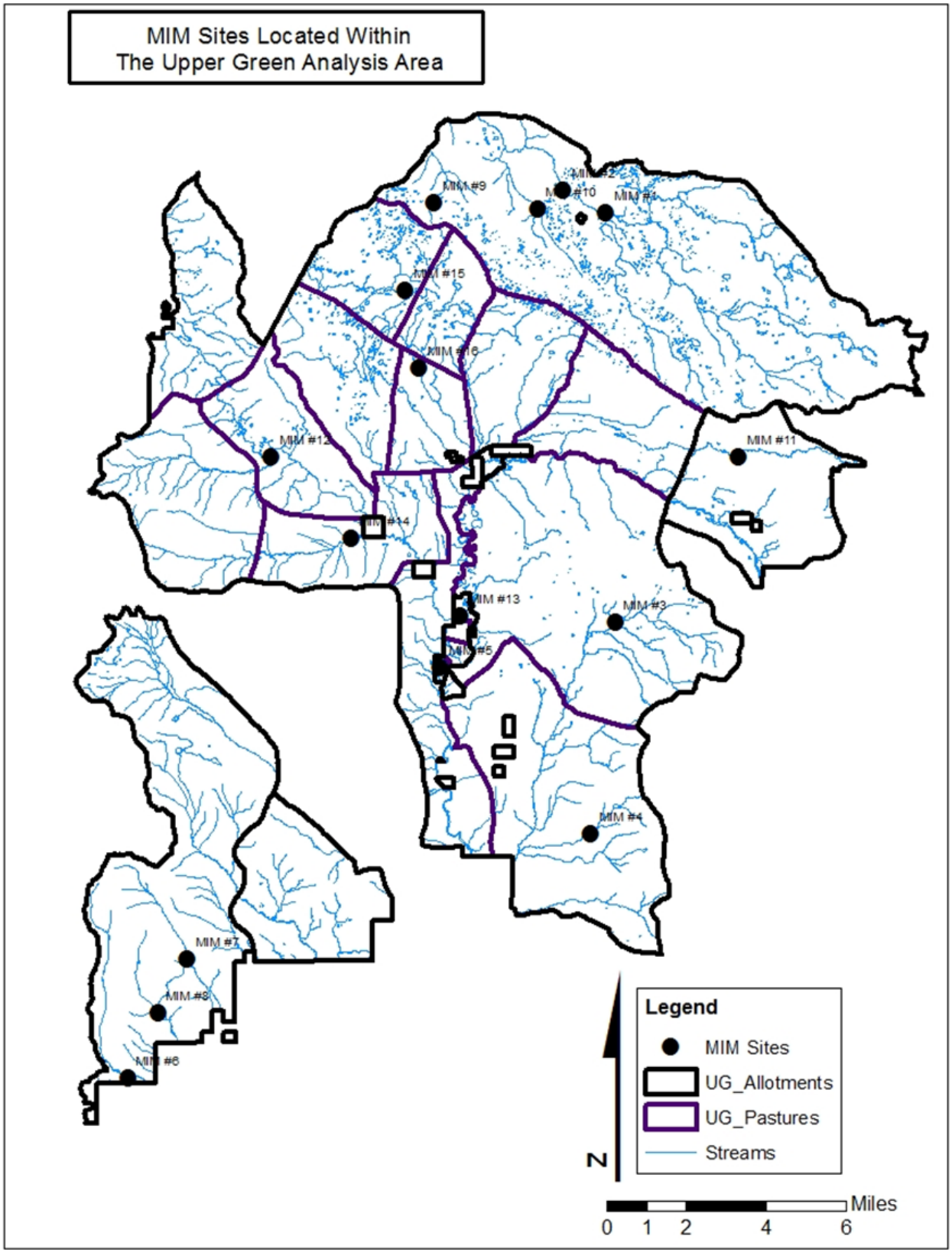

Figure 41. Location of stream monitoring sites (MIM sites) in the Upper Green River project area

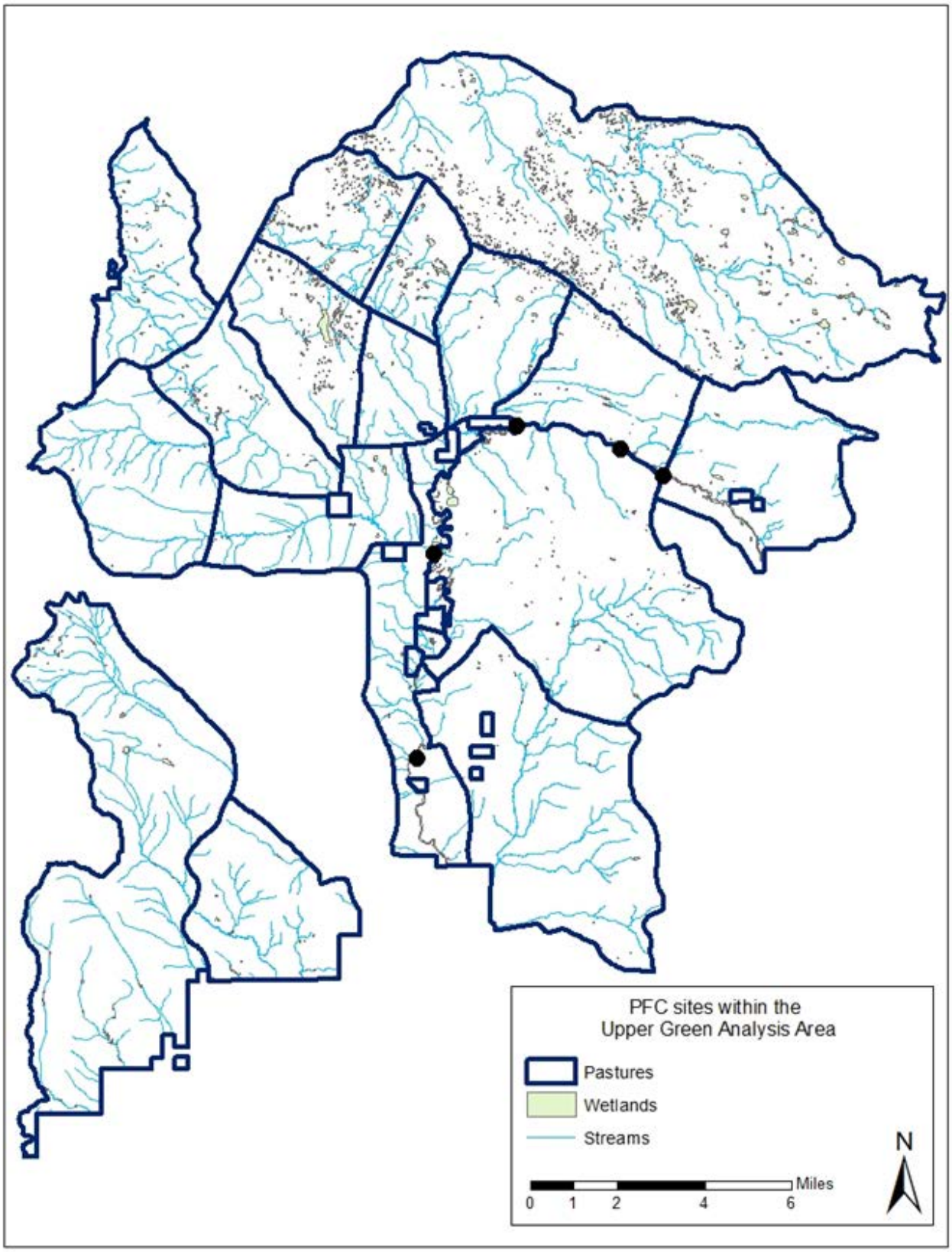

Figure 42. Location of PFC stream monitoring sites

Proper functioning condition (PFC) is a qualitative method for assessing the condition of riparian-wetland areas. This method describes both an assessment process and a defined, on the-ground condition of a riparian-wetland area (Bureau of Land Management 1998). This assessment was completed at five sites along the Green River within the driveway pasture of the Upper Green Allotment. This method was selected for evaluation of the Upper Green River, versus the MIM protocol, because it is more appropriate for larger streams such as the Upper Green River. Five assessments were completed to ensure that the entire stretch of the Upper Green River within the allotments was represented. The sites were selected to reflect areas that would be accessible by cattle and were reflective of the use within that pasture.

Proper functioning condition is a qualitative method for assessing the condition of riparian-wetland areas (Bureau of Land 1998). This method allows for a consistent approach for assessing hydrology, vegetation, and erosional and depositional attribute processes for determining the overall health and function of a riparian area. If a riparian area is properly functioning, it will be able to withstand high flow events, a function of vegetation soil and hydrologic processes, along with providing fish habitat and propagating healthy riparian vegetation. A riparian area that is not functioning properly cannot sustain these desired values. All of these attributes and physical processes are compiled into a checklist, and this checklist is the tool which allows an interdisciplinary team to assess the proper functioning condition of a riparian area.

Wham surveys (see Fisheries Section) and professional judgment based on site visits were used to evaluate riparian function in the Upper Green River project area.

The Sublette County Conservation District has collected water quality data on three sites within the analysis area. Two sites are located on the Green River and one site on Gypsum Creek. The National Wetlands Inventory was used to supplemented wetland maps and field data.

Riparian Function and Stream Bank Stability

Channel vulnerability to impacts from livestock, and the ability of channels to recover from past adverse impacts, depends on inherent channel characteristics. Streams analyzed for this analysis were classified using Rosgen channel types (Rosgen 1996) to describe these characteristics. The Forest Plan accounts for characteristics of different types of streams in the Stream Bank Stability Guideline. It should be noted that the Beaver Twin Allotment, South Gypsum Pasture, and Mosquito South East Pasture had not been grazed at the time of field observations. Figure 41 displays the locations of these streams, MIM transect sites, and observations within the project area.

Table 23. Stream bank stability, bank vegetative cover and alteration for Multiple Indicator Monitoring (MIM) sites

MIM Site # and Stream	Location	Rosgen Stream Type	Allowable Alteration Guideline (%)	Bank Alteration (%) *		Bank Veg. Cover (%)		Stream-bank Stability Objective (%)	Stream bank Stability (%)	
				2009	2012	2009	2012		2009	2012
#1 - Fish Creek (1)	Focus area in Upper Green Allotment Fish Creek Pasture	C4	20	14	41	96	69	75	70	46
#2 - Fish Creek (2)	Upper Green Allotment Fish Creek Pasture	C4	20	26	5	96	97	75	59	76
#3 - Gypsum Creek	Upper Green Allotment North Gypsum Pasture	C Typing not complete	20	15		99		-	85	
#4 - South Gypsum	Upper Green Allotment North Gypsum Pasture	C4	20	7	14	95	100	75	59	73
#5 - Klondike	Focus area in Noble Pastures Allotment Pasture 4	Not typed	20	12	26	86	79	-	71	48
#6 - Miner	Big Twin Allotment North Beaver Pasture	C Typing not complete	20	5	0	93	99	-	91	99
#7 - North Beaver	Big Twin Allotment North Beaver Pasture	E Typing not complete	20	4	7	94	100	85	90	93
#8 - Packer	Big Twin Allotment North Beaver Pasture	Not typed	20	6	0	86	97	-	85	81
#9 - Raspberry Creek	Upper Green Allotment Fish Creek Pasture	C5c	20	22	8	95	100	75	86	71

MIM Site # and Stream	Location	Rosgen Stream Type	Allowable Alteration Guideline (%)	Bank Alteration (%) *		Bank Veg. Cover (%)		Stream-bank Stability Objective (%)	Stream bank Stability (%)	
				2009	2012	2009	2012		2009	2012
#10 - Strawberry Creek	Upper Green Allotment Fish Creek Pasture	C4b	20	12	10	95	100	75	80	48
#11 - Roaring Fork	Roaring Fork Allotment Roaring Fork East Pasture	C	20	3	11	99	100	-	79	98
#12 - Tepee	Focus area in Upper Green Allotment Lower-Tepee Pasture	B4c	20	25	37	84	49	80	40	40
#13 - Tosi (1) [a]	Focus area in Noble Pastures Allotment Pasture 1	C4	20	34	20	95	93	75	34	71
#14 - Tosi (2)	Upper Green Allotment Tosi Pasture	C4	20	11	7	99	98	75	65	85
#15 - Wagon Creek (1)	Upper Green Allotment Mosquito Lake Northwest Pasture	E4	20	9	32	94	98	85	80	75
#16 - Wagon Creek (2)	Focus area in Upper Green Allotment Mosquito Lake Southeast Pasture	Not typed	20	20	0	96	100	-	76	100 [b]

[a] different reach of Tosi Creek was monitored in 2009 and 2012 because of a beaver dam caused water inundation of the original site.

b Wagon Creek in the focus area has been excluded from livestock grazing under current management and meets the stream bank stability objective.

Existing Conditions by Allotment or Rotation

Badger Creek Allotment and Beaver-Twin Allotment

Streams in the Badger Creek and Beaver-Twin allotments meet the stream bank stability and riparian function objectives. Big Twin and Little Twin Creeks run through the Beaver-Twin and Badger Creek allotments. The creeks have a well-established willow community with a thick understory of grasses. Overall, the stream bank conditions of both streams looked to be stable with productive riparian vegetation and both met the riparian function objective. Localized areas with livestock impacts noted in 2009 have improved when revisited in 2013. The Beaver-Twin Allotment has not been grazed four out of five years since 2009. It was grazed by livestock in 2012. Badger Allotment had two years of non-use out of five years.

Figure 43. Big Twin Creek with willows along the stream bank indicating stable banks.

Within the Beaver-Twin Allotment, some trailing was observed in 2009 through the willows but most impacts were seen next to the fence line where an unauthorized all-terrain vehicle (ATV) road had been created and at stream crossings along that fence line. This road followed the fence line through the wet willow bottom creating ponding, ruts, and potential soil compaction. During the 2013 field visit, signs of the illegal ATV road crossing were almost entirely gone. Riparian vegetation had established in the areas of bare ground along the stream bank and the stream met the riparian function objective. In 2009, the stream bank at a livestock crossing near the fence line on Big Twin Creek was trampled. In 2013, riparian vegetation had reestablished and stream bank stability has improved after four years of rest from livestock grazing (Figure 44).

Figure 44. Big Twin Creek livestock crossing in 2009 (left) and in 2013 after four years of rest (right photo)

Little Twin Creek had very similar features as Big Twin: a lower width to depth ratio; cobble and fine stream bed matrix; older age willow community with a thick herbaceous understory; and is highly sinuous (Figure 45). New willow growth was observed along the stream banks but the majority of the willow community was of an older age class.

Figure 45. Little Twin Creek has an older age class willow community with thick herbaceous understory along banks and is sinuous.

Similar issues were also seen along Little Twin with unauthorized two track roads and widened stream crossing areas. Access to the streams is limited due to the expansive willow bottom as seen in Figure 45 and most livestock trailing impacts observed were along fence lines and in the uplands. Upstream, in the western section of the allotment, there is one main stream crossing used by cattle and recreationists accessing the Water Dog Lakes Trail. In 2009 the stream at the crossing was bare of vegetation and over-widened. In 2013, the stream at the crossing was recruiting riparian vegetation, cover was increasing, and immediately upstream and downstream of the crossing the stream was narrowing and deepening (Figure 46).

Figure 46. Stream crossing on Little Twin Creek in 2009 (left photo) and in 2013 (right photo)

Miner Creek (MIM site #6) is located in the proposed North Beaver Pasture within the Beaver-Twin Allotment. The allotment was not grazed by livestock at the time of the 2009 and 2012 surveys. The willow community was well established throughout the valley bottom and had an understory of grasses with sedges growing along the stream banks (Figure 47). This area experiences impacts from both grazing and public use. An active beaver population was evident by recent and historical dams. Large amounts of woody material intermixed with fine grained sediments was in the stream channel and along the banks, a sign of recent beaver activity. This stream is in excellent condition with little stream bank alteration and stable banks due to the excellent vegetation cover on the stream banks (Table 23).

Figure 47. Miner Creek (MIM site #6) in the North Beaver Pasture of Beaver-Twin Allotment has riparian vegetation supporting stable stream banks.

North Beaver Creek is located in the proposed North Beaver Pasture. This section of stream was located in a large willow bottom near a dispersed camping site. The willow community was older with few young willows growing within it and browse was evident on the new willow leader growth. The willows had a thick understory of grasses with sedges growing along the stream banks (Figure 48). Within the willow bottom a lot of ponding and wet areas were also observed. This area experiences impacts from both grazing and public use; a large dispersed camping site was located upstream of the surveyed reach and a road ran alongside the willow bottom. This stream has a very active beaver population and both recent and historical dams were

observed within the surveyed reach. Within the stream channel and along the banks there was a large amount of woody material and fine grained sediments intermixed with this material and this is likely due to the beaver presence.

North Beaver Creek exhibits the features of an E Rosgen stream type which have low width to depth ratios, high sinuosity, and little deposition within the channel (Rosgen 1996). According to Rosgen (1996), E channels have a very high sensitivity to disturbance, good recovery potential once they are disturbed, moderate stream bank erosion potential, and vegetation has a very high controlling influence on channel form and function. The stream bank stability objective for an E stream type is 85 percent. This stream is in excellent condition with little stream bank alteration (7 percent) and stable banks (stability of 93 percent) due to the excellent vegetative cover (100 percent) on the stream banks (Table 23).

Packer Creek is located in the proposed North Beaver Pasture in a large willow bottom similar to the North Beaver Creek. Along the reach surveyed, sedges were the dominate stream bank vegetation along the greenline with willows located farther up the stream bank (Figure 48). This area experiences impacts from both grazing and public use. This stream has a very active beaver population and both recent and historical dams present. Within the stream channel large deposits of fine grained sediments were left along the meander bends. This is likely due to old beaver dams blowing out and depositing these collected sediments downstream. In 2012, this stream was in excellent condition with no stream bank alteration and stable banks (81 percent) due to the excellent cover (97 percent) on the stream banks Table 23.

Figure 48 North Beaver Creek (left photo) and Packer Creek (right photo) in the North Beaver Pasture of Beaver-Twin Allotment have riparian vegetation supporting stable stream banks.

Streams in the proposed Rock Creek Pasture were not surveyed with the MIM protocol because they did not meet the MIM site selection criteria. Streams contained cobble and boulder armored stream banks with gradients greater than 4 percent which are not sensitive to livestock use. The only stream reach within Rock Creek that would have qualified under the MIM site selection criteria was an area not representative of cattle use within the allotment and therefore would not show riparian trends due to livestock grazing.

Noble Pastures Allotment

Tosi Creek Focus Area:

MIM site #13 was located in Tosi Creek focus area in Noble Pasture #1. This section of the stream has a moderate width to depth ratio, moderate sinuosity, and a streambed load consisting of a mix of gravel and fines. Several point bars were observed along the survey reach which are a common feature of laterally

moving streams with the ability to carry a large amount of sediment. Vegetation occurring around the stream consisted of a decadent willow bottom with an herbaceous understory. This lower reach of Tosi surveyed as a Rosgen C4 stream type (Rosgen, 1996). According to Rosgen, C4 stream types are low gradient, meandering, have high width to depth ratios and broad defined flood plains. These stream types have moderate to very high sensitivity to disturbance and moderate to very high potential for stream bank erosion; vegetation controls channel stability and width-depth ratios. They have good recovery potential once impacts to channels are managed. (Rosgen, 1996)

This site is located in a pasture managed for concentrated grazing for short periods of time. Historically, when this property was privately owned, this pasture experienced season-long concentrated grazing with irrigation. Due to these past and current impacts, Tosi Creek shows sign of down-cutting and shear banks which are features of an unstable stream trying to stabilize itself. Sloughing was evident along several sections of the right stream bank (Figure 49) and large amounts of trailing through the willow bottom was occurring on both sides of the stream. While the stream bank had plenty of cover, the trailing and sloughing observed were a big impact on the overall stability of the stream bank.

The 2012 MIM survey was conducted just downstream (~100 yards) from the 2009 site due to the older site having been inundated by a beaver pond. The site is located within the same reach and stream type as the original location but due to the change in survey location, a comparison of the values obtained from 2009 to 2012 is just a general comparison. Cover maintained a consistent value over the monitoring time period and stability values increased. Alteration was 34 and 20 percent; vegetative cover was 95 and 93 percent and steam bank stability was 34 and 71 percent in 2009 and 2012, respectively (Table 23).

Figure 49. Tosi Creek focus area had sloughing along the right stream bank and trailing.

Klondike Creek Focus Area:

Klondike Creek is located within the south pasture (Pasture #4) of the Noble Pastures Allotment. Due to historical use, Klondike Creek was fenced from 1985 until 2008 to allow for recovery of the creek. In 2008, the exclosure was removed. Vegetation consisted of a mixture of grasses with some sedges. Stream bank sloughing was observed along the old fence line but within the survey reach outside of the pasture fence almost no sloughing was noted. This stream has a low width to depth ratio, a cobble with mixed in gravel streambed, and is slightly sinuous (Figure 50).

Figure 50. Klondike Creek (MIM site #5) is slightly sinuous (right photo) with grasses and some sedge on the stream banks (both photos in 2009).

Alteration increased (12 to 26 percent); cover decreased (86 to 79 percent) and overall bank stability decreased (71 to 48 percent) from 2009 to 2012 (Table 23). Although this stream has not been typed, the stream bank stability of 48 percent is below the stream bank stability objective which range from 75 to 85 percent. Typically each pasture gets grazed twice to three times in a grazing season with the exception of Pasture #4 which is grazed season-long. This allotment experiences concentrated grazing, and due to this management action, Klondike Creek experiences concentrated amounts of high livestock use for the duration of the season which has resulted in the decline in stream bank stability and vegetative cover from 2009 to 2012.

Roaring Fork Allotment

The Roaring Fork is located in a valley with a mixed conifer and upland shrub vegetation. The survey reach is located about 0.5 miles east of the road closure gate on Forest Service Road 663. Cattle were present in the allotment at the time of survey in 2009 but were observed farther south near the road closure. The Roaring Fork channel had a high width to depth ratio with wide meanders, and a mixture of grasses and shrubby cinquefoil (Figure 51) were growing along the stream banks. The bed material consisted primarily of a mixture of cobble and gravels and point bar deposits were prevalent along the entire reach.

Roaring Fork has the features of a possible C Rosgen stream type. According to Rosgen (1996), C stream types are low gradient, meandering, have higher width to depth ratios and broad defined flood plains. These stream types have moderate to very high sensitivity to disturbance and moderate to very high potential for stream bank erosion; vegetation controls channel stability and width-depth ratios. They have good recovery potential once impacts to channels are managed (Rosgen 1996). Stream bank alteration fell well below 20 percent, bank stability increased from 79 percent in 2009 to 98 percent in 2012, and the stream banks had excellent ground cover. Overall, Roaring Fork is in excellent condition and met the stream bank stability and riparian function objectives.

Figure 51. Roaring Fork has vegetated stream banks, high width to depth ratio with wide meanders, and cobble/gravel bed material.

Figure 52. Wagon Creek in the Wagon Creek Allotment has gravel/ rock armored banks with willows.

Wagon Creek Allotment

The headwaters of Wagon Creek are located in the Upper Green River Allotment within the Mosquito Lake Pastures; Wagon Creek proceeds to flow eastward through the Wagon Creek Allotment and then enters the Green River. As Wagon Creek reaches the eastern edge of the Mosquito Lake Pastures and enters the Wagon Creek Allotment, Wagon Creek gains both gradient and energy, has a wider width to depth ratio, and has a cobble dominated stream bed with well armored banks (Figure 52). A MIM transect was not conducted in the Wagon Creek Allotment because the stream displayed a high gradient change and had armored banks which stabilizes stream banks and makes the MIM monitoring irrelevant..

Upper Green River Allotment

Mud Lake/Fish Creek Rotation

Crow Creek: The majority of Crow Creek is located in the Mud Lake East Pasture in the Upper Green River Allotment. Several resource concerns were identified for a small segment of Crow Creek. The fence dividing the pastures runs alongside the stream channel and livestock concentrates use on this segment of Crow Creek. Heavy browsing, trailing, and a notable absence of riparian vegetation were observed along the stream channel. The willows that were present were pedestaled (Figure 53). A small spring located on the hillside adjacent to the stream channel also was showing signs of heavy browsing and pedestaling along with hummocking of the wet riparian vegetation. This segment of Crow Creek does not meet the riparian function objective.

Figure 53. Crow Creek segment at the pasture boundary (2013) with pedestaled willows and absence of herbaceous riparian vegetation

Raspberry Creek is located in the Fish Creek Pasture and the survey reach was located about 100 yards upstream of Forest Service Road 600 at the Raspberry Stream crossing. This segment is in a riparian area dominated by a mixture of sedge and grasses. The stream exhibited the features of a Rosgen C5 stream type and was slightly entrenched, meandering, with a well-developed floodplain (Rosgen 1996). According to Rosgen, C5 stream types are located in low gradient valley bottoms, with sandy or silty bottoms, and are highly sensitive to disturbance but have good recovery potential once they are disturbed.

The small draw that Raspberry Creek is located in is a driveway area for the cattle moving from the lower Mosquito Lake Pastures to the Fish Creek Pasture. The stream bank has experienced higher amounts of current year alteration, 22 percent in 2009, due to the combination of impacts from the road and cattle trailing activities. Stream bank stability decreased from 86 percent in 2009 to 71 percent in 2012 even though there was a decrease in current year alteration of 22 and 8 percent, respectively (Table 23). A 71 percent value for stream bank stability was considered meeting the 75 percent objective because it is within the margin of variability associated with sampling error and stream banks were well vegetated, but the creek warrants continued monitoring. Vegetation was comprised mostly of sedge species along the stream bank and high cover values (95 and 100 percent) maintain the stability of the stream (Figure 54). This stream meets the stream bank stability and riparian function objectives.

Figure 54. Raspberry Creek has well vegetated stream banks and a well-developed flood plain.

Figure 55. Strawberry Creek has vegetated stream banks and cobbles in the steam bed which contribute to armoring the banks.

Strawberry Creek is located in the Fish Creek Pasture and the survey reach is approximately 100 yards east of Forest Service Road 600 near where the stream crosses under the road through a culvert. Cows were present in the area during the 2009 and 2012 surveys. One large trail was observed within the survey reach and this section of the channel was widened and had less vegetation growing on the bank. The stream bed had a mixture of cobbles and gravels with some fines intermixed. The cobbles within the streambed also were observed along the bank and were contributing to a slight armoring of the stream bank (Figure 55). Due to the location of this MIM site (MIM #10), the vicinity of the road and trailing across the stream, the interdisciplinary team chose to make this a focus designated monitoring area to study the effects of access from the road and trailing this stream segment experiences during grazing season.

Strawberry Creek has the features of a C4 Rosgen stream type. According to Rosgen, C4 stream types are low gradient, meandering, have higher width to depth ratios and broad defined flood plains (Rosgen 1996). These stream types have moderate to very high sensitivity to disturbance and moderate to very high potential for stream bank erosion; vegetation controls channel stability and width-depth ratios. They have good recovery potential once impacts to channels are managed (Rosgen 1996). Stream bank alteration was below

20 percent in 2009 and 2012 but stream bank stability values decreased by almost 30 percent from 80 percent in 2009 to 48 percent in 2012 (Table 23). There were signs of trailing alongside the stream channel and in 2012, more trailing was observed across the channel than seen in 2009. This stream does not meet the stream bank stability objective, however, this MIM site is not representative of livestock grazing in the pasture because of the proximity of the road and the location of the livestock crossing which impacts the stream bank stability rating.

Fish Creek Focus Area:

South Fork Fish Creek is located in the Fish Creek Pasture. South Fork Fish Creek exhibits the features of a Rosgen C4 stream type which include higher width to depth ratios, low gradient, and being slightly entrenched with moderately to highly sinuous meandering sand-bed channels. Because meandering is pronounced in these channels, point bars are common features. Sediment supply can be high to very high and these types of channels can be susceptible to shifts in both lateral and vertical stability caused by channel disturbances and changes in the flow and sediment regimes of the contributing watershed. These channels have a high sensitivity to disturbance and fair recovery potential once disturbed. (Rosgen1996). The stream bank stability objective for this C4 stream is 75 percent.

Figure 56. S. Fork Fish Creek at the MIM site #1 Figure 57. S. Fork Fish Creek at MIM site #2

The first MIM transect (MIM site #1) was located about 2 miles northeast of the bridge crossing near Fish Creek Guard Station. The streambed consisted of finer grained sandy bed material and large sandy point bar deposits were observed along the stream banks. Due to the fine grained texture of the bed material, more scour was evident on the stream banks than on the second MIM performed on Fish Creek downstream of this site. Vegetation at MIM site #1 consisted of a mixture of shrub and grass such as sage, shrubby cinquefoil, mixed grass species, and isolated patches of willow (Figure **56**). Trailing either by cattle or recreational livestock was prevalent all through the survey reach, along with sloughing banks and shearing that is often seen with trailing activities. A closed two track road leads to Fish Creek and a dispersed camping site. The MIM transect began just downstream of the dispersed camping site and this MIM site was later determined not to be an ideal location because of the influence of both the road and dispersed camping site. Another MIM site #2 was surveyed on a lower reach of Fish Creek within the same pasture.

At MIM site #1, stream bank stability (70 to 46 percent) and vegetative cover (96 to 69 percent) decreased and bank alteration increased (14 to 41 percent) from 2009 to 2012, respectively (Table 23). The MIM site #1 in the Fish Creek focus area does not meet the stream bank stability objective. The road could be acting as an access for the cattle and recreational livestock to reach water and grass located on Fish Creek. Overall, the condition of the stream is good within the entire pasture but may be degrading at this location due to the

impacts from the camping site, alteration on the stream banks due to livestock, and the road located on the right bank of the MIM site.

MIM site #2 on Fish Creek was located about 1 mile downstream of the Fish Creek Bridge. This section of stream had more cobble within the streambed and was more confined than the upper reach (Figure 57). Some hummocks were observed along the survey reach which suggests that grazing occurs when the soils are still moist and beaver activity was also observed. The vegetation had more of a grass, willow, and sedge component versus the upland shrub community that was seen in the upper reach at MIM site #1. Trailing was observed but was more prevalent on the right bank of the reach and along the upper terrace of the left bank.

At MIM site #2, stream bank stability increased (59 to 76 percent), vegetative cover remained high (96 to 97 percent) and bank alteration decreased (26 to 5 percent) from 2009 to 2012, respectively. With a decrease in current year alteration there is a corresponding increase in stream bank stability. The MIM site #2 in the Fish Creek met the stream bank stability objective. Livestock were present near the survey reach during both surveys. Impacts to consider are the proximity of both the road and bridge, which may lead to a more focused amount of use by recreationists, wildlife, and livestock on this segment of Fish Creek. The main road through the Fish Creek Pasture, which also crosses Fish Creek upstream of MIM site #2, is a popular Forest access road for recreationists to access the Upper Green area and also to access the Shoshone National Forest to the east of the Bridger-Teton. The vegetative cover was excellent at this site and is helping protect the stream bank from the year to year changes in the amount of alteration that occurs at this site.

Mosquito Lake Rotation

The headwaters of Wagon Creek are located in the Upper Green River Allotment within the Mosquito Lake Pastures and then Wagon Creek flows eastward through the Wagon Creek Allotment. At its headwaters, Wagon Creek is a low energy, highly sinuous meandering stream with a small width to depth ratio (Figure 58). Wagon Creek MIM site #15 is located in the Mosquito Lake Northwest Pasture. This stream reach is located in a valley formed by glacial processes as evident by large glacial erratics, potholes, kettle lakes, and glacial till. The area is dominated by a sagebrush/grass uplands and predominately grass with some sedges intermixed in the riparian area with small patches of willow. The bedload consisted of a mixture of large cobbles and some fines. These cobbles contributed to a well armored stream bank in sections. This section of Wagon Creek surveyed as an E4 Rosgen channel type, which have a very high sensitivity to disturbance, good recovery potential, moderate stream bank erosion potential, and vegetation has a very high influence on channel form and function. This reach of Wagon Creek is highly covered with vegetation, and appeared in excellent condition, but the stream bank stability was (80 to 75 percent) below the 85 percent objective. Vegetative cover remained high (94 to 98 percent) and bank alteration increased (9 to 32 percent) from 2009 to 2012, respectively at MIM site #15. This segment of Wagon Creek does not meet the stream bank stability objective.

Figure 58. Wagon Creek (MIM site #15) vegetation was predominantly grass with some sedges intermixed.

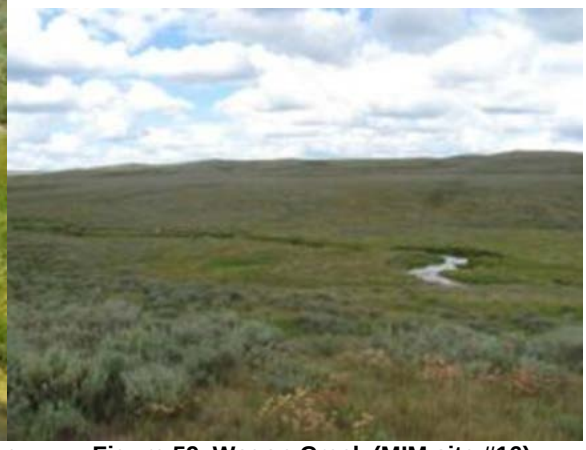

Figure 59. Wagon Creek (MIM site #16)

Wagon Creek Focus Area

Wagon Creek MIM site #16 is located in the Wagon Creek focus area in the Mosquito Lake Southeast Pasture. This pasture was rested in 2009 and the section around the road has been fenced off for the previous 4 years due to water quality concerns and was not grazed at the time of survey in 2012. Wagon Creek at this site has similar vegetation seen in the previous transect except that the willow and grass communities were more robust at this site, most likely due to the resting of the pasture. The stream had a slightly higher width to depth ratio and exhibited slightly more sinuosity in this reach and was typed as a Rosgen E4 channel. These channels are very sensitive to disturbance due to their high dependence on vegetation for bank stability; they have high stream bank erosion potential if banks or riparian vegetation are disturbed. When they are in dynamic equilibrium, these channels have a high capacity for transporting sediment and are very stable unless banks are disturbed, sediment supply changes, or streamflow is altered (Rosgen 1996).

Wagon Creek in the focus area had vegetative bank cover of 96 and 100 percent, current year alteration of 20 and 0 percent, and stream bank stability of 76 and 100 percent in 2009 and 2012, respectively. Bank stability met the stream bank stability objective which is between 75 to 85 percent (undetermined) because the Rosgen typing has not been determined. Increased erosion is occurring at the site where cattle cross the creek and a closed road intersects the creek. This situation resulted in the creek not meeting the riparian function objective.

Tosi Creek/Tepee Creek/Kinky Creek Rotation

Upper Tosi Creek (MIM site #14) is located within the Tosi Pasture in the Upper Green Allotment. This upper section of Tosi is more confined and sinuous with a lower width to depth ratio compared to the lower section of Tosi Creek surveyed in the Tosi Creek focus area. Beaver activity was observed within the reach surveyed and some trailing was noted through the stream and willows. Located within a willow bottom, a mixed grass and shrub community was growing underneath the willow overstory along the stream reach. The stream bed had a mix of cobbles and gravels and had a well-defined C4 Rosgen stream type (Rosgen, 1996). According to Rosgen, C4 stream types are low gradient, meandering, have high width to depth ratios and broad defined flood plains. These stream types have moderate to very high sensitivity to disturbance and

moderate to very high potential for stream bank erosion; vegetation controls channel stability and width-depth ratios. They have good recovery potential once impacts to channels are managed (Rosgen 1996).

Tosi Creek at this location had excellent bank cover (99 and 98 percent) and the current year alteration (11 and 7 percent) was under the guideline of 20 percent in 2009 and 2012, respectively. Bank stability rated at 65 percent in 2009 but increased to 85 percent which met the stream bank stability objective of 75 percent. This increase in stability could be due to the beaver activity and the trailing observed in 2009. More long-term monitoring is needed to indicate if this transect is unstable due to management actions or natural features exhibited in this drainage.

Kinky Creek is located within the Kinky Creek Pasture of the Upper Green Allotment. Kinky Creek is a tributary to the Gros Ventre River which is a designated Scenic River under the Wild and Scenic River Act. Scenic Rivers are defined as rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive or shorelines largely undeveloped but accessible in places by roads. The current management of Kinky Creek Pasture is ungrazed by livestock in the majority of the pasture with the exception of horses grazing in a 57-acre portion of the pasture along the boundary of the Darwin Ranch through a special use permit. The only portion of Kinky Creek that was field reviewed was directly adjacent to the Darwin Ranch where the season-long horse grazing is occurring. Kinky Creek at that location is confined by a two track road and the private property fencing. Soil compaction and hummocks were evident along that portion of the stream bank and within the riparian area and adjacent wetlands (Figure 60). Water quality of the Gros Ventre is sufficient to support the outstandingly remarkable values in a Wild and Scenic River designation and with what was observed, Kinky Creek could be a potential sediment and nutrient source to the Gros Ventre River. This section of Kinky Creek is not representative of the pasture; rather it reflects the season-long grazing of horses associated with the Darwin Ranch. Beginning in 2014 the special use permit was not renewed. The 27 horses will be managed under a term grazing permit and will be required to rotate through the pastures in a deferred rotation under the action alternatives. The permittee may choose to use the Kinky Creek Pasture solely only when the pasture is scheduled for livestock grazing. Currently, this short segment of Kinky Creek does not meet the riparian function objective due to soil compaction and hummucking.

Figure 60. Soil compaction and hummocks in the 57-acre meadow area near Kinky Creek

Tepee Creek is located in the Lower Tepee Pasture and is a moderately sinuous stream with a moderate width to depth ratio. The stream bed material consists primarily of gravel and fines. The fines are a result of the numerous beaver dams that are located upstream of the focus area that blew out during spring flow of 2009. Beaver are active on Tepee Creek and introduce a lot of sediment and woody material into the system.

Tepee Creek Focus Area

Tepee Creek focus area is a B4c- stream type. According to Rosgen (1996), B4c- stream types are moderately entrenched systems with gradients between 2-4 percent. These channel types have a moderate width/depth ratio with channel materials consisting mostly of gravel with lesser amounts of sand. These stream types have moderate sensitivity to disturbance and they have good to excellent recovery potential once impacts to channels are managed (Rosgen 1996).

At MIM site #12, stream bank alteration values increased (25 to 37 percent) and vegetative cover decreased (84 to 49 percent) from 2009 to 2012. Bank stability values remained static at 40 percent. The Tepee Creek focus area does not meet the stream bank stability and the riparian function objectives. However, over time with the change in management and a full time rider to keep the cattle out of the sensitive stream bank areas, this system has been trending upward in stream bank health. This channel is recovering from past impacts as can be seen in the historical documentation but it still has not achieved the 80 percent stream bank stability objective that is desired for this stream type.

The Lower Tepee Pasture had some historical issues with overgrazing but since the 1980s has been cooperatively managed to address stream bank trampling concerns within the Tepee Creek focus area (Rangeland Vegetation Section). In 1982, Tepee Creek focus area was characterized by sloughing banks, lack of vegetation, widening of the channel and trailing along the stream banks (Figure 61). In 2009, Tepee Creek focus area had improved and was characterized by willow regeneration, vegetation on stream banks and presence of more woody material within the channel. In response to changes in livestock grazing management, channels typically take longer to recover compared to establishment of vegetation on stream banks. Magilligan and McDowell (1997) studied geomorphic channel adjustments in streams that had been excluded from grazing over a 14 year time period and found that 14 years may not be long enough for stream channels to recover from grazing impacts. The most notable difference in changes in a short period of time (5 to 10 years) was the riparian vegetation.

Past management included the installation of large logs which were stacked, riprapped, and cabled into the stream banks to accelerate the recovery of Tepee Creek by promoting stream bank stability and fish habitat. Over time these structures have degraded and are now in many cases residing in the center of the channel, causing channel scour and not meeting the original intent of the stream bank rehabilitation project. Although this project was implemented to improve stream bank stability, it is now causing more harm to the stream banks than protection.

Figure 61. Tepee Creek in 1982 (left photo) lacked vegetation and banks sloughing compared to 2009 existing conditions with vegetation on banks (right photo).

Gypsum Creek Rotation

Gypsum Creek (MIM site #3) is located in the Upper Gypsum Pasture. This reach had a mixture of cobble, small gravels, and fines within the streambed and the banks were vegetated with a mixture of grass, sedges, and willow. Beaver activity was present upstream and this could account for the amount of fines seen in the stream reach. Gypsum Creek at this location exhibits the features of a Rosgen C stream which includes higher width to depth ratios, point bars, low gradient, and being slightly entrenched with moderately to highly sinuous meandering channels.

Livestock were present within the pasture at the time of 2009 survey and were observed using the vegetation throughout the valley bottom both in the willows and uplands. Trailing was observed through the stream at one location which was near an old closed road which the livestock used to cross the stream. Besides this one historic stream crossing and adjacent crossing, this stream looked to be functioning well with excellent vegetative cover and in good condition.

At MIM site #3, stream bank stability was 85 percent, alteration was 15 percent and 99 percent vegetative cover in 2009. This site was not re-read in 2012 because the site was inundated with water due to beaver activity. Gypsum Creek meets the stream bank stability and the riparian function objectives.

Figure 62. Gypsum Creek is well vegetated with stable stream banks.

Figure 63. South Gypsum Creek is well vegetated with sedges and willows establishing on sediment deposited from the 2007 fire.

South Gypsum Creek is located in the Lower Gypsum Pasture. In 2007, the Salt Lick wildfire burned in the South Gypsum drainage and the MIM monitoring site # 4 was located within the burn perimeter. The Lower Gypsum Pasture was closed to livestock grazing in 2007 and 2008 and opened to livestock grazing since 2009. This stream has the features of a Rosgen C4 channel, a low gradient stream with wide meanders. The Rosgen C4 stream type has a moderate to very high sensitivity to disturbance and fair to good recovery potential if disturbed (Rosgen 1996). Vegetation on the South Gypsum Creek consisted of a dominant willow community with grass and sedge intermixed (Figure 63). Young willow and sedges were growing along the point bars and areas of recent sediment deposition. Large amounts of sediment were collecting on the point bars and lower elevation areas of the stream reach. This is likely due to runoff from the nearby burn area which is consistent with Martin and Moody (2009) who reported that post-fire erosion is the greatest the first year after a wildfire and elevated yields of post-fire sedimentation can persist for 4 to 7 years.

Otherwise, the stream banks looked stable with well vegetated banks and little trailing or current-year alteration was evident. Bank alteration was low (7 and 14 percent) and vegetation on the banks was high (95 and 100 percent) on the South Gypsum Creek (MIM site #4) for 2009 and 2012, respectively. Bank stability was low (59 percent) in 2009 but this was likely due to the recent sediment deposition from the burned area upstream. In 2012, stream bank stability increased to 73 percent which is considered at the objective of 75 percent because it is within the range of variability associated with sampling error. However, this creek warrants further monitoring to ensure the stream meets the stream bank stability objective and the desired condition.

River Bottom Pasture/ Livestock Driveway

The Upper Green River is located within the River Bottom Pasture. The livestock driveway follows the length of the Upper Green River starting from the Forest boundary approximately 12.5 miles to the bend in the Green River. The Upper Green River from the Green River Lake to the Forest boundary exhibits the features of a Rosgen C stream type (Rosgen, 1996). According to Rosgen, C stream types are low gradient, meandering, have high width to depth ratios, bed material dominated by cobbles, and broad defined flood plains. These stream types have moderate to very high sensitivity to disturbance and moderate to very high potential for stream bank erosion; vegetation controls channel stability and width-depth ratios. They have good recovery potential once impacts to channels are managed (Rosgen 1996).

A popular camping and recreating area, many dispersed camping sites and two track roads can be seen all along the Green River (Figure 64). Cows were observed utilizing both the willow bottoms and shrubby uplands all along the driveway length. Some trailing was observed along the terraces down to the river and along the river bottom within the willows. The most notable impacts were from roads and dispersed recreation. The most popular spots to camp are along the main river corridor and this especially was seen concentrated along Forest Service Road 600 and the main Green River road that leads to Green River Lake. There is also an elk feedground located near the confluence with Moose Creek. Impacts such as trampling from wildlife and concentration of wildlife could be a factor in that area but notable impacts from cattle have not been documented.

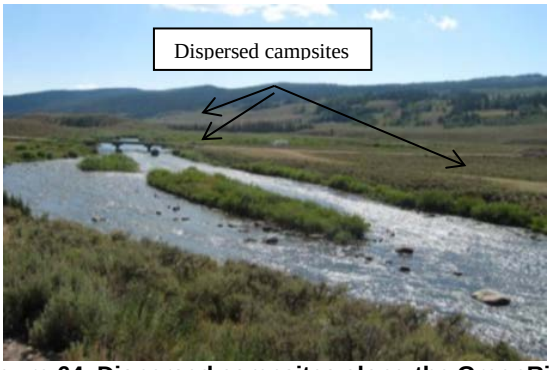

Figure 64. Dispersed campsites along the GreenRiver at Forest Service Road 600 bridge crossing

Figure 65. Properly functioning condition assessment site #1 contained a mixture of willow and sedge.

Five properly functioning condition (PFC) assessments were performed on the Upper Green River within the River Bottom Pasture/livestock driveway (Figure 42). This method was selected for the Upper Green River, versus the MIM protocol, due to the very nature and size of the Upper Green River. Four of the five sites rated out as "properly functioning" and site #4 rated out as "functional – at risk". The definition of properly functioning is:

> "Riparian-wetland areas are functioning properly when adequate vegetation, land form, or large woody debris is present to dissipate stream energy, filter sediment, aid floodplain development; improve flood-water retention and groundwater recharge; develop root masses that stabilize stream banks against cutting action; and develop diverse ponding and channel characteristics to provide the habitat for fish production and waterfowl and to support greater biodiversity (Bureau of Land Management 1998)."

All four sites that rated as properly functioning had very similar vegetation types and channel features with a mixture of willow and sedge riparian vegetation that exhibited multi-age classes and are species that have root masses capable of withstanding high flow events. These sites had active point bars and the evidence of an active floodplain. Light use by both livestock and recreational use was observed at all four sites during the assessments. Therefore, the Green River at sites #1, 2, 3, and 5 met the riparian function objective.

PFC site #4 is located on the Green River directly across the Upper Green River elk feedground near the confluence of the Roaring Fork and is the only site assessed that rated as functional-at risk. A functional-at risk riparian wetland area possesses some or most of the attributes given in the definition of a properly functioning riparian-wetland but at least one of its attributes gives it a high probability of degradation during high flow events (Bureau of Land Management 1998). This site had a negative response for three elements: 1) stream bank vegetation was not comprised of plants or plant communities that have root masses capable of withstanding high flow events; 2) there was not a diverse age-class distribution of riparian-wetland vegetation (i.e. lack of plant recruitment); and 3) there was not any obvious sign that the riparian-wetland area was widening to its potential extent. Vegetation at site #4 consisted predominately of mixed grasses with very little willow. Shrubby cinquefoil and sagebrush was found alongside the stream bank which indicates a drier site and lowered water table. There were hummocked soils within the riparian area which indicates grazing on wet soils and pedestaling of willows within the riparian/floodplain area. Trailing alongside and across the stream banks was observed along with obvious slumping of the stream bank on the north side of the river. Therefore, this section of the Green River (Site #4) did not meet the riparian function objective.

Figure 66. PFC site #4 consisted primarily of mixed grasses with very little willow.

Figure 67. Shrubby cinquefoil and sagebrush alongside the stream bank at PFC site #4.Water Quality

The objective of the Wyoming water pollution control program is to "provide, wherever attainable, the highest possible water quality commensurate with [designated beneficial uses]" (Wyoming DEQ, 2001, Section 3). Wyoming Department of Environmental Quality classifies streams in the Wyoming Surface Water Classification List, Tables A and B, according to beneficial uses that are, or should be, supported for a given stream or reach.

The Green River from the mouth of the New Fork River to the wilderness boundary is considered Class 1 water and this includes the entire section of the Green River within the Upper Green Analysis Area. Class 2AB waters that are located within the Upper Green Analysis Area are: North Beaver Creek, Little Twin and Big Twin Creeks, Jim Creek, Gypsum Creek, Rock Creek, Lime Creek, Klondike Creek, Tosi Creek, Tepee Creek, Roaring Fork, and Wagon Creek.

The Sublette County Conservation District has collected water quality data on three sites within the analysis area. Two sites are located on the Green River, one located below Green River Lake and the other at the Forest boundary. Data has been collected from April 2001 through November 2012 (to date). The third site is located on Gypsum Creek upstream of the confluence with the Green River and data was collected from April 2001 through November 2011 (to date). All water quality parameters collected at these three sites meet the State of Wyoming water quality criteria. Data and Wyoming water quality criteria are summarized in the Hydrology Specialist Report (Robertson 2016). Additional water temperature data was collected by the Forest Service within the project area (Anderson 2015). Water temperature on Wagon Creek did not meet the stream temperature objective. Refer to the Fisheries section for more information.

The Wyoming Department of Environmental Quality has also collected water quality data within the analysis area. Two sites on Wagon Creek were sampled in 2008 for E. coli. The geometric mean for the first site was 30.7 organisms per 100 milliliters and the geometric mean for the second site was 36.9 organisms per 100 milliliters. The State standard for E. coli is, "concentrations of E. coli bacteria shall not exceed a geometric mean of 126 organisms per 100 milliliters based on a minimum of not less than 5 samples obtained during separate 24 hour periods for any 30-day period." This pertains to the summer recreation season (May 1 through September 30) in all waters designated for primary contact recreation. Both sites on Wagon Creek meet the state standards for E. coli.

Physical stream channel characteristics and riparian vegetation are used as indicators of water quality condition, in accordance with Forest Plan Standards and Guidelines and Wyoming Grazing Best Management Practices (BMPs) (WDEQ, 1997). BMPs are defined in the Wyoming Surface Water Quality

Standards as "a practice or combination of practices that after problem assessment, examination of alternative practices, and in some cases public participation, are determined to be the most technologically and economically feasible means of managing, preventing or reducing nonpoint source pollution." (WDEQ, 2007) As stated in the Grazing BMPs, "… (BMPs) are guidelines for reduction of nonpoint source water pollution from grazing by livestock, wildlife, and wild horses." The Bridger-Teton National Forest adheres to these BMPs. BMPs that are currently being implemented are Practice 1E – Proper Grazing – Riparian and Wetland Areas, Practice 2 – Fencing, Practice 3 – Herding, and Practice 5 – Herding.

Riparian areas and stream channels that are in good condition act as filters for sediment, bacteria and nutrients. They also provide cover to maintain water temperatures, ensure that stream channels have a form that allows them to transport the sediment being supplied to them from stream bank erosion and from their watersheds, and supply good habitat for aquatic organisms. Agouridis et al. (2005) noted that numerous studies document the negative impacts of grazing on stream channel condition and water quality, but that few studies have evaluated the success of best management practices in mitigating these adverse impacts from grazing. The few studies they were able to find on best management practices' effectiveness did show water quality and stream channel benefits from implementing best management practices. The impacts to water quality from grazing, and the water quality benefits from maintaining riparian and stream channel conditions, are also summarized in the Wyoming Grazing Best Management Practices (Wyoming Department of Environmental Quality 1997) and in other literature, including Leffert (2005); Sovell et al. (2000); Mosley et al. (1997). It is reasonable, based on these and other references, to assume that channel and riparian area conditions are reasonable indicators of water quality conditions.

Wetlands

Wetlands are generally located along the Green River and in the northern pastures of the Upper Green Allotment, although there are small isolated wetlands throughout the entire analysis area. Livestock use of wetlands is expected to correspond to use on riparian areas when livestock are in the allotment. At this time, in general most wetlands have robust vegetation reflective of healthy conditions which is described further in the stream channel conditions and is based upon visual observations. Vegetation is comprised of a sedge/grass mixture that in some places was measured at over 18 inches in height.

Wetland in Fish Creek Pasture in 2013

Environmental Consequences

Issue 2: Riparian and Aquatic Conditions

The concern is that livestock grazing may affect riparian areas, riparian vegetation, fisheries and overall stream function and health.

Effects Indicators for Comparison of Alternatives

Indicators: Stream bank stability (percent), and riparian function (properly functioning condition rating, and professional judgment).

Alternative 1 – No Livestock Grazing (No Action Alternative)

Direct and Indirect

Current conditions would be maintained or would improve along all streams and riparian areas where livestock grazing is the primary source of direct and indirect impacts to these resources. Both short-term (e.g. vegetative cover) and long-term indicators (e.g. stream bank stability and riparian function) would increase, reflecting these conditions. Stream bank alteration (i.e. trampling) would decrease on all stream reaches identified in the project area with the removal of livestock. Stream bank stability would increase over time with the impacts of the channel alteration being lessened by the removal of livestock.

Grazing impacts related to alteration and stability by wildlife would still continue under this alternative. Utilization of riparian vegetation by wildlife and the associated impacts related to loss of cover on stream banks would still continue to occur under this alternative; although generally no notable wildlife impacts were seen in the analysis area with the exception of the Green River at the Roaring Fork confluence near the Upper Green River elk feedground.

Direct and Indirect Effects by Allotment or Rotation

Badger Creek Allotment and Beaver-Twin Allotment

Under Alternative 1, existing conditions would be maintained and streams in the Badger Creek and Beaver-Twin allotments would continue to meet the stream bank stability and riparian function objectives. The well-established willow communities with grass/sedge understory and riparian vegetation would be maintained along Big Twin and Little Twin Creeks. Evidence of trailing in the willows would decrease although wildlife such as moose would still cause some trailing. The livestock crossing of Big Twin Creek at the fence line would continue to establish riparian vegetation and increase stream bank stability. The stream crossing on Little Twin Creek would continue to recruit riparian vegetation and the stream immediately upstream and downstream of the crossing would continue to narrow and deepen. Miner Creek, North Beaver Creek, and Packer Creek would remain in excellent condition with high vegetation cover on the stream banks and only minimal bank alternation due to wildlife. These creeks would continue to meet the stream bank stability and riparian function objectives and therefore meet desired conditions.

Noble Pastures Allotment

Tosi Creek Focus Area

Under Alternative 1, discontinuing livestock grazing would increase the riparian vegetation on the stream banks, decrease alteration, and increase the overall stream bank stability on Tosi Creek. Trailing through the willows would decrease although some minor trailing would still continue to occur by wildlife, but would not prevent the attainment of the riparian function objective. Lateral movement of the stream and the deposition of sediment on the point bars would continue but overall sedimentation would likely decrease over time as

riparian vegetation increased and stabilized the stream banks. Stream bank stability and riparian function of the creek would move towards the desired condition at the fastest rate compared to Alternatives 2, 3 and 4.

Klondike Creek Focus Area

Under Alternative 1, discontinuing livestock grazing would increase the riparian vegetation on the stream banks, decrease alteration and sloughing, and increase stream bank stability of Klondike Creek. Stream bank stability and riparian function of the creek would move towards the objective and desired conditions at a faster rate than under Alternative 2 and at a similar rate to Alternatives 3 and 4 in which livestock would be fenced out of the creek but allowed in to promote willow establishment by reducing competing sedges and grasses.

Roaring Fork Allotment

Eliminating livestock grazing would increase the riparian vegetation on the stream banks and the existing conditions would be maintained or improved. Roaring Fork would continue to meet the stream bank stability and riparian function objectives.

Wagon Creek Allotment

Existing conditions would be maintained because the armored banks would continue to stabilize the stream banks and Wagon Creek would continue to meet the stream bank stability and riparian function objectives.

Upper Green River Allotment

Mud Lake/Fish Creek Rotation

Under Alternative 1, discontinuing livestock grazing would improve the riparian condition of the Crow Creek segment located in the southwest corner of Mud Lake East Pasture. Browsing on willows would decrease and riparian vegetation would re-establish along the stream channel and increase. Improved conditions would also occur at the small spring located nearby with reduction in soil compaction, hummocking and willow browsing. Stream bank stability and riparian function of this segment of Crow Creek would move towards the objectives and desired conditions at the fastest rate compared to Alternatives 2, 3 and 4. Under Alternative 1, alteration would decrease on Raspberry Creek and stream bank stability would likely increase slightly because Raspberry Creek currently has stable stream banks. Raspberry Creek would continue to meet the stream bank stability and riparian function objectives. The stream bank stability of Strawberry Creek would continue to be impacted by the road but would generally increase as a result of the discontinuation of livestock both crossing the creek and trailing alongside the creek. The absence of these trailing activities would allow for riparian vegetation to increase along the stream banks.

The Green River would continue to meet the riparian function objective along the majority of the river. Riparian function would improve slightly at the segment of the Green River near the elk feedground (PFC site #4) which is currently functioning at risk; however, alteration and stability impacts caused by wildlife, primarily elk, would continue under this alternative due to the concentration of a large number of elk being fed and wintering along this segment of the river. Riparian vegetation use by wildlife and the associated impacts related to loss of cover on stream banks would still continue to occur under this alternative. Impacts to the Green River from dispersed camping and two track roads would continue.

Fish Creek Focus Area

Under Alternative 1, alteration would decrease, and vegetative cover and stream bank stability would increase on South Fork Fish Creek within the focus area. However, impacts to Fish Creek, including decreases in vegetative cover and stream bank stability, from the unauthorized use of the closed two-track

road and dispersed camping would continue. Stream bank stability and riparian function of the creek would move towards the objective and desired conditions at the fastest rate compared to Alternatives 2, 3 and 4, although negative impacts associated with roads and dispersed camping may prevent the creek from reaching desired conditions.

Mosquito Lake Rotation

Eliminating livestock grazing would decrease alteration on the stream banks and increase vegetative cover and stream bank stability on the Wagon Creek segment in the Mosquito NW Pasture. This segment of Wagon Creek is currently below but near the stream bank stability objective (75 percent and 85 percent, respectively). Alternative 1 would result in Wagon Creek meeting the stream bank stability objective at the fastest rate compared to Alternatives 2, 3, and 4.

Wagon Creek Focus Area

Under Alternative 1, willow, sedges and grasses would continue to establish along the Wagon Creek banks and maintain the stream bank stability at objective. Eventually, the creek width to depth ratio would decrease resulting in a narrower and deeper channel. Erosion at the livestock stream crossing would decline as riparian vegetation reestablishes unless reestablishment of vegetation is inhibited by unauthorized motor vehicle use crossing Wagon Creek. Alternative 1 would result in Wagon Creek meeting the riparian objective at a faster rate than Alternative 2 but at a similar rate to Alternatives 3 and 4 because under both these alternatives, livestock would be fenced out of Wagon Creek in the focus area, a hardened crossing would be installed to reduce erosion at the crossing, and a gate would be installed at the head of the closed road to prohibit unauthorized motorized access.

Tosi Creek/Tepee Creek/Kinky Creek Rotation

Discontinuing livestock grazing would decrease alteration on the stream banks and increase vegetative cover and stream bank stability slightly on Tosi Creek. This creek would continue to meet the stream bank stability and riparian function objectives.

The riparian function of the Kinky Creek segment near Darwin Ranch and adjacent meadow would improve under Alternative 1 with the removal of season-long horse grazing. Over time, soil compaction and hummocking would decline and the potential for Kinky Creek to be a potential sediment and nutrient source to the Gros Ventre River would diminish. Water quality of the Gros Ventre would continue to support the outstandingly remarkable values in a Wild and Scenic River designation. Under this alternative, Kinky Creek would move towards the riparian function objective at the fastest rate compared to Alternatives 2, 3, and 4.

Tepee Creek Focus Area

Under Alternative 1, discontinuing livestock grazing would decrease alteration on the stream banks and increase vegetative cover and stream bank stability on Tepee Creek and would move the creek towards the stream bank stability and the riparian function objectives at a faster rate than Alternative 2. However, impacts associated with the existing log structures and cabling on Tepee Creek, including channel scouring, would continue under Alternative 1 and may prevent the creek from reaching stream bank stability and riparian function objectives and desired conditions. Alternatives 3 or 4 would better meet the objectives on Tepee Creek than Alternative 1 because livestock would be excluded from Tepee Creek with fencing and the log structures and cabling would be removed.

Gypsum Creek Rotation

Eliminating livestock grazing would decrease alteration on the stream banks and increase vegetative cover and stream bank stability slightly on Gypsum Creek. Gypsum Creek would continue to meet the stream bank stability and the riparian function objectives.

South Gypsum Creek

Under Alternative 1, young willow and sedges would continue to establish on the point bars and areas of recent sediment deposition associated with the 2007 Salt Lick Fire. Discontinuing livestock grazing would decrease alteration slightly on the stream banks and increase vegetative cover and stream bank stability slightly on South Gypsum Creek because livestock use along the creek is currently low.

River Bottom Pasture/ Livestock Driveway

Discontinuing livestock grazing would continue to maintain the majority of the Green River (sites #1, 2, 3, and 5) at properly functioning condition and the river would meet the riparian function objective. The exception to this is the segment of the Green River near the elk feedground, which is located in the Mud Lake East Pasture and is currently functioning at risk. Effects of implementing Alternative 1 are described above under the Mud Lake/Fish Creek Rotation. Impacts to the Green River from dispersed camping and two track roads would continue, regardless of the presence or absence of livestock. These impacts include reduction of riparian vegetation along the stream bank, soil compaction near the stream channel and reduced stream bank stability due to high levels of use from dispersed camping along the river corridor.

Cumulative Effects for Alternatives 1, 2, 3 and 4

The interdisciplinary team identified past, present and reasonably foreseeable future activities which were considered for this cumulative effects analysis (Appendix A). Cumulative effects are analyzed at the 6th field hydrologic units (HUCs) level. These HUCs are typically watersheds, although there are rare exceptions when HUC boundaries do not follow watershed divides. These HUCs are usually 5,000 to 50,000 acres in size. The following HUCs are included in the project area and define the cumulative effects spatial boundary:

Table 24. Sixth field hydrologic units in the Upper Green River analysis area

HUC number	HUC name	Size of HUC (acres)
170401020105	Bacon Creek	22,966.18
170401020102	Middle South Fork Fish Creek	30,805.01
170401020202	Gros Ventre River- Kinky Creek	29,884.81
170401020101	Upper South Fork Fish Creek	27,069.66
140401010105	Wagon Creek	14,762.13
140401010102	Green River-Mill Creek	36,226.74
140401010201	Tosi Creek	35,936.45
140401010104	Roaring Fork	15,740.47
140401010202	Green River-Lime Creek	22,687.22
140401010205	Gypsum Creek	24,537.66
140401010203	Rock Creek	12,493.45
140401010206	Green River-Big Twin Creek	40,415.71
140401010204	Green River-Boulder Creek	30,479.90
140401010302	North Beaver Creek	24,082.95

A number of fires have burned in the HUCs that contain the allotments over the past fifty years, affecting many areas within them. The most recent fire was the Packer Miner Fire, which burned 458 acres in 2013 and was located in the Badger Allotment near Little Twin Creek within the North Beaver Creek HUC. Other fires that have burned within the analysis area are the Kinky Fire (1991) in the Gros Ventre. The Salt Lick Fire (2007), North Gypsum Creek Fire (1961), South Gypsum Creek Fire (1971), Battle Mountain Fire (2006) and the Jim Creek WFU Fire (2006) all burned in the Gypsum Creek HUC. These fires burned a total of 9415.25 acres. These fires have occurred over a long period of time which would allow for recovery between them and decrease the cumulative impacts due to multiple fires burning in a short time frame. Hydrologic changes would be expected to last approximately five years after the burn with vegetative recovery taking place by that time, but changes in sediment loading to streams and transport could persist over a longer period of time. These impacts could be sedimentation from roads, potential changes in runoff and timing, stream function and health due to loss of vegetation if the burn severities were high, increased amounts of overland flow due to loss of hillslope vegetation which also leads to increased sedimentation in streams due to lack of streamside vegetation which can capture sediment from hillsides.

Historically, multiple timber sales have taken place within the analysis area but currently there are only two small timber sales being implemented currently – the Lost Creek Timber Salvage and Red Cliff Timber Sales. These sales are a mixture of salvage and prescribed fire. Impacts from timber sale activities would be the same under all alternatives. Potential impacts from timber sale activities include sedimentation from newly built or temporary logging roads, a decrease in ground cover which could lead to a change in timing of runoff flows, and compaction of soils from logging activities. Along with the logging operations, firewood cutting is permitted within the project area. Temporary roads built for these timber sales and decreased amount of vegetation cover could lead to an increased amount of sedimentation in streams but if BMPs are followed and temporary roads were/are decommissioned after activities (as required by contracts), only short term inputs of sediment would have been seen. Along with the impacts described above, treatment of more than 30 percent of the area of a 6th field HUC may lead to a change in water yield and runoff timing, particularly in forested areas (Megahan et al. 1995, Cheng 1989). Treatments that leave more than 30 percent of the forested area of a 6th field HUC in a clearcut or equivalent condition within a 30-year period are contrary to Forest Plan direction. Treatments including fire, roads, and timber activities were analyzed during the current Forest Plan revision process and in all of the watersheds identified in this analysis area; none of the watersheds exceeded the 30 percent threshold and these past activities should not lead to an increase in runoff yield and timing.

Impacts from roads would be the same under all alternatives. Sediment production from roads and delivery to stream channels and riparian areas would continue at existing rates, channels and floodplains would continue to be confined and altered by these facilities, and water routing would be altered by roads and their drainage structures. The stream crossing on Wagon Creek is a sediment source in Wagon Creek and the spurs roads along the Upper Green within the driveway are areas of soil compaction. Spur roads along Fish Creek are also a source of sedimentation reaching Fish Creek and soil compaction along the stream corridor is occurring at identified dispersed camping locations.

Impacts from trampling due to wildlife would continue. It is hard to determine the amount of impact on channels due to these wild animals because of the difficulty in determining the differences in hoof prints when monitoring stream bank trampling. Wildlife impacts near the elk feedground would continue but water quality is meeting State standards, as stated in the specialist report for the elk feedgrounds (Simon 2008b). There was little sign of impact by elk in the riparian area of Green River. Impacts (trailing, trampling) appeared to be from cattle, and overall stream channel conditions were meeting Forest Plan direction.

Impacts from historic grazing would be the same under all alternatives. Channel form and function on Tepee Creek in the lower Tepee Pasture is still recovering from past season-long grazing management of cattle and

sagebrush treatments which affected the willow and riparian communities along the stream channel. Channel form and function on Klondike and Tosi Creek within Noble Pastures is still recovering from the historical management of season-long use grazing. Excessive grazing and trampling can affect riparian-stream habitats by reducing or eliminating riparian vegetation, causing channel aggradation or degradation, causing widening or incisement of stream channels, changing stream bank morphology, and as an accumulative result often lowering surrounding water tables (Platts 1986). While riparian vegetation was present on the stream banks with good amounts of cover, channel stability ratings were still low indicating that the streams' channel form is still recovering. It has been shown that channel recovery is often much slower than vegetative recovery. Kondolf (1993) studied channels in California that were excluded from grazing for over 25 years but still had not returned to their pre-disturbance morphology despite the presence of healthy riparian vegetation along the stream banks.

Impacts from dispersed recreational use would be the same under all alternatives, along with impacts from unauthorized ATV activities. Impacts from unauthorized ATV trails including increased sediment production and delivery to stream channels would continue at existing rates and water routing would be altered by these unauthorized trails that are located near or across stream channels. Dispersed recreational sites tend to be located near stream channels and the most common impacts seen are soil compaction and stream alteration due to the concentrated activity at those sites. This leads to a greater possibility of sediment entering the stream channel and the loss of soil productivity. These sites also are vectors for invasive plants due to the high amount of disturbance they receive and these types of plants are not desirable for stream bank stability and riparian health. The areas within the Upper Green Analysis Area that were observed to have the highest amounts of ATV and dispersed recreation impacts were the Upper Green Driveway and the Fish Creek Pasture within the Upper Green Allotment.

Alternatives 1, 3 and 4 would maintain or improve stream bank stability and riparian function of streams in the six allotments and when combined with the negative effects of past fires, timber sale activities, roads, elk feedground, historic livestock grazing, dispersed recreational use, and unauthorized ATV activities, the cumulative effect on stream bank stability and riparian function in the project area would be localized areas with stream bank stability or riparian function concerns but overall healthy and properly functioning riparian systems. Alternative 2-Grazing as Currently Permitted would result in declines in stream bank stability and riparian function of streams in the six allotments and when combined with the negative effects of past fires, timber sale activities, roads, elk feedground, historic livestock grazing, dispersed recreational use, and unauthorized ATV activities, the cumulative effect would be a net decline in stream bank stability and riparian function in the project area and concern that streams would be functioning at risk.

Alternative 2 – Grazing as Currently Permitted/ Current Management

Direct and Indirect Effects by Indicator

Current conditions and trends described in the Affected Environment would continue under Alternative 2-Grazing as Currently Permitted. Under Alternative 2 the Forest would continue to authorize the same maximum numbers, seasons, grazing systems, and utilization would continue to be capped at 55 percent for uplands and 65 percent for riparian area as specified in the Forest Plan. The environmental consequences of this alternative may result in different conditions compared to the existing conditions because over the last decade, livestock have not been run at full numbers in all cases, and the utilization has been approximately 30 percent in most of the pastures with the exception of Wagon Creek and Noble Pastures allotments. While it is likely that utilization would remain about the same level as current management, it is important to analyze the potential effects of this alternative assuming maximum forage utilization authorized and maximum grazing intensity as described under Alternative 2-Grazing as Currently Permitted.

Range monitoring data suggest that upland utilization based on these stocking rates and season in the recent past has often been well below the allowable maximum level. Stubble height, as measured along the greenline of the stream, has ranged from 3-6 inches where it has been measured. Prior to the cooperative permittee and Forest Service monitoring effort, there are few records of annual utilization, and so it is possible that utilization levels were much higher than have been recorded in more recent years. If vegetation conditions or permittee management changed dramatically, this alternative would allow for a near-doubling of recent forage utilization levels to 65 percent in riparian areas. In that case, downward trends in riparian vegetation conditions and stream bank stability would be expected. In Clary and Webster (1989), it is recommended that streamside utilization of herbaceous forage should not exceed 40-50 percent of the current growth and in special situations such as critical fisheries habitats or easily eroded stream banks may require stubble heights of greater than 6 inches. Under Alternative 2 there is not a maximum stubble height requirement.

Channel instability would continue or increase, if the maximum 65 percent forage utilization in riparian areas is implemented on streams in the project area as proposed under Alternative 2- Grazing as Currently Permitted. Livestock impacts would continue to occur in areas found to have higher amounts of stream bank alteration (>20 percent), since no alteration limitation would be in place under Alternative 2, resulting in bank instability and inhibiting channel and riparian recovery. Bank instability is often the first sign of overgrazing impacts on a stream (Platts 1991). The direct effects of hooves on stream banks (i.e. alteration) can modify the shape of banks and reduce the ability of those banks to resist erosion during subsequent high flows (Trimble and Mendal 1995). Bengeyfield (2006) stated, “the most widespread impact livestock have on riparian areas is trampling stream banks,” and found that bank alteration criteria were often met before stubble height criteria. If bank alteration is used as a criteria for moving livestock off a pasture, it is typically recommended to limit annual-year alteration to some level less than 30 percent (20 percent or even 10 percent maximum alteration have been suggested). Cowley and Burton (2005) indicates that the level of alteration that is acceptable on a given stream reach would vary based on site conditions and the level should be adjusted based on the response of long-term indicators such as bank stability or width-depth ratios (Simon 2008). Levels of bank alteration should not be considered a riparian goal but should be used as a short-term indicator of use in riparian areas. As stated in the Water Quality section of this document and in the Hydrology Specialist Report (Robertson 2016), where physical stream channel and riparian conditions are degraded, there is the potential for water quality to be degraded too. Such concerns would exist on Tosi Creek, Klondike Creek, South Fork Fish Creek, and Tepee Creek focus areas and segments of Wagon Creek, and Strawberry Creek where bank alteration percentages exceeded 20 percent and/or stream bank stability is below the 75-85 percent objective.

Badger Creek Allotment and Beaver-Twin Allotment

Under Alternative 2, existing conditions could be maintained and streams in the Badger Creek and Beaver-Twin allotments could continue to meet the stream bank stability and riparian function objectives if the existing levels of livestock use are maintained. Currently both of these allotments have experienced 30 percent utilization levels in years grazed by livestock. The Beaver-Twin Allotment has not been grazed four out of five years and the Badger Allotment has not been grazed two out of five years (2009 through 2013). The MIM data reflects this light livestock use with stable stream banks exceeding 80 percent. The streams within these allotments (North and South Twin Creeks, North Beaver Creek, Packer Creek, and Miner Creek) have well-established willow communities with grass/sedge understory and well-established riparian vegetation which would be maintained under 30 percent utilization.

A maximum 55 percent forage utilization on key forage species would be authorized and managed using a season-long grazing system. Evidence of trailing in the willows could increase if these allotments were fully stocked and current year alteration would increase, leading to a decrease in overall bank stability. With the possible increased use by livestock under Alternative 2, the livestock crossing of Big Twin Creek at the fence

line would be used again at higher levels and would lead to a decrease in stream bank stability and riparian vegetation establishment. The stream crossing on Little Twin Creek would also likely see an increased amount of use by livestock and would lead to a decrease in stream bank stability and riparian vegetation establishment.

At the current levels of use, Miner Creek, North Beaver Creek, and Packer Creek would remain in excellent condition with high vegetation cover on the stream banks and only minimal bank alternation due to livestock use. These creeks would continue to meet the stream bank stability and riparian function objectives at the current lower utilization levels (30 percent). If the maximum forage utilization (55 percent utilization of key forage species in riparian areas) and season-long grazing were implemented, these streams would experience higher levels of use, leading to an increase in current year alteration and a decrease in stream bank stability.

Noble Pastures Allotment

Tosi Creek Focus Area

Under Alternative 2, Pasture 1 of the Noble Pastures Allotment would continue to be managed as a four pasture rotation with 2 to 3 times over grazing and a maximum forage utilization of key forage species of 65 percent in the riparian areas. Actual use in Pasture 1 is currently 50 percent forage utilization. This pasture and Tosi Creek focus area would experience concentrated amounts of high livestock use for short periods of time. Tosi Creek would continue to show signs of down-cutting and shear banks which are features of an unstable stream trying to stabilize itself. Sloughing of the stream banks and trailing alongside and across the stream would continue in the focus area. While the stream bank would likely continue to maintain sufficient vegetative cover, the trailing and sloughing would impact the overall stability of the stream bank. Tosi Creek would not meet the stream bank stability objective within the focus area under Alternative 2. If the current utilization level (50 percent) increased to the maximum authorized (65 percent), increased alteration along the stream channel, decreased vegetative cover, and decreased stream bank stability would be expected. Tosi Creek would not meet the riparian function and stream bank stability objectives under this alternative.

Klondike Creek Focus Area

Under this alternative, Pasture 4 would continue to be grazed season-long with a maximum forage utilization of 65 percent in the riparian areas. Pasture 4 is currently grazed at a 50 percent forage utilization level, season-long. This pasture experiences concentrated livestock grazing and due to this management action, Klondike Creek experiences concentrated amounts of high use throughout the season of use. Widening of the stream channel was observed at two major crossings on the stream, sloughing along the entire channel was present and cover decreased from 2009 to 2012. At current grazing levels, Klondike Creek is not meeting the stability objectives and if the current utilization levels increased to what is authorized under Alternative 2, that increased utilization would correspond to an increase in alteration along the channel which would further decrease the overall vegetation cover and stream bank stability. Klondike Creek would not meet the riparian function and stream bank stability objectives with implementation of the authorized 65 percent forage utilization level.

Roaring Fork Allotment

Roaring Fork Allotment is currently managed as a single pasture with season-long grazing. Current levels of forage utilization are only measured at approximately 30 percent but permitted use is a maximum of 65 percent forage utilization of key forage species in riparian areas. With the current 30 percent forage utilization, Roaring Fork Creek had high levels of riparian vegetation cover (approaching 100 percent), increasing stream bank stability values (from 79 percent in 2009 to 98 percent in 2012) and low levels of current year alteration (less than 15 percent). The Roaring Fork channel had a high width to depth ratio with wide meanders, and a mixture of grasses and shrubby cinquefoil were growing along the stream banks. The

bed material consisted primarily of a mixture of cobble and gravels and point bar deposits were prevalent along the entire reach observed. With the current 30 percent forage utilization, the Forest is meeting the stream bank stability and riparian function objectives, and therefore Roaring Fork Creek is at desired condition. Under Alternative 2, implementation of the authorized 65 percent forage utilization would result in an increase in livestock use and current year alteration with a corresponding decrease in stream bank stability and decrease in vegetation cover along the stream channel. Implementation of 65 percent forage utilization of key forage species would likely result in Roaring Fork Creek not meeting the stream bank stability and riparian function objectives, and therefore would not meet desired conditions.

Wagon Creek Allotment

Wagon Creek Allotment is currently managed as a single pasture with the grazing season not to exceed 45 days. Current level of forage utilization is measured at 50 percent but authorized to 65 percent in riparian areas under Alternative 2-Grazing as Permitted. Existing conditions (stable stream banks) would be maintained because rocks and boulders armor Wagon Creek in this allotment, preventing alteration or trampling of the banks by livestock. If utilization increased from 50 to 65 percent, there would likely be a slight increase in livestock use along the riparian areas, but with the armoring and willow component along the stream banks, the riparian function and stream bank stability objectives would likely be met in Wagon Creek.

Upper Green River Allotment

Mud Lake/Fish Creek Rotation

Continuing livestock grazing at current or authorized maximum utilization levels would not improve the riparian condition of the Crow Creek segment located in the southwest corner of Mud Lake East Pasture. Heavy browsing on willows would continue to occur and riparian vegetation would not have the ability to re-establish along the stream channel nor increase. Existing conditions would continue to occur at the small spring located nearby with soil compaction, hummocking and willow browsing expected. Stream bank stability and riparian function of this segment of Crow Creek would not move towards the objectives and desired conditions under Alternative 2.

Alteration would persist at the same levels if the current utilization rate of 30 percent continues on Raspberry Creek. Stream bank stability would likely remain stable. Raspberry Creek would continue to meet the stream bank stability and riparian function objectives. The stream bank stability of Strawberry Creek would continue to be impacted by the road and livestock trailing alongside the creek when moving cattle from the Mosquito Pasture to the Fish Creek Pasture. Trailing activities would continue along Raspberry Creek which could decrease overall vegetative cover alongside the channel and increase stream bank alteration. Under Alternatives 3, livestock would be trailed along alternative routes, an overall 35 percent utilization would be implemented for riparian areas, and a 6-inch stubble height would be retained for Strawberry Creek and a 4-inch stubble height would be retained for Raspberry Creek. Implementing stubble height requirements under this alternative retains vegetation on the stream banks and promotes stream bank stability. Under Alternative 2, the allowable use in this pasture would be 65 percent forage utilization of key forage species in riparian areas. This would lead to greater amounts of stream bank alteration and decreased vegetative cover resulting in a decrease in stream bank stability compared with existing condition. Alternative 2 would likely result in both Raspberry Creek and Strawberry Creek not meeting the riparian objective and stream bank stability objective.

Under Alternative 2-Grazing as Currently Permitted, the Green River would continue to meet the riparian function objective along the majority of the river at the current utilization level of 20 percent. This area along the Green River could be grazed up to 65 percent forage utilization of key forage species which could mean higher levels of livestock use along the Green River. Cows were observed using both the willow bottoms and

shrubby uplands all along the length of the Green River, and this use would be expected to increase. Some trailing would be observed along the terraces down to the river and along the river bottom within the willows. Riparian function at the segment of the Green River at the confluence of Roaring Fork near the elk feedground (PFC site #4) would continue to be functioning at risk. Alteration and stability impacts caused by wildlife, primarily elk, would continue under this alternative due to the concentration of a large number of elk being fed and wintering along this segment of the river and this could be compounded by increase use by livestock. Utilization of riparian vegetation by wildlife and the associated impacts related to loss of cover on stream banks would still continue to occur under this alternative. Impacts to the Green River from dispersed camping and two track roads would continue.

Fish Creek Focus Area

Under current grazing practices (30 percent forage utilization), Fish Creek would not meet the stream bank stability and riparian function objectives. Impacts from livestock grazing include trailing alongside the stream channel, bank sloughing, and a decrease in overall vegetative cover. These impacts were observed with a lower utilization than what is authorized under Alternative 2- Grazing as Currently Permitted (65 percent forage utilization). At 65 percent forage utilization, even further instability and loss of cover would occur with the increase in livestock use. Additional impacts to Fish Creek, including decreases in vegetative cover and stream bank stability resulting from the unauthorized use of the closed two-track road and dispersed camping would also continue under this alternative. Stream bank stability and riparian function of the creek would not move towards the objective and desired conditions with the selection of this alternative. In comparison, Alternative 3 and Alternative 4 include designs features such as a 20 percent alteration limit, a minimum 6-inch stubble height, and 35 percent forage utilization which would restrict livestock use in the riparian areas and improve conditions in the Fish Creek focus area.

Mosquito Lake Rotation

Under this alternative, Mosquito Lake rotation would be managed as a four pasture rest rotation with 30 percent forage utilization. Alternative 2 authorizes a maximum of 65 percent forage utilization in riparian areas which is a substantial increase from current use. Currently, Wagon Creek within the Mosquito Lake rotation is within the range of meeting the stream bank stability objective and near 100 percent vegetative cover at both monitoring sites. Heavier utilization was noted around fence lines and road crossings but overall Wagon Creek had good vegetative cover. The segment of Wagon Creek in Mosquito NW Pasture (MIM site #15) is currently below but near the stream bank stability objective (75 percent and 85 percent, respectively) and is meeting the riparian function objective under current practices.

If higher utilization rates were implemented (65 percent forage utilization), alteration on the stream banks would increase and vegetative cover would be reduced. This would result in a decrease in stream bank stability. Alternative 2 would result in Wagon Creek likely not meeting the stream bank stability and riparian function objectives compared to these objectives being met under Alternatives 3 or 4.

Wagon Creek Focus Area

The permittees would continue to maintain an existing electric fence exclosure when the cattle are using the pasture. Willow, sedges and grasses would continue to establish along the Wagon Creek banks and maintain the stream bank stability at objective. Eventually, the creek width to depth ratio would decrease resulting in a narrower and deeper channel. Erosion at the livestock stream crossing would decline as riparian vegetation reestablishes unless reestablishment of vegetation is inhibited by unauthorized motor vehicle use crossing Wagon Creek. Alternative 2 would result in Wagon Creek meeting the riparian function objective at a similar rate to but not as fast as Alternatives 3 or 4 because under these alternatives, a hardened crossing would be

installed to reduce erosion and a gate would be installed at the head of the closed road to prohibit unauthorized motorized access, in addition to livestock being fenced out of Wagon Creek.

Under Alternative 2, there is no specific focus area prescription and forage utilization could reach a maximum of 65 percent. This could result in decreased willow, sedges and grasses along the Wagon Creek banks, and erosion at the livestock stream crossing could increase. The focus area would likely not meet the stream bank stability and riparian function objectives.

Tosi Creek/Tepee Creek/Kinky Creek Rotation

Continuing livestock grazing at the current utilization level of 30 percent would allow for Tosi Creek to maintain its riparian vegetative cover and stream bank stability. This creek would continue to meet the stream bank stability and riparian function objectives. Under Alternative 2, forage utilization could reach a maximum of 65 percent in the riparian areas, which if implemented, would lead to higher amounts of stream bank alteration, decreased vegetative cover along the stream banks, and decreased stream bank stability.

The riparian function of the Kinky Creek segment near Darwin Ranch and the adjacent 57-acre meadow would improve over existing conditions because the duration that the horses graze in this area would be reduced substantially. Horses would only be allowed to graze along Kinky Creek and in the meadow when cattle are scheduled in the Lower Tepee Creek Pasture. The horses could rotate through the entire Tosi Creek/ Tepee Creek rotation with the cattle. However, under Alternative 2, no cattle would be authorized in the Kinky Creek Pasture. This change in management was initiated in 2014 and horses would no longer be allowed to graze this small pasture season-long under Alternative 2. Effects of this change in the grazing system would increase vegetative cover and potentially decrease sediment and nutrient deposition into the headwaters of the Gros Ventre River compared with existing conditions. Forage utilization could reach a maximum of 65 percent in the riparian areas under Alternative 2, which would maintain existing soil compaction and hummocking below desired conditions and potentially maintain low vegetative cover along the segment of Kinky Creek associated with Darwin Ranch. However, the Gros Ventre River would continue to support the outstandingly remarkable values of the wild river designation because conditions would be a slight improvement from the conditions under which the Gros Ventre River received the wild river designation.

Tepee Creek Focus Area

Continuing livestock grazing at 30 percent forage utilization would likely result in continued high alteration and low vegetative cover on the stream banks of the Tepee Creek focus area as indicated by existing conditions using MIM monitoring results collected in 2009 and 2012. Photos comparing the creek in 1982 and 2009, however, indicate some improvement in riparian vegetation and reduction in bank sloughing. Although improvement has been noted on Tepee Creek, the focus area would likely continue to not meet the stream bank stability and the riparian function objectives. Under Alternative 2-Grazing as Currently Permitted, the pasture would be part of a three pasture deferred rotation with 65 percent forage utilization in riparian areas. This forage utilization level is considerably greater than the 30 percent under current practices and would likely result in greater alteration and lower vegetative cover on the stream banks. Tepee Creek focus area would not meet the stream bank stability and the riparian function objectives when grazed to 65 percent forage utilization. In addition, existing log structures and cabling which is causing channel scouring and additional stream bank instability would remain under Alternative 2 and prevent the creek from the reaching stream bank stability and riparian function objectives. Alternative 3 or 4 would better meet the stream bank stability and riparian function objectives because livestock would be excluded from Tepee Creek with fencing and the log structures and cabling would be removed.

Gypsum Creek Rotation

Under current practices with forage utilization of 30 percent in riparian areas, Gypsum Creek would continue to meet the stream bank stability and riparian function objectives. Gypsum Creek has a mixture of cobble, small gravels, and fines within the streambed and the banks are vegetated with a mixture of grasses, sedges, and willows. Beaver activity may account for the amount of fines seen in the stream reach. Gypsum Creek rotation would be managed as a 2 pasture deferred rotation with a maximum of 65 percent forage utilization of key forage species in the riparian area under Alternative 2. At 65 percent forage utilization levels, increased alteration on the stream banks, increased trailing alongside the stream banks, and overall decreased vegetative cover and stability of the stream banks would be expected.

South Gypsum Creek

Under current practices, South Gypsum Creek is meeting and would continue to meet the stream bank stability and riparian function objectives with continued livestock grazing at 30 percent forage utilization. Low values of alteration and recruitment of riparian vegetation and willows would be expected to continue. Impacts of the 2007 Salt Lick Fire included recent sediment deposition and flushing water flows that move sediment downstream. Sediment would continue to deposit on point bars and sedges would continue to establish on the point bars with low levels of livestock utilization. Stream bank stability would continue to increase. Under Alternative 2, 65 percent forage utilization would substantially increase the amount of current year alteration and could lead to a decrease in overall stream bank stability. South Gypsum Creek may not be able to meet the stream bank stability and riparian function objectives at 65 percent forage utilization proposed under Alternative 2- Grazing as Currently Permitted compared to meeting the objectives under Alternative 3 or 4 with a proposed minimum 6-inch stubble height along the greenline and a maximum of 35 percent forage utilization in the riparian area.

River Bottom Pasture/ Livestock Driveway

Continuing livestock grazing at the current utilization level of 20 percent would maintain the majority of the Green River (sites #1, 2, 3, and 5) at properly functioning condition and the river would meet the riparian function objective. Cows would continue to use both the willow bottoms and shrubby uplands all along the length of the Green River. Trailing along the terraces down to the river and along the river bottom within the willows would also persist. The exception to meeting the riparian function objective is the segment of the Green River at the confluence of Roaring Fork near the elk feedground (site #4). This segment of the Green River is located in the Mud Lake East Pasture and would continue to function at risk due to the concentration of elk associated with the nearby Wyoming Game and Fish Department’s elk feedground. Effects of implementing Alternative 2 are described above under the Mud Lake/Fish Creek rotation.

Under Alternative 2, the riparian area along the Green River could receive higher levels of livestock use up to a maximum of 65 percent forage utilization of key forage species. However, 65 percent forage utilization is not likely to be reached based on actual use levels, current number of livestock and season of use. If 65 percent utilization along the Green River was reached, increased use of the willow bottoms, decreased vegetative cover, and increased trailing would be expected.

Impacts to the Green River from dispersed camping and two track roads would continue, regardless of the presence or absence of livestock. These impacts include reduction of riparian vegetation along the stream bank, soil compaction near the stream channel and reduced stream bank stability due to high levels of use from dispersed camping along the river corridor.

Cumulative Effects

See discussion of cumulative effects under Alternative 1

Alternative 3 - Modified Grazing Management (Proposed Action)

Direct and Indirect Effects by Allotment or Rotation

Alternative 3 is a livestock grazing strategy designed to generally maintain range and riparian resource conditions where they are currently meeting desired conditions and move these resources toward desired conditions where they are not currently meeting the desired conditions. This alternative implements updated grazing management including benchmarks for desired conditions, continued and/or improved monitoring to determine if benchmarks are being met, and site-specific management to ensure those sites which are currently meeting Forest Plan desired conditions (e.g. ground cover, species composition, soil disturbance, bank stability, fish habitat, and riparian grazing) continue to meet these conditions while ensuring those sites currently not meeting desired conditions have at the very least a stable if not an upward trend. The changes from current management proposed under Alternative 3 would improve cattle distribution and timing and reduce allowable impacts on stream channels and riparian areas. Riparian areas that are currently showing impacts from grazing would improve in the long term compared to Alternative 2, but would not improve as much – or as quickly – as under Alternative 1 or 4 due to continued livestock grazing impacts.

As Clary and Kinney (2000) states “Maintaining a minimum stubble height helps preserve forage plant vigor, retain sufficient forage to reduce cattle browsing of willows, stabilize sediments, and indirectly limit stream bank trampling…” Implementation of an overall 4-inch stubble height allowable use of riparian areas as compared to the 65 percent riparian utilization limit of Alternative 2 would decrease the amount of time that livestock currently spend in riparian areas and allow for more residual vegetation to be left on stream banks. Studies that have shown “relationships that show continuity between recommendations of 40-50 percent utilization and recommendations of leaving 3-4-inches of residual stubble height for maintenance of plant vigor…” which would be implemented with this alternative and provide the needed residual vegetation. Additional stubble height, such as 6 inches or more, may be necessary to protect riparian ecosystem function (Myers, 1989). As stated by Myers (1989) and Clary and Kinney (2000), residual vegetation is important in protecting plant vigor and stabilizing stream banks something which would be implemented with this alternative as compared to Alternative 2. There are streams that are not currently meeting the long-term stability objective and implementing a 6-inch stubble height should decrease the amount of time that livestock graze within these identified riparian areas which include streams in Upper Gypsum Pasture, Pasture 1 of Noble Pastures, the focus areas identified in Fish Creek Pasture, Mosquito Southeast pasture and in turn short-term stream bank alteration should also decrease in these areas, too, as compared to Alternative 2. Where short-term adverse impacts are decreased from reduced stream bank alteration, long-term adverse impacts to channel stability would decrease as well.

Under Alternative 3, livestock grazing would continue to be authorized on the Badger Creek, Beaver-Twin, Noble Pastures, Roaring Fork, Wagon Creek, and the Upper Green River allotments, using livestock management strategies designed to sustain resource conditions where desired conditions are being met and improve resource conditions where a gap between existing conditions and desired conditions has been identified. This alternative implements a livestock grazing management strategy that includes site specific allowable use standards (i.e., forage utilization and stubble height standards), focus area prescriptions, structural improvements, and adaptive management to meet or move conditions towards resource objectives.

Range monitoring data suggest that upland utilization based on the current stocking rates and season in the recent past has often been well below the allowable maximum level proposed in Alternative 3. Stubble height, as measured along the greenline of the stream, has ranged from 3-6 inches where it has been measured. In Clary and Webster (1989), it is recommended that streamside utilization of herbaceous forage should not exceed 40-50 percent of the current growth and in special situations such as critical fisheries habitats or easily eroded stream banks may require stubble heights of greater than 6 inches. Under Alternative 3, there is a minimum 4-inch stubble height standard with up to a 6-inch standard in some

pastures. Riparian forage utilizations would be decreased from a range of 65-55 percent to a range of 50-40 percent under Alternative 3.

Badger Creek Allotment and Beaver-Twin Allotment

Existing conditions would be maintained and streams in the Badger Creek and Beaver-Twin allotments could continue to meet the stream bank stability and riparian function objectives if the proposed levels of livestock use are maintained at the existing utilization levels. Currently both of these allotments have experienced 30 percent utilization levels in years grazed by livestock. The Beaver-Twin Allotment has not been grazed four out of five years and the Badger Allotment has not been grazed two out of five years (2009 through 2013). The MIM data reflects this light livestock use with stable stream banks exceeding 80 percent. The streams within these allotments (North and South Twin Creeks, North Beaver Creek, Packer Creek, and Miner Creek) have well-established willow communities with grass/sedge understory and well-established riparian vegetation which would be maintained under the current 30 percent utilization.

Under this alternative, a maximum 50 percent forage utilization on key forage species would be authorized and a 4-inch stubble height would be implemented. The management systems of both allotments would be changed from one pasture season long grazing to a one pasture deferred grazing system for Badger Creek Allotment and a three pasture deferred rotation for Beaver-Twin Creek Allotment. Changing the grazing system from season-long to deferred rotation on Badger Creek and Beaver-Twin allotments would reduce the amount of time that the riparian vegetation would be grazed within those pastures. This would decrease the amount of time for alteration to be occurring on Packer, Miner, Big Twin, Little Twin, and North Beaver Creeks compared to Alternative 2. Pasture fencing is proposed between North Beaver and Twin Creek allotments to allow for better livestock distribution. There would be a short-term impact from fencing including ground disturbing activities during the construction and re-construction of fences. This may include removal of vegetation and soil disturbance but these are short term impacts and the overall benefit from the fencing includes better livestock distribution and protection of riparian resources.

At the current levels of use, Miner Creek, North Beaver Creek, and Packer Creek would remain in excellent condition with high vegetation cover on the stream banks and only minimal bank alternation due to livestock use. These creeks would continue to meet the stream bank stability and riparian function objectives at the current lower utilization levels (30 percent). If the maximum forage utilization (50 percent utilization of key forage species in riparian areas) was reached, it would be expected that the riparian areas and streams would experience an increase use, leading to an increase in current year alteration and a decrease in stream bank stability. However, 50 percent forage utilization is not likely to be reached based on actual use levels, current number of livestock and season of use.

Noble Pastures Allotment

Tosi Creek Focus Area

Under Alternative 3, Pasture 1 of the Noble Pastures Allotment would continue to be managed as a deferred four pasture rotation with 2 to 3 times over grazing and a maximum forage utilization of key forage species of 40 percent in the riparian areas. Actual use in Pasture 1 is currently 50 percent forage utilization. This pasture and Tosi Creek focus area would experience concentrated amounts of high livestock use for short periods of time. Under Alternative 3-Modified Grazing Management, Tosi Creek would have a focus area prescription of maximum 20 percent stream bank alteration and a 6-inch stubble height requirement. Other proposals included in Alternative 3 for this pasture are to maintain the irrigation ditches to provide for off-stream livestock water and an option to install an electric fence can be implemented to help re-distribute the livestock out of the riparian area. Implementing ditch maintenance standards would ensure that the ditches are functioning properly and being used at the correct time periods during the grazing season. This would

allow the water to travel throughout the entire pasture and would decrease the amount of use on Tosi Creek for livestock watering purposes compared to Alternative 2.

Under the current utilization levels Tosi Creek is not meeting the riparian and stream bank stability objectives with very high levels of alteration and corresponding low levels of stream bank stability. Implementing a 20 percent maximum alteration prescription would decrease the amount of time that livestock are allowed to graze within a riparian area and the corresponding 6-inch stubble height requirement would allow for more riparian vegetation to be left on the bank after the grazing season. The combination of decreasing the amount of exposed soil on the stream bank and increasing the riparian vegetation cover would lead over time to an increase in stream bank stability. With these proposed prescriptions under Alternative 3, Tosi Creek would be given the opportunity to stabilize itself with the decreased livestock pressure and would in time meet the riparian and stream bank stability objectives.

Klondike Creek Focus Area

Under Alternative 3- Modified Grazing Management, Pasture 4 would not continue to be grazed season-long with a maximum forage utilization of 50 percent in the riparian areas. Pasture 4 is currently grazed at a 50 percent forage utilization level, season-long. This pasture experiences concentrated livestock grazing and due to this management action, Klondike Creek experiences concentrated amounts of high use throughout the season of use. Widening of the stream channel was observed at two major crossings on the stream, sloughing along the entire channel was present and cover decreased from 2009 to 2012. At the current management levels, Klondike Creek is not meeting the stability objectives. Under Alternative 3-Modified Grazing Management, Klondike Creek would have a focus area prescription of rebuilding and slightly expanding the riparian fence, planting live-stake willows to promote willow recruitment and to manage the fenced out portion as a riparian pasture with brief grazing to stimulate willow establishment. The riparian pasture would be grazed at a maximum forage utilization of 0.5 AUM per year and would likely not be grazed some years. Other proposals included in Alternative 3 for this pasture are to install two hardened crossings on Klondike Creek that are already being heavily trafficked by livestock; maintain the irrigation ditches to provide for off-stream livestock water; and to construct a holding area within the unfenced portion of the pasture. There would be a short-term impact from fencing including ground disturbing activities during the construction and re-construction of fences. This may include removal of vegetation and soil disturbance but these are short term impacts and the overall benefit from the fencing includes better livestock distribution and protection of riparian resources. Implementing ditch maintenance standards would ensure that the ditches are functioning properly and being used at the correct time periods during the grazing season. This would allow the water to travel throughout the entire pasture and would decrease the amount of use on Tosi and Klondike Creek for livestock watering purposes as compared to Alternative 2. With these proposed prescriptions, Klondike Creek over time would meet the riparian and stream bank stability objectives.

Roaring Fork Allotment

Roaring Fork Allotment is currently managed as a single pasture with season-long grazing. Under Alternative 3, this allotment would be managed as a three pasture deferred system. A 4-inch stubble height and 50 percent forage utilization would be implemented in all three pastures which is a decrease from the current management of 55-65 percent utilization. Changing the grazing system from season-long to deferred rotation on the Roaring Fork South Pasture would reduce the amount of time that the riparian vegetation would be grazed within that pasture. This would decrease the amount of time for alteration to be occurring on Roaring Fork Creek as compared to Alternative 2.

Current levels of forage utilization are only measured at approximately 30 percent but permitted use is a maximum of 50 percent forage utilization of key forage species in riparian areas. With the current management of 30 percent forage utilization, Roaring Fork Creek had high levels of riparian vegetation

cover (approaching 100 percent), increasing stream bank stability values (from 79 percent in 2009 to 98 percent in 2012) and low levels of current year alteration (less than 15 percent). The Roaring Fork channel had a high width to depth ratio with wide meanders, and a mixture of grasses and shrubby cinquefoil were growing along the stream banks. The bed material consisted primarily of a mixture of cobble and gravels and point bar deposits were prevalent along the entire reach observed. With the current 30 percent forage utilization, Roaring Fork Creek is meeting the stream bank stability and riparian function objectives, and therefore is at desired condition. If the maximum forage utilization was reached as proposed under Alternative 3, it would be expected that the riparian areas and streams would experience an increase use, leading to an increase in current year alteration and a decrease in stream bank stability. However, 50 percent forage utilization is not likely to be reached based on actual use levels, current number of livestock and season of use.

Wagon Creek Allotment

Wagon Creek Allotment is currently managed as a single pasture with the grazing season not to exceed 45 days. Current level of forage utilization is measured at 50 percent but authorized to 65 percent in riparian areas under Alternative 2-Grazing as Permitted. Under Alternative 3, Modified Grazing Management, Wagon Creek Allotment would be managed as a one pasture deferred rotation with a 4-inch stubble height and a maximum of 50 percent forage utilization of key species. Existing conditions (stable stream banks) would be maintained because rocks and boulders armor Wagon Creek in this allotment, preventing alteration or trampling of the banks by livestock. With the armoring and willow component along the stream banks, the riparian function and stream bank stability objectives would likely be met under Alternative 3.

Upper Green River Allotment

Mud Lake/Fish Creek Rotation

Under Alternative 3, a 4-inch stubble height and 50 percent maximum utilization of key forage species would be implemented within the Mud Lake portion of the Mud Lake/Fish Creek rotation. Current riparian conditions within the southwest corner of the Crow Creek segment include heavy browsing on willows along Crow Creek and soil compaction and hummocking of soils in the small spring complex adjacent to Crow Creek. It is proposed under Alternative 3 to relocate the boundary fence uphill due east of the current fence location and to consider development of up to two water sources. These management actions would allow for the redistribution of livestock away from the spring area and prevent the livestock from concentrating at that southwest corner of the pasture. At the current utilization levels of 30 percent, the current riparian impacts would continue to occur and riparian vegetation would not have the ability to re-establish along the stream channel nor increase. Existing conditions would continue to occur at the small spring located nearby with soil compaction, hummocking and willow browsing expected. Stream bank stability and riparian function of this segment of Crow Creek would not move towards the objectives and desired conditions without the additional proposed structure improvements proposed within Alternative 3 and would allow Crow Creek to move towards desired conditions at a quicker rate than Alternative 2, which does not have any proposed improvements within its current management objectives.

Alteration would continue at the same levels if the current utilization rate of 30 percent continues to be implemented on Raspberry Creek. Stream bank stability would likely remain stable. Raspberry Creek would continue to meet the stream bank stability and riparian function objectives. The stream bank stability of Strawberry Creek under current conditions is being impacted by the road and livestock trailing alongside the creek when moving cattle from the Mosquito Pasture to the Fish Creek Pasture. Trailing activities currently occurring along Raspberry Creek could lead to a decrease in overall vegetative cover alongside the channel and increase stream bank alteration. Under Alternative 3, livestock would be trailed along alternative routes, an overall 50 percent utilization would be implemented for riparian areas, and a 6-inch stubble height would

be retained for Strawberry Creek and a 4-inch stubble height would be retained for Raspberry Creek. Implementing stubble height requirements under this alternative retains vegetation on the stream banks and promotes stream bank stability. Alternative herding practices would have to result in resources meeting prescribed vegetation and stream channel conditions, or changes to the annual operating instructions could result. Alternative trailing through Strawberry Creek and Raspberry Creek has been discussed during the 2013 summer field season. As Bengeyfield (2006) stated "Livestock management needs to respond to the necessity of maintaining the dimension, pattern, and profile of stream channels, so that water distribution throughout the riparian area can maintain riparian values and beneficial uses (Bengeyfield and Svoboda 1998) and implementation of both of these best management practices would allow for a decrease in time that cattle spend within these riparian areas which are currently not being implemented under Alternative 2 and better protect the riparian values identified. Alternative 3-Modified Grazing Management would allow Raspberry Creek to continue to meet the riparian objective and stream bank stability objectives and Strawberry Creek to move towards desired conditions at a faster rate than Alternative 2.

The Green River would continue to meet the riparian function objective along the majority of the river at the current utilization level of 20 percent. Under Alternative 3, this area along the Green River could be grazed up to 50 percent of key forage species along with a 4-inch stubble height on the greenline. Cows were observed using both the willow bottoms and shrubby uplands all along the length of the Green River, and this use would be expected to either maintain at the current levels of use (20 percent utilization) or decrease in areas with the implementation of the 4-inch stubble height. Some trailing would be observed along the terraces down to the river and along the river bottom within the willows. Riparian function at the segment of the Green River at the confluence of Roaring Fork near the elk feedground (PFC site #4) would continue to be functioning at risk. Alteration and stability impacts caused by wildlife, primarily elk, would continue under this alternative due to the concentration of a large number of elk being fed and wintering along this segment of the river. Livestock would be actively herded out of the elk feedground which would decrease the utilization of riparian vegetation along this segment of the Upper Green River. Use of riparian vegetation by wildlife and the associated impacts related to loss of cover on stream banks would still continue to occur under this alternative. Impacts to the Green River from dispersed camping and two track roads would continue.

Fish Creek Focus Area

Under current management, Fish Creek is not meeting the stream bank stability and riparian function objectives. Impacts from livestock grazing include trailing alongside the stream channel, bank sloughing, and a decrease in overall vegetative cover. These impacts were observed with a lower utilization than what is currently authorized under Alternative 2-Grazing as Currently Permitted (65 percent forage utilization). The Fish Creek Focus Area Prescription includes a 20 percent alteration limit, a 6-inch stubble height and 35 percent maximum forage utilization under this alternative. All of these management prescriptions would restrict livestock use in the Fish Creek riparian area and improve conditions in the Fish Creek focus area. Additional impacts to Fish Creek not related to livestock grazing include a decrease in vegetative cover and stream bank stability resulting from the unauthorized use of the closed two-track road. The closure and rehabilitation of this unauthorized road will be implemented under the authorization of the 1995 Pinedale Travel Management Plan. Impacts to the riparian area from dispersed camping activities, which include a decrease in vegetative cover and stream bank stability, would continue under this alternative. Stream bank stability and riparian function of the creek would move towards the objective and desired conditions more quickly with this alternative and site specific prescriptions rather than under Alternative 2 which currently allows for a much higher utilization rate of 65 percent and does not include any focus area prescriptions to allow for the protection of riparian habitat.

Mosquito Lake Rotation

Mosquito Lake rotation would be managed as a four pasture deferred rotation with an option of rest rotation. Alternative 3 authorizes a maximum of 50 percent forage utilization in riparian areas and a 4-inch stubble height within the Mosquito Southeast and Northeast pastures. In the northwest and southwest pastures, an average 30 percent forage utilization over a 5 year period with a maximum of 50 percent utilization in any given year along with a 4-inch stubble height would be implemented. Currently at a utilization level of 30 percent, Wagon Creek, within the Mosquito Lake rotation, is within the range of meeting the stream bank stability objective and near 100 percent vegetative cover at both monitoring sites. Heavier utilization was noted around fence lines and road crossings but overall Wagon Creek had good vegetative cover. The segment of Wagon Creek in Mosquito Northwest Pasture (MIM site #15) is currently below but near the stream bank stability objective (75 percent and 85 percent, respectively) and is meeting the riparian function objective under current management. If the maximum forage utilization proposed under Alternative 3 (50 percent utilization of key forage species in riparian areas) was reached, it would be expected that the riparian areas and streams would experience an increase in use, leading to an increase in current year alteration and a decrease in stream bank stability. However, 50 percent forage utilization is not likely to be reached based on actual use levels, current number of livestock and season of use.

Wagon Creek Focus Area

The permittees would continue to maintain an existing electric fence exclosure when the cattle are using the pasture and a 6-inch stubble height would be implemented outside of the exclosure within the focus area boundary under Alternative 3. A hardened crossing would be installed to reduce erosion and a gate would be installed at the head of the closed road to prohibit unauthorized motorized access, in addition to livestock being fenced out of Wagon Creek. This would lead to a long-term increase in channel stability in the vicinity of the developed crossing. Water quality concerns would be reduced with Alternative 3 as compared to Alternative 2 by the implementation of the focus area prescriptions which include a 6-inch stubble height, hardened stream crossing, and electric fencing around the existing exclosure. Appropriate vegetative cover, stream channel geometry, substrates free of excess fine sediments, and high stream bank stability are essential for achieving good water quality and aquatic habitat (Burton et al. 2008). The stricter utilization limits on this identified stream segment would allow for an increase in vegetative cover which would decrease the amount of instream sedimentation and help protect water quality. Alternative 3 would result in Wagon Creek meeting the riparian function objective at a faster rate than Alternative 2, which does not have any specific focus area prescriptions and has a current maximum forage utilization of 65 percent versus the proposed 50 percent utilization under Alternative 3.

Tosi Creek/Tepee Creek/Kinky Creek Rotation

The Tosi-Tepee Creek Rotation would be managed as a four pasture deferred rotation with a 50 percent maximum forage utilization of key riparian species along with a 4-inch stubble height. Alternative 3 differs from Alternative 2 with the addition of a new pasture and the inclusion of the North Kinky Creek as a contingency pasture. Additionally, horses would no longer be allowed to graze season long in the South Kinky Pasture and cattle would be authorized to graze within this pasture within the rotation. Horses would only be allowed to graze the Kinky Creek Pasture when cattle are scheduled to graze in that pasture. Effects of this change in the grazing system would increase vegetative cover and potentially decrease sediment and nutrient deposition into the headwaters of the Gros Ventre River as compared with existing conditions. Implementation of these new allowable use standards and change in rotation would allow the Gros Ventre River to continue to support the outstandingly remarkable values of the wild river designation because conditions would be improved over time in comparison to stream conditions under which the Gros Ventre River received the wild river designation.

Continuing livestock grazing at the current utilization level of 30 percent would allow for Tosi Creek to maintain its riparian vegetative cover and stream bank stability. If the maximum forage utilization proposed under Alternative 3 (50 percent utilization of key forage species in riparian areas) was reached, it would be expected that the riparian areas and streams would experience an increase use, leading to an increase in current year alteration and a decrease in stream bank stability. However, 50 percent forage utilization is not likely to be reached based on actual use levels, current number of livestock and season of use.

Tepee Creek Focus Area

Under Alternative 3, a segment of Tepee Creek within the Lower Tepee Creek pasture was identified as having multiple management concerns. Currently, livestock utilization has been measured at 30 percent with the current livestock rates and seasons of use. Existing conditions using MIM monitoring results collected in 2009 and 2012 indicated continued high rates of alteration and low vegetative cover on the banks of Tepee Creek despite the lower utilization rates. Photos comparing the creek in 1982 and 2009, however, indicate some improvement in riparian vegetation and reduction in bank sloughing. Although improvement has been noted on Tepee Creek, the focus area would likely continue to not meet the stream bank stability and the riparian function objectives.

Under Alternative 3, the Tepee Creek focus area would have a permanent exclosure fence downstream of the bridge to the change in gradient with a water gap and hardened crossing. Also included in the management prescription is to remove all the non-functional logs cabled into Tepee Creek. These logs were placed in Tepee Creek in the late 1980s as an attempt to help stabilize the stream banks. A number of these structures are no longer functioning as a stabilizer and are in fact, destabilizing the stream channel by allowing scour and preventing vegetation to establish on the stream banks. By removing these structures, the channel would be given the opportunity to stabilize itself naturally without any impediments to lateral stream movement and access to the floodplain which is what is not happening at present with the structures. Fencing out the Tepee Creek focus area would remove cattle grazing within that fenced portion of the stream and allow for an elimination of stream bank alteration by livestock. By removing this portion of stream from the available area to graze on Tepee, this may just push the effects of livestock use on the riparian area from one portion of the stream to another within this pasture so while alteration may be eliminated in one segment of Tepee Creek, it could increase on another segment of the stream channel. There would be a short-term impact from fencing including ground disturbing activities during the construction and re-construction of fences. This may include removal of vegetation and soil disturbance but these are short term impacts and the overall benefit from the fencing includes better livestock distribution and protection of riparian resources. Utilization and stubble height limits would still apply which should help adjacent areas from deteriorating and maintaining stability. Alternative 3 would better meet the stream bank stability and riparian function objectives than Alternative 2 because livestock would be excluded from Tepee Creek with fencing and the log structures and cabling would be removed and Tepee Creek would over time meet the stream bank stability and riparian guidelines at a faster rate than Alternative 2.

Gypsum Creek Rotation

Under current stocking rates and season of use, Gypsum Creek is meeting the stream bank stability and riparian function objectives. Gypsum Creek has a mixture of cobble, small gravels, and fines within the streambed and the banks are vegetated with a mixture of grasses, sedges, and willows. Beaver activity may account for the amount of fines seen in the stream reach. Gypsum Creek rotation would be managed as a two pasture deferred rotation with a maximum of 50 percent forage utilization of key forage species and a 4-inch stubble height would be implemented in the riparian area. If the maximum forage utilization proposed under Alternative 3 (50 percent utilization of key forage species in riparian areas) was reached, it would be expected that the riparian areas and streams would experience an increase use, leading to an increase in

current year alteration and a decrease in stream bank stability. However, 50 percent forage utilization is not likely to be reached based on actual use levels, current number of livestock and season of use.

South Gypsum Creek

At current utilization levels of 30 percent, South Gypsum Creek is meeting and would continue to meet the stream bank stability and riparian function objectives with continued livestock grazing. Low values of alteration and recruitment of riparian vegetation and willows would be expected to continue. Impacts of the 2007 Salt Lick Fire included recent sediment deposition and flushing water flows that move sediment downstream. Sediment would continue to deposit on point bars and sedges would continue to establish on the point bars with low levels of livestock utilization. Stream bank stability would continue to increase. Under Alternative 3, a 50 percent utilization limit and a 6-inch stubble height is proposed until South Gypsum Creek meets the stream bank stability objective for two consecutive monitoring cycles. Once the stability objective is reached on South Gypsum Creek, then a 4-inch stubble height would be implemented. By implementing this site specific stubble height, it would allow the South Gypsum Creek to stabilize itself following the recent fire activity. With the specific management actions proposed in Alternative 3, South Gypsum Creek would move towards stream bank and riparian objectives more quickly than Alternative 2 which does not include a stubble height limit and allows up to 65 percent utilization of the riparian area.

River Bottom Pasture/ Livestock Driveway

Authorizing livestock grazing at a utilization level of 50 percent along with a 4-inch stubble height would maintain the majority of the Green River (sites #1, 2, 3, and 5) at properly functioning condition and the river would meet the riparian function objective. Cows would continue to use both the willow bottoms and shrubby uplands all along the length of the Green River. Trailing along the terraces down to the river and along the river bottom within the willows would also persist. The exception to meeting the riparian function objective is the segment of the Green River at the confluence of Roaring Fork near the elk feedground (site #4). This segment of the Green River is located in the Mud Lake East Pasture and would continue to function at risk due to the concentration of elk associated with the nearby Wyoming Game and Fish Department's elk feedground. Effects of implementing Alternative 3 are described above under the Mud Lake/Fish Creek rotation.

The riparian area along the Green River could receive higher levels of livestock use up to a maximum of 50 percent forage utilization of key forage species. However, 50 percent forage utilization is not likely to be reached based on actual use levels, current number of livestock and season of use. If 50 percent utilization along the Green River was reached, increased use of the willow bottoms, decreased vegetative cover, and increased trailing would be expected.

Impacts to the Green River from dispersed camping and two track roads would continue, regardless of the presence or absence of livestock. These impacts include reduction of riparian vegetation along the stream bank, soil compaction near the stream channel and reduced stream bank stability due to high levels of use from dispersed camping along the river corridor.

Cumulative Effects

See discussion of cumulative effects under Alternative 1

Alternative 4 - Modified Grazing Management with Riparian Emphasis

Direct and Indirect Effects by Allotment or Rotation

Alternative 4 is a livestock grazing strategy designed to generally promote healthy riparian and wetland conditions and improve existing conditions at areas of concern. This alternative includes monitoring which

would be used to make adjustments to domestic livestock grazing as needed based on monitoring results. The main difference between Alternative 4 and Alternative 3 are the differences in the allowable riparian area utilization limits under Alternative 4 (35 percent) that are more stringent than under Alternative 3. The exception to this overall 35 percent utilization level for riparian and meadow areas is in the Noble Pastures Allotment (permits a maximum of 40 – 50 percent utilization) and Wagon Creek Allotment (permits a maximum of 50 percent utilization) as well as the Mosquito NW and SW pastures of the Upper Green River Allotment (permits an average of 30 percent utilization over 5 years with a maximum of 50 percent) in which the maximum utilization of key forage species permitted in riparian and meadow areas would be identical under Alternatives 3 and 4.

Under Alternative 4, livestock grazing would continue to be authorized on the Badger Creek, Beaver-Twin, Noble Pastures, Roaring Fork, Wagon Creek, and the Upper Green River allotments, using livestock management strategies designed to sustain resource conditions where desired conditions are being met and improve resource conditions where a gap between existing conditions and desired conditions has been identified. This alternative implements a livestock grazing management strategy that includes site specific allowable use standards (i.e., forage utilization and stubble height standards), focus area prescriptions, structural improvements, and adaptive management that would meet or move conditions towards resource objectives.

Monitoring data suggest that utilization based on the current stocking rates and season in the recent past has often been closely matched with the allowable maximum level proposed in Alternative 4. Stubble height, as measured along the greenline of the stream, has ranged from 3-6 inches where it has been measured. In Clary and Webster (1989), it is recommended that streamside utilization of herbaceous forage should not exceed 40-50 percent of the current growth and in special situations such as critical fisheries habitats or easily eroded stream banks may require stubble heights of greater than 6 inches. Clary (1995) recommended a 4 to 6 inch stubble height (~30 percent forage utilization) at the end-of-season. Under Alternative 4, there is a minimum 4-inch stubble height standard with up to a 6-inch standard in some pastures. Riparian forage utilizations would be decreased from a range of 65-55 percent to a range of 35-50 percent in Alternative 4.

Badger Creek Allotment and Beaver-Twin Allotment

This alternative would maintain existing conditions and streams in the Badger Creek and Beaver-Twin allotments. These streams would continue to meet the stream bank stability and riparian function objectives if the proposed levels of livestock use are maintained at the existing utilization levels. Currently both of these allotments have experienced 30 percent utilization levels in years grazed by livestock. The Beaver-Twin Allotment has not been grazed four out of five years and the Badger Allotment has not been grazed two out of five years (2009 through 2013). The MIM data reflects this light livestock use with stable stream banks exceeding 80 percent. The streams within these allotments (North and South Twin Creeks, North Beaver Creek, Packer Creek, and Miner Creek) have well-established willow communities with grass/sedge understory and well-established riparian vegetation which would be maintained under the current 30 percent utilization.

Under Alternative 4, maximum 35 percent forage utilization on key forage species within riparian and wetlands would be authorized and a 4-inch stubble height would be implemented. The management systems of both allotments would be changed from one pasture season long grazing to a one pasture deferred grazing system for Badger Creek Allotment and a three pasture deferred rotation for Beaver-Twin Creek Allotment. Changing the grazing system from season-long to deferred rotation on Badger Creek and Beaver-Twin allotments would reduce the amount of time that the riparian vegetation would be grazed within those pastures. This would decrease the amount of time for alteration to be occurring on Packer, Miner, Big Twin, Little Twin, and North Beaver creeks compared to Alternative 2. Pasture fencing is proposed between North Beaver and Twin Creek allotments to allow for better livestock distribution. There would be a short-term

impact from fencing including ground disturbing activities during the construction and re-construction of fences. This may include removal of vegetation and soil disturbance but these are short term impacts and the overall benefit from the fencing includes better livestock distribution and protection of riparian resources.

At the current levels of use, Miner Creek, North Beaver Creek, and Packer Creek would remain in excellent condition with high vegetation cover on the stream banks and only minimal bank alternation due to livestock use. These creeks would continue to meet the stream bank stability and riparian function objectives at the current lower utilization levels (30 percent). Under Alternative 4 (35 percent forage utilization), these creeks would continue to meet the stream bank and riparian objectives and over time be able to maintain these conditions with the stricter utilization limits as compared to Alternatives 3 and 2 which allow for a higher level of utilization within the riparian and wetland areas (50-65 percent).

Noble Pastures Allotment

Tosi Creek Focus Area

Under Alternative 4, Pasture 1 of the Noble Pastures Allotment would be managed as a deferred four pasture rotation with 2 to 3 times over grazing and a maximum forage utilization of key forage species of 40 percent in the riparian areas. Actual use in Pasture 1 is currently 50 percent forage utilization. This pasture and Tosi Creek focus area has experienced concentrated amounts of high livestock use for short periods of time. Under Alternative 4-Modified Grazing Management with Riparian Emphasis, Tosi Creek would have a focus area prescription of a maximum 20 percent stream bank alteration and a 6-inch stubble height requirement. Other proposals included in Alternative 4 for this pasture are to maintain the irrigation ditches to provide for off-stream livestock water and an option to install an electric fence can be implemented to help re-distribute the livestock out of the riparian area. Implementing ditch maintenance standards would ensure that the ditches are functioning properly and being used at the correct time periods during the grazing season. This would allow the water to travel throughout the entire pasture and would decrease the amount of use on Tosi Creek for livestock watering purposes as compared to Alternative 2.

Under the current utilization levels Tosi Creek is not meeting the riparian and stream bank stability objectives with very high levels of alteration and corresponding low levels of stream bank stability. Under Alternative 4, implementing a 20 percent maximum alteration prescription would decrease the amount of time that livestock are allowed to graze within a riparian area and the corresponding 6-inch stubble height requirement would allow for more riparian vegetation to be left on the bank after the grazing season. The combination of decreasing the amount of exposed soil on the stream bank and increasing the riparian vegetation cover would lead to an increase in stream bank stability over time. With these proposed prescriptions under Alternative 4, Tosi Creek, over time, would be given the opportunity to stabilize itself with the decreased livestock pressure and would meet the riparian and stream bank stability objectives.

Klondike Creek Focus Area

Pasture 4 would continue to be grazed season-long with a maximum forage utilization of 50 percent in the riparian areas under current management. This pasture experiences concentrated livestock grazing and due to this management action, Klondike Creek experiences concentrated amounts of high use throughout the season of use. Widening of the stream channel was observed at two major crossings on the stream, sloughing along the entire channel was present and cover decreased from 2009 to 2012. At the current management levels, Klondike Creek is not meeting the stability objectives. Under Alternative 4, Klondike Creek would have a focus area prescription of rebuilding and slightly expanding the riparian fence, planting live-stake willows to promote willow recruitment and managing the fenced out portion as a riparian pasture with brief grazing to stimulate willow establishment. There would be a short-term impact from fencing including ground disturbing activities during the construction and re-construction of fences. This may include removal

of vegetation and soil disturbance but these are short term impacts and the overall benefit from the fencing includes better livestock distribution and protection of riparian resources. The riparian pasture would be grazed at a maximum forage utilization of 0.5 animal unit months per year and would likely not be grazed some years. Other proposals included in Alternative 4 for this pasture are to install two hardened crossings on Klondike Creek that are already being heavily trafficked by livestock; maintain the irrigation ditches to provide for off-stream livestock water and construct a holding area within the unfenced portion of the pasture. Implementing ditch maintenance standards would ensure that the ditches are functioning properly and being used at the correct time periods during the grazing season. This would allow the water to travel throughout the entire pasture and would decrease the amount of use on Tosi and Klondike creeks for livestock watering purposes compared to Alternative 2. With these proposed prescriptions under Alternative 4, Klondike Creek over time would meet the riparian and stream bank stability objectives.

Roaring Fork Allotment

Roaring Fork Allotment is currently managed as a single pasture with season-long grazing. Under Alternative 4, Modified Grazing Management with Riparian Emphasis, this allotment would be managed as a three pasture deferred system. A 4-inch stubble height and 50 percent forage utilization would be implemented in all three pastures which is a decrease from Alternative 2's 55-65 percent utilization. Changing the grazing system from season-long to deferred rotation on the Roaring Fork south pasture would reduce the amount of time that the riparian vegetation would be used within that pasture. This would decrease the amount of time for alteration to be occurring on Roaring Fork Creek as compared to Alternative 2.

Current levels of forage utilization are only measured at approximately 30 percent but permitted use is a maximum of 65 percent forage utilization of key forage species in riparian areas. With the current management of 30 percent forage utilization, Roaring Fork Creek had high levels of riparian vegetation cover (approaching 100 percent), increasing stream bank stability values (from 79 percent in 2009 to 98 percent in 2012) and low levels of current year alteration (less than 15 percent). The Roaring Fork channel had a high width to depth ratio with wide meanders, and a mixture of grasses and shrubby cinquefoil were growing along the stream banks. The bed material consisted primarily of a mixture of cobble and gravels and point bar deposits were prevalent along the entire reach observed. With the current 30 percent forage utilization, the Forest is meeting the stream bank stability and riparian function objectives, and therefore Roaring Fork Creek is at desired condition. If the maximum forage utilization of 35 percent was reached as proposed under Alternative 4, the riparian areas and streams would not likely experience any change in utilization levels within the riparian areas and Roaring Fork would continue to meet the riparian and stream bank stability objectives.

Wagon Creek Allotment

Wagon Creek Allotment is currently managed as a single pasture with the grazing season not to exceed 45 days. Current level of forage utilization is measured at 50 percent but authorized to 65 percent in riparian areas under Alternative 2. Under Alternative 4, Wagon Creek Allotment would be managed as a one pasture deferred rotation with a 4-inch stubble height and a maximum of 50 percent forage utilization of key species. Existing conditions (stable stream banks) would be maintained because rocks and boulders armor Wagon Creek in this allotment, preventing alteration or trampling of the banks by livestock. With the armoring and willow component along the stream banks, the riparian function and stream bank stability objectives would likely be met in Wagon Creek.

Upper Green River Allotment

Mud Lake/Fish Creek Rotation

Under Alternative 4, Modified Grazing Management with Riparian Emphasis, a 4-inch stubble height and 35 percent maximum utilization of key forage species in riparian and wetland areas would be implemented within the Mud Lake portion of the Mud Lake/Fish Creek rotation. Current riparian conditions within the southwest corner of the Crow Creek segment include heavy browsing on willows along Crow Creek and soil compaction and hummocking of soils in the small spring complex adjacent to Crow Creek. It is proposed under Alternative 4 to relocate the boundary fence uphill due east of the current fence location and to consider development of up to two water sources. These management actions would allow for the redistribution of livestock away from the spring area and prevent the livestock from concentrating at that southwest corner of the pasture. There would be a short-term impact from fencing including ground disturbing activities during the construction and re-construction of fences. This may include removal of vegetation and soil disturbance but these are short term impacts and the overall benefit from the fencing includes better livestock distribution and protection of riparian resources. At the current utilization levels, the current riparian impacts would continue to occur and riparian vegetation would not have the ability to re-establish along the stream channel nor increase. Existing conditions would continue to occur at the small spring located nearby with soil compaction, hummocking and willow browsing expected. Stream bank stability and riparian function of this segment of Crow Creek would not move towards the objectives and desired conditions without the additional proposed structure improvements proposed under Alternative 4 and would allow Crow Creek to move towards desired conditions at a quicker rate than Alternative 2, which does not have any proposed improvements under current management.

Alteration would continue at the same levels if the current utilization rate of 30 percent continues to be implemented on Raspberry Creek. Stream bank stability would likely remain stable. Raspberry Creek would continue to meet the stream bank stability and riparian function objectives. The stream bank stability of Strawberry Creek under current conditions is being impacted by the road and livestock trailing alongside the creek when moving cattle from the Mosquito Pasture to the Fish Creek Pasture. Trailing activities currently occurring along Raspberry Creek could lead to a decrease in overall vegetative cover alongside the channel and increase stream bank alteration. Under Alternative 4, livestock would be trailed along alternative routes, an overall 35 percent utilization would be implemented for riparian and wetland areas, and a 6-inch stubble height would be retained for Strawberry Creek and a 4-inch stubble height would be retained for Raspberry Creek. Implementing stubble height requirements under this alternative retains vegetation on the stream banks and promotes stream bank stability. Alternative herding practices would have to result in resources meeting prescribed vegetation and stream channel conditions, or changes to the annual operating instructions could result. Alternative trailing through Strawberry Creek and Raspberry Creek has been discussed during the 2013 summer field season. As Bengeyfield (2006) stated “Livestock management needs to respond to the necessity of maintaining the dimension, pattern, and profile of stream channels, so that water distribution throughout the riparian area can maintain riparian values and beneficial uses (Bengeyfield and Svoboda 1998) and implementation of both of these best management practices would allow for a decrease in time that cattle spend within these riparian areas which are currently not being implemented under Alternative 2 and better protect the riparian values identified. Alternative 4 would allow Raspberry Creek to continue to meet the riparian objective and stream bank stability objectives and Strawberry Creek to move towards desired conditions at a faster rate than Alternatives 2 and 3 with the implementation of stricter utilization levels and stubble heights which more accurately match the current season of use and stocking rates.

Under Alternative 4, the Green River would continue to meet the riparian function objective along the majority of the river at the current utilization level of 20 percent. Up to 35 percent of key forage species in riparian and wetlands could be grazed along the Green River leaving a 4-inch stubble height on the greenline under Alternative 4. Cows were observed using both the willow bottoms and shrubby uplands all along the

length of the Green River, and this use would be expected to either maintain at the current levels of use (20 percent utilization) or decrease in areas with the implementation of the 4-inch stubble height. Some trailing would be observed along the terraces down to the river and along the river bottom within the willows. Riparian function at the segment of the Green River at the confluence of Roaring Fork near the elk feedground (PFC site #4) would continue to be functioning at risk. Alteration and stability impacts caused by wildlife, primarily elk, would continue under this alternative due to the concentration of a large number of elk being fed and wintering along this segment of the river. Under Alternative 4, livestock would be actively herded out of the elk feedground which would decrease the utilization of riparian vegetation along this segment of the Upper Green River. Utilization of riparian vegetation by wildlife and the associated impacts related to loss of cover on stream banks would still continue to occur under this alternative. Impacts to the Green River from dispersed camping and two track roads would also continue.

Fish Creek Focus Area

Under current management, Fish Creek is not meeting the stream bank stability and riparian function objectives. Impacts from livestock grazing include trailing alongside the stream channel, bank sloughing, and a decrease in overall vegetative cover. These impacts were observed with a lower utilization than what is currently authorized under Alternative 2 (65 percent forage utilization). Under Alternative 4, Modified Grazing Management with Riparian Emphasis, the Fish Creek Focus Area Prescription includes a 20 percent alteration limit, a 6-inch stubble height and 35 percent maximum forage utilization. All of these management prescriptions would restrict livestock use in the Fish Creek riparian area and improve conditions in the Fish Creek focus area.

Additional impacts to Fish Creek not related to livestock grazing under current management include a decrease in vegetative cover and stream bank stability resulting from the unauthorized use of the closed two-track road. The closure and rehabilitation of this unauthorized road would be implemented as part of Alternative 4. Impacts to the riparian area from dispersed camping activities, which include a decrease in vegetative cover and stream bank stability, would continue under this alternative. Stream bank stability and riparian function of the creek would move more quickly towards the objective and desired conditions under this alternative with its site specific prescriptions rather than under Alternative 3 or Alternative 2 which allow higher utilization levels of up to 50 to 65 percent, respectively, in the riparian and wetland areas. In addition, Alternative 2 does not include any focus area prescriptions to allow for the protection of riparian habitat.

Mosquito Lake Rotation

Under Alternative 4, Mosquito Lake rotation would be managed as a four pasture deferred rotation with an option of rest rotation. Alternative 4 authorizes a maximum of 35 percent forage utilization in riparian and wetland areas and a 4-inch stubble height within the Mosquito Southeast and Northeast pastures. In the northwest and southwest pastures, an average 30 percent forage utilization over a 5 year period with a maximum of 50 percent utilization in any given year along with a 4-inch stubble height would be implemented. Currently at a utilization level of 30 percent, Wagon Creek within the Mosquito Lake rotation is within the range of meeting the stream bank stability objective and near 100 percent vegetative cover at both monitoring sites. Heavier utilization was noted around fence lines and road crossings but overall Wagon Creek had good vegetative cover. The segment of Wagon Creek in Mosquito Northwest Pasture (MIM site #15) is currently below but near the stream bank stability objective (75 percent and 85 percent, respectively) and is meeting the riparian function objective under current management. Alternative 4 would allow Wagon Creek to continue to meet the riparian objective and stream bank stability objectives over time with the implementation of stricter utilization levels and stubble heights which more accurately match the current season of use and stocking rates.

Wagon Creek Focus Area

Under Alternative 4, the permittees would continue to maintain an existing electric fence exclosure when the cattle are using the pasture and a 6-inch stubble height would be implemented outside of the exclosure within the focus area boundary. A hardened crossing would be installed to reduce erosion and a gate would be installed at the head of the closed road to prohibit unauthorized motorized access, in addition to livestock being fenced out of Wagon Creek. This would lead to a long-term increase in channel stability in the vicinity of the developed crossing. Water quality concerns would be reduced with Alternative 4 as compared to Alternative 2 by the implementation of the focus area prescriptions mentioned above. Appropriate vegetative cover, stream channel geometry, substrates free of excess fine sediments, and high stream bank stability are essential for achieving good water quality and aquatic habitat (Burton et al. 2008). The stricter utilization limits on this identified stream segment would allow for an increase in vegetative cover which would decrease the amount of instream sedimentation and help protect water quality. This alternative would result in Wagon Creek meeting the riparian function objective at a faster rate than under Alternatives 2 and 3 which have a current maximum forage utilization of a range between 50-65 percent versus Alternative 4's 35 percent utilization.

Tosi Creek/Tepee Creek/Kinky Creek Rotation

Under Alternative 4, the Tosi-Tepee Creek Rotation would be managed as a four pasture deferred rotation with 35 percent maximum forage utilization of key riparian and wetland species along with a 4-inch stubble height. Alternative 4 differs from Alternative 2 with the addition of a new pasture and the inclusion of the North Kinky Creek as a contingency pasture. Additionally, horses would no longer be allowed to graze season long in the South Kinky Pasture and cattle would be authorized to graze in this pasture within the rotation. Horses would only be allowed to graze the 57-acre portion of the Kinky Creek pasture adjacent to Darwin Ranch when cattle are scheduled to graze in the South Kinky Pasture. Effects of this grazing system would increase vegetative cover and reduce hummocking in the pasture and potentially decrease sediment and nutrient deposition into the headwaters of the Gros Ventre River compared with existing conditions. Implementation of these new allowable use standards and change in rotation would allow the Gros Ventre River to continue to support the outstandingly remarkable values of the wild river designation because conditions would be improved over time in comparison to stream conditions under which the Gros Ventre River received the wild river designation.

Continuing livestock grazing at the current utilization level of 30 percent would allow for Tosi Creek to maintain its riparian vegetative cover and stream bank stability. If the maximum forage utilization proposed under Alternative 4 (35 percent utilization of key forage species in riparian areas) was reached, it would be expected that the riparian areas and streams would maintain their current conditions. This maximum utilization closely matches the current use with the number of livestock and season of use on these pastures. Under Alternative 4, Tosi Creek would continue to meet the stream bank and riparian objectives and over time be able to maintain these conditions with the stricter utilization limits compared to Alternatives 3 and 2 which allow for a higher level of utilization within the riparian and wetland areas (50-65 percent).

Tepee Creek Focus Area

A segment of Tepee Creek within the Lower Tepee Creek pasture was identified as having multiple management concerns. Currently, livestock utilization has been measured at 30 percent with the current livestock rates and seasons of use. Existing conditions using MIM monitoring results collected in 2009 and 2012 indicated continued high rates of alteration and low vegetative cover on the banks of Tepee Creek despite the lower utilization rates. Photos comparing the creek in 1982 and 2009, however, indicate some improvement in riparian vegetation and reduction in bank sloughing. Although improvement has been noted

on Tepee Creek, the focus area would likely continue to not meet the stream bank stability and the riparian function objectives under current management.

Under Alternative 4, the Tepee Creek focus area would have a permanent exclosure fence downstream of the bridge to the change in gradient with a water gap and hardened crossing. Also included in the management prescription is to remove all the non-functional logs cabled into Tepee Creek. By removing these structures, the channel would be given the opportunity to stabilize itself naturally without any impediments to lateral stream movement and access to the floodplain which is what is not happening at present with the structures. Fencing out the Tepee Creek focus area would remove cattle grazing within that fenced portion of the stream and allow for an elimination of stream bank alteration by livestock. By removing this portion of the stream from the available area that allows grazing, this may just push the effects of livestock use on the riparian area from one portion of the stream to another within this pasture so while alteration may be eliminated in one segment of Tepee Creek it could increase on another segment of the stream channel. There would be a short-term impact from fencing including ground disturbing activities during the construction and re-construction of fences. This may include removal of vegetation and soil disturbance but these are short term impacts and the overall benefit from the fencing includes better livestock distribution and protection of riparian resources. Utilization and stubble height limits would still apply which should help keep adjacent areas from deteriorating and maintain stability. Alternative 4 would better meet the stream bank stability and riparian function objectives than Alternative 2 because livestock would be excluded from Tepee Creek with fencing and the log structures and cabling would be removed. Tepee Creek under Alternative 4 would over time meet the stream bank stability and riparian guidelines at a faster rate than under Alternative 2.

Gypsum Creek Rotation

Under current stocking rates and season of use, Gypsum Creek is meeting the stream bank stability and riparian function objectives. Gypsum Creek has a mixture of cobble, small gravels, and fines within the streambed and the banks are vegetated with a mixture of grasses, sedges, and willows. Beaver activity may account for the amount of fines seen in the stream reach. Under Alternative 4, Gypsum Creek rotation would be managed as a two pasture deferred rotation with a maximum of 35 percent forage utilization of key forage species and a 4-inch stubble height would be implemented in the riparian area. Gypsum Creek would continue to meet the stream bank stability and riparian function objectives and over time be able to maintain these conditions with the stricter utilization limits under this alternative as compared to Alternatives 3 and 2 which allow for a higher level of utilization within the riparian and wetland areas (50-65 percent).

South Gypsum Creek

At current utilization levels of 30 percent, South Gypsum Creek is meeting and would continue to meet the stream bank stability and riparian function objectives with continued livestock grazing. Low values of alteration and recruitment of riparian vegetation and willows would be expected to continue. Impacts of the 2007 Salt Lick Fire included recent sediment deposition and water flows that flush sediment downstream. Sediment would continue to deposit on point bars and sedges would continue to establish on the point bars with low levels of livestock utilization. Stream bank stability would continue to increase. Under Alternative 4, a 35 percent forage utilization limit and a 6-inch stubble height is proposed until South Gypsum Creek meets the stream bank stability objective for two consecutive monitoring cycles. Once the stability objective is reached on South Gypsum Creek, then a 4-inch stubble height would be implemented. By implementing this site specific stubble height, it would allow the South Gypsum Creek to stabilize itself following the recent fire activity. With the specific management actions proposed in Alternative 4, South Gypsum Creek would move towards stream bank stability and riparian function objectives more quickly than it would under Alternatives 2 and 3. Alternative 2 does not include a stubble height limit and allows up to 65 percent utilization of the riparian area and Alternative 3 allows up to 50 percent utilization within the riparian and wetland areas.

River Bottom Pasture/ Livestock Driveway

Under Alternative 4, authorizing livestock grazing at a utilization level of 35 percent along with a 4-inch stubble height would maintain the majority of the Green River (sites #1, 2, 3, and 5) at properly functioning condition and the river would meet the riparian function objective. Cows would continue to use both the willow bottoms and shrubby uplands all along the length of the Green River. Trailing along the terraces down to the river and along the river bottom within the willows would also persist. The exception to meeting the riparian function objective is the segment of the Green River at the confluence of Roaring Fork near the elk feedground (site #4). This segment of the Green River is located in the Mud Lake East Pasture and would continue to function at risk due to the concentration of elk associated with the nearby Wyoming Game and Fish Department's elk feedground. Effects of implementing Alternative 4 are described above under the Mud Lake/Fish Creek rotation.

The riparian and wetland areas along the Green River could receive levels of livestock use up to a maximum of 35 percent forage utilization of key forage species. This 35 percent forage utilization most closely matches the current actual use levels, current number of livestock and season of use. Under Alternative 4, the Upper Green River would continue to meet the riparian function and stream bank stability objectives.

Impacts to the Green River from dispersed camping and two track roads would continue, regardless of the presence or absence of livestock. These impacts include reduction of riparian vegetation along the stream bank, soil compaction near the stream channel and reduced stream bank stability due to high levels of use from dispersed camping along the river corridor.

Cumulative Effects

See discussion of cumulative effects under Alternative 1.

Fisheries

The Fisheries section presents the issues and indicators addressed in the fisheries analysis, the existing condition of pertinent fish species and their habitat, and discusses the environmental effects of each alternative on pertinent fish species and their habitat. Pertinent fish species include fish species that occurred in the project area and were identified as a threatened or endangered species by the U.S. Fish and Wildlife Service, a sensitive species as determined by Region 4 of the Forest Service or a management indicator species as determined by the Forest Plan. The fisheries analysis was conducted to: 1) determine whether the actions of each alternative would jeopardize the continued existence or cause adverse modification of habitat for endangered or threatened fish species and their listed critical habitat; and 2) determine whether the actions of each alternative would contribute to any sensitive fish species becoming or trending towards federal listing as threatened or endangered. Management indicator species were analyzed to indicate the effects of habitat changes associated with proposed management activities by alternative. The information provided in this section was summarized from the Fisheries Report (Anderson 2015). Adaptive management was referred to as “progressive design features” in this specialist report (Anderson 2015). The term “progressive design features” is synonymous with “adaptive management” and is described in this DEIS beginning on page 71 and 112 for Alternatives 3 and 4, respectively.

Overview of Issues Addressed

Issue 1: Effects on Threatened, Endangered, and Sensitive Species, as well as Other Species of Concern

The concern is that livestock grazing may affect the recovery of threatened, endangered, proposed, candidate and sensitive species, in addition to viability and habitat objectives for other species in the project area. The Forest Plan provides direction for threatened, endangered, sensitive species, and management indicator species. Species conservation is directed by laws, regulations, and policies.

Issue 2: Riparian and Aquatic Conditions

The concern is that livestock grazing may affect riparian areas, riparian vegetation, fisheries and overall stream function and health.

Issue Indicators for Comparison of Alternatives:

Indicators for Colorado River cutthroat trout, Yellowstone cutthroat trout and rainbow trout are:

- Stream bank stability (percent)
- Stream temperature (degrees Fahrenheit)
- Riparian function

Affected Environment

The project area occurs primarily in the headwaters of the Green River and a small portion of the project area also extends into the headwaters of the Gros Ventre River. For the purposes of this analysis, the affected environment is defined as all areas that could be authorized for grazing or trailing of livestock, as well as aquatic habitat areas downstream where potential effects could occur. The affected environment from the aquatics perspective lies within 13 different watersheds in the Upper Green River sub-basin and three watersheds in the Gros Ventre sub-basin. These watershed boundaries will be used to define the analysis area. Within these 16 watersheds, there are 1,054 total miles of stream channels, with 408 miles of perennial stream.

Water quality is generally good within the analysis area. The Green River is glacially fed in part, which leads to elevated natural turbidity, but most of the glacial sediment settles out in the Upper Green River Lakes. Other streams in the area are all spring fed and thus generally run clear and cold. None of the streams within the analysis area are listed on the Wyoming 303d list of water quality impaired streams (Wyoming Dept. of Environmental Quality 2012).

The existing condition discussion is divided into two main sections: fish species distribution and existing habitat conditions, particularly as they relate to the identified issues associated with livestock grazing.

Fish Species Distribution

Threatened and Endangered Species

Kendall Warm Springs Dace

The Kendall Warm Springs dace is federally listed as an endangered species by the U.S. Fish and Wildlife Service. The only known location of Kendall Warm Springs' dace (*Rhinichthys osculus thermalis*) is within Kendall Warm Springs approximately 32 miles north of Pinedale, Wyoming. The springs are tributary to the Green River and are within the project area. The entire population resides in a 328 yard reach of springs. Kendall Warm Springs originates at the base of a bluff, flows 328 yards through a braided channel, and cascades over a waterfall into the Green River. The springs maintain a constant flow of approximately 8 cubic feet per second and a constant temperature of 85ºF. The temperature of the stream channel fluctuates seasonally with winter temperatures cooler downstream and near the channel margin (US Fish and Wildlife Service 2010).

The Kendall Warm Springs dace use various habitats within the channel. Adult dace primarily use shallow pool habitat in the main channel, while juvenile dace are found mostly in slower channel margin habitat. The dace are believed to spawn throughout the year. Juvenile dace use habitat near the channel margins or stay in benthic habitats in the littoral zone. Aquatic vegetation provides important hiding cover for the dace (US Fish and Wildlife Service 1982). Small pools created by large ungulates are believed to provide valuable habitat for the dace (US Fish and Wildlife Service 2010).

Management Indicator Species and Sensitive Species

The National Forest Management Act of 1976 provides direction for selecting management indicator species. These species are selected "because their population changes are believed to indicate the effects of management activities" (36 CFR 219.19). Management indicator species are identified in the Forest Plan, and represent threatened and endangered species, important harvest species, ecological indicator species, and sensitive species. Twenty-three management indicator species occur on the Bridger-Teton National Forest: seven mammals, four birds, three fish (Colorado River cutthroat trout, Yellowstone/ Snake River fine-spotted cutthroat, rainbow trout), two amphibians, and seven plant species. 36 CFR 219.14(f) allows for those plans under the 1982 Planning Rule to use habitat as an indicator instead of population trends unless the plan specifically addresses population trends.

Colorado River Cutthroat Trout

The Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) is a Bridger-Teton National Forest management indicator species and Forest Service Region 4 sensitive species. The Colorado River cutthroat trout is native to Wyoming in the Green River and is found in the project area. This trout species requires relatively cool, well-oxygenated water and the presence of clean, well-sorted gravel with minimal fine sediment for successful spawning. They generally spawn in clear, cold, shallow riffles of small streams soon after ice is off in the spring. The initiation of spawning is influenced by water temperature, increased water discharge from runoff, elevation and latitude. The distance cutthroat trout travel to spawn is generally short

and eggs hatch within 28-40 days depending on water temperature. Optimal stream habitat is characterized by clear, cold, relatively silt-free water with rocky substrate.

Colorado River cutthroat trout are estimated to occupy 11 percent of their historic range which included portions of the Colorado River drainage in Wyoming, Colorado, Utah, Arizona, and New Mexico (Hirsch et al. 2013). Current distribution on the Bridger-Teton National Forest occurs primarily in the headwaters of the Green River and down the western slope of the Wyoming Range. Colorado River cutthroat trout occupy approximately 217 miles of stream habitat on the Bridger-Teton National Forest of which approximately 27 miles of habitat (12 percent) is located in the project analysis area (Figure 68). Colorado River cutthroat trout strongholds on the forest are those populations with little or no invasion pressure from non-native trout, particularly brook trout. The populations within the project area are all extensively invaded by non-native trout with the exception of Klondike Creek.

Monitoring data collected by Wyoming Game and Fish Dept. and the Forest Service indicates that populations that are invaded by competing non-native salmonids, particularly brook trout, are experiencing population declines. Streams that have extensive brook trout invasions have very low CRCT populations, such as Rock Creek, Jim Creek, and Gypsum Creek.

Yellowstone Cutthroat Trout (*Oncorhynchus clarki ssp*.)

Yellowstone/ Snake River fine-spotted cutthroat: The Yellowstone cutthroat trout is native to the Yellowstone and Snake River systems. This trout is native within one of the six allotments; Ecological MIS (riparian) and Sensitive

The Yellowstone cutthroat trout is a Bridger-Teton National Forest management indicator species and Forest Service Region 4 sensitive species. Yellowstone cutthroat trout are widely distributed within their historic range in the states of Utah, Nevada, Idaho, Montana and Wyoming (May et al. 2003). On the Bridger-Teton National Forest, Yellowstone cutthroat trout are found throughout their original range in the upper Snake River above Palisades Dam (Van Kirk and Benjamin 2001). There are approximately 1,537 miles of river and streams and 3,116 acres of lake on the Bridger-Teton National Forest that support Yellowstone cutthroat trout. These populations contain both historical and currently occupied habitat and encompass the headwaters of the Snake River, Gros Ventre, Greys-Hoback, and Salt River watersheds.

Yellowstone cutthroat trout currently occupy most of their historical habitat within the project area including throughout Fish Creek and tributaries, Raspberry Creek, and the Gros Ventre River in the northern portion of the project area (Figure 68). On the Forest, Yellowstone cutthroat trout occupy 1,527 miles of habitat and within the project they occupy 37 miles of habitat (2.4 percent of the Forest-wide habitat). They are found in one of six allotments in the project area. Yellowstone cutthroat trout have a much smaller fraction of their habitat that has been invaded by non-native trout, and available data indicates that the populations are relatively stable.

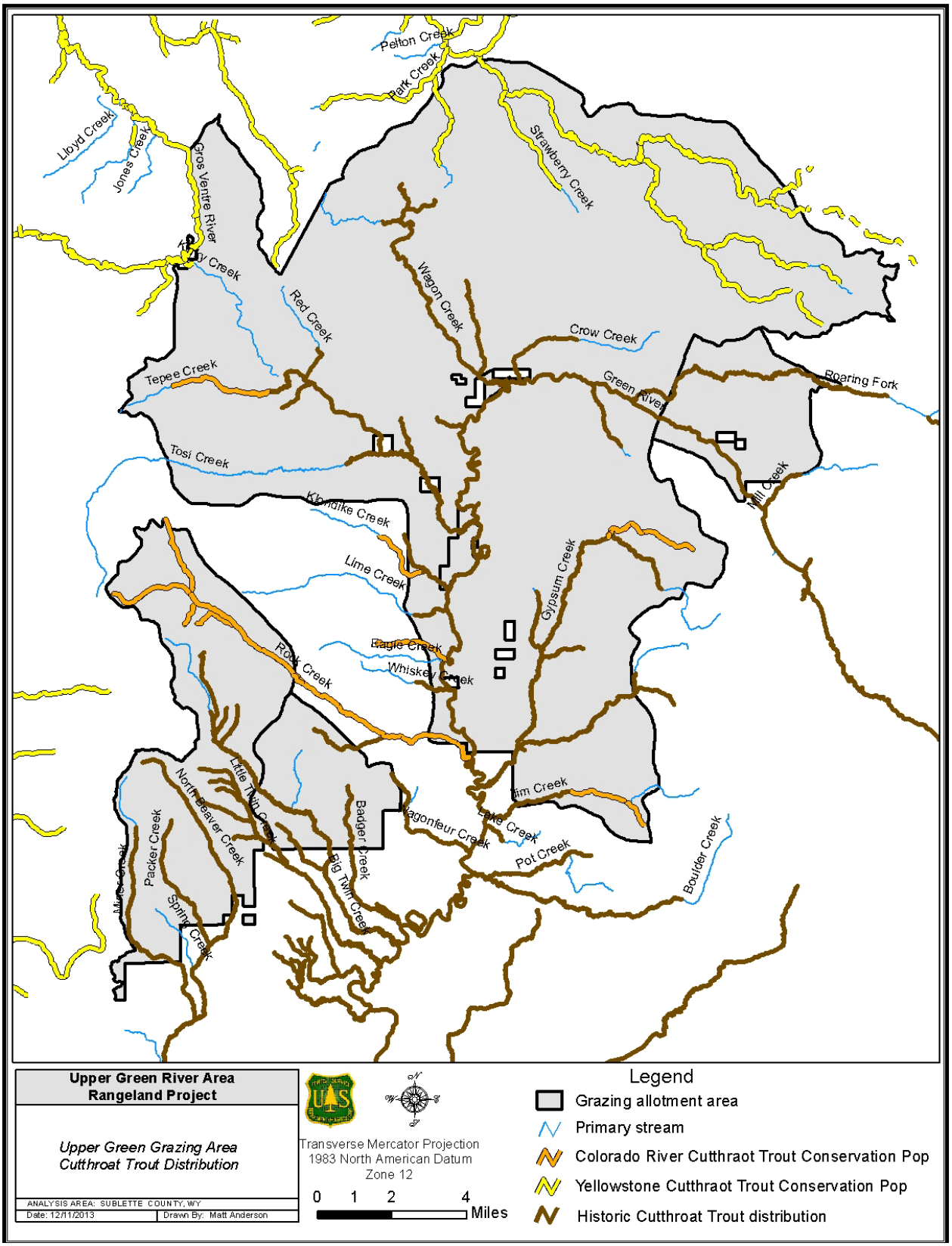

Figure 68. Map of the distribution of Conservation Populations and historical occurrence of Colorado River cutthroat and Yellowstone cutthroat trout and historical distribution within the project analysis area

Typical of other cutthroat trout sub-species, Yellowstone cutthroat trout require relatively cool, well-oxygenated water and the presence of clean, well-sorted gravel with minimal fine sediment for successful spawning. They generally spawn in clear, cold, shallow riffles of small streams soon after ice is off in the spring. The initiation of spawning is influenced by water temperature, increased water discharge from runoff, elevation and latitude. The distance cutthroat trout travel to spawn is generally short and eggs hatch within 28-40 days depending on water temperature. Optimal stream habitat is characterized by clear, cold and relatively silt-free water with rocky substrate.

Rainbow Trout

Rainbow trout: This non-native trout was historically stocked in many lakes and streams on the Bridger-Teton National Forest and is found in five of the six allotments. Although not native, the species has been identified as a harvest management indicator species and has populations and habitat within the project.

Rainbow trout (*Oncorhynchus mykiss*) is a Bridger-Teton National Forest management indicator species. The rainbow trout is native to coastal streams flowing into the Pacific Ocean along the west coast of North America and is an introduced species on the Bridger-Teton National Forest. This trout has been introduced into many streams and rivers as a game fish and is found in five of the six allotments. Rainbow trout are generally considered stream-dwelling species, but they also thrive in lakes. Rainbow trout are a popular species for sport fisheries and due to historical introductions they now occur throughout the Bridger-Teton National Forest. Wyoming Game and Fish Department has largely discontinued stocking of rainbow trout in streams and rivers in order to reduce impacts to the native cutthroat trout. Within the project area, rainbow trout are found in the Green River and in the lowest segments of some of the tributaries. Recent monitoring data indicate that the population of rainbow trout has been declining. This is likely due to a combination of factors that include reduced stocking and increase in the brown trout population (Wyoming Game and Fish Department 2011).

Summary of Existing Conditions by Indicator

Riparian Function

Methodology and Data Sources

Riparian areas were evaluated at a broad-scale based using data collected under the Wyoming Habitat Assessment Methodology (WHAM) level I survey (Quist and Hubert 2004). Habitat surveys were conducted on 188.5 miles of 408 miles of perennial stream in the analysis area which is larger than the project area and includes 148.4 miles of 253 total perennial miles of stream within the six allotments. The Level I assessment is a rapid process that provides a characterization of upland, riparian, and aquatic habitat conditions. The protocol is designed to identify potential problems and management opportunities in a watershed. This is an ocular survey that involves walking a perennial stream from the mouth of the stream, or the Forest boundary, to its headwaters. Stream condition class was assigned based on surveyor’s evaluation of the following criteria: 1) Riparian functioning – riparian area is functioning to capture sediment and maintain high water table, riparian area has a diversity of vegetation that is capable of slowing high flows and protecting and stabilizing the banks; 2) Hydric soils present – soils saturated with water are present indicating that the stream is not incised; 3) Riparian vegetation recruitment – saplings and young woody plants are present in the reach; and 4) Bank erosion – the fraction of the length of the bank that shows evidence of recent erosion and that would be susceptible to further erosion under high-flow conditions. Riparian condition class was assigned at the reach level using the WHAM data set (Table 25).

Table 25. Criteria for determining riparian conditions class based on WHAM data

Class I	Class II	Class III
< 25% bank erosion and;	< 50% bank erosion and;	≥ 50% bank erosion or;
At least three of: • <10% bank erosion • Riparian functioning • Hydric soils present • Riparian vegetation recruitment	At least two of: • <25% bank erosion • Riparian functioning • Hydric soils present • Riparian vegetation recruitment	Fails to meet two of: •<25% bank erosion • Riparian functioning • Hydric soils present • Riparian vegetation recruitment

In addition to the WHAM surveys, Multiple Indicator Monitoring (MIM, Burton et al. 2011) sites were established as key sites, which are used to monitor conditions in stream reaches that are sensitive to management impacts and representative of broader conditions, and focus areas, which are areas of special concern or areas that are known to not be meeting desired conditions. The MIM riparian assessment is described in the Hydrology section of this document and focus areas are discussed by allotment below. In order to analyze the potential effects of grazing on the Green River and its riparian area, five proper functioning condition (PFC, Bureau of Land Management 1998) assessments were conducted. Figure 69 displays monitoring locations for MIM sites, sediment core sample sites, water temperature logger sites, and proper functioning conditions assessment.

Incomplete and Unavailable Information

Extensive stream habitat surveys have been completed on streams within the project area; however there are some habitat components that have limited information available. Continuous summer stream temperature data has been collected from some streams, but temperature regimes from other streams are unknown. Even on streams that have some temperature data, the information is not spatially complete.

Existing Condition

Riparian vegetation plays an important role in maintaining habitat for fisheries. Riparian vegetation provides root strength, which resists erosion and helps maintain channel form, particularly in low-gradient alluvial valleys. Riparian vegetation provides roughness, thereby reducing flow velocities during high flow conditions and encourages sediment deposition on the banks. Shade provided by streamside vegetation buffers streams from solar heating and effects levels of primary production, which can affect macroinvertebrate community composition.

Riparian areas were evaluated at a broad-scale based using data collected under the Wyoming Habitat Assessment Methodology (WHAM) level I survey (Quist and Hubert 2004). Habitat surveys were conducted on 188.5 miles of 408 miles of perennial stream in the analysis area, including 148.4 miles of 253 total perennial miles of stream within the allotments. The Level I assessment is a rapid process that provides a characterization of upland, riparian, and aquatic habitat conditions. The protocol is designed to identify potential problems and management opportunities in a watershed. This is an ocular survey that involves walking a perennial stream from the mouth of the stream, or the Forest boundary, to its headwaters. Stream condition class was assigned based on surveyor's evaluation of the following criteria: 1) Riparian functioning – riparian area is functioning to capture sediment and maintain high water table, riparian area has a diversity of vegetation that is capable of slowing high flows and protecting and stabilizing the banks; 2) Hydric soils present – soils saturated with water are present indicating that the stream is not incised; 3) Riparian vegetation recruitment – saplings and young woody plants are present in the reach; and 4) Bank erosion – the fraction of the length of the bank that shows evidence of recent erosion and that would be

susceptible to further erosion under high-flow conditions. Riparian condition class was assigned at the reach level using the WHAM data set.

The results of the reach-scale riparian condition class are illustrated in Figure 70. Based on these criteria, out of 148.4 miles of stream surveyed on the allotments, 130.3 miles (84 percent) were Class I, 15.4 miles (12 percent) were Class II, and 2.7 miles (4 percent) were Class III condition. Streams with Class III condition class include one reach of Tepee Creek, an area referred to as Tepee Creek focus area in the Tepee-Tosi Creek rotation, a tributary of Lime Creek outside the cattle grazing allotments, and a reach of Fish Creek outside of the cattle grazing allotments. Streams with Class II reaches include Jim Creek, Gypsum Creek, Roaring Fork, Tepee Creek, Packer Creek, Miner Creek, and North Beaver Creek. The condition of specific streams and reaches is discussed in more detail under the specific allotments in the Fisheries Report.

In addition to the WHAM surveys, multiple indicator monitoring (MIM) sites were established as key sites, which are used to monitor conditions in stream reaches that are sensitive to management impacts and representative of broader conditions, and focus areas, which are areas of special concern or areas that are known to not be meeting desired conditions (Burton *et al.* 2011). The MIM riparian assessment is described in detail in the Water Quality Specialist's Report and focus areas are discussed by allotment in the Fisheries Report.

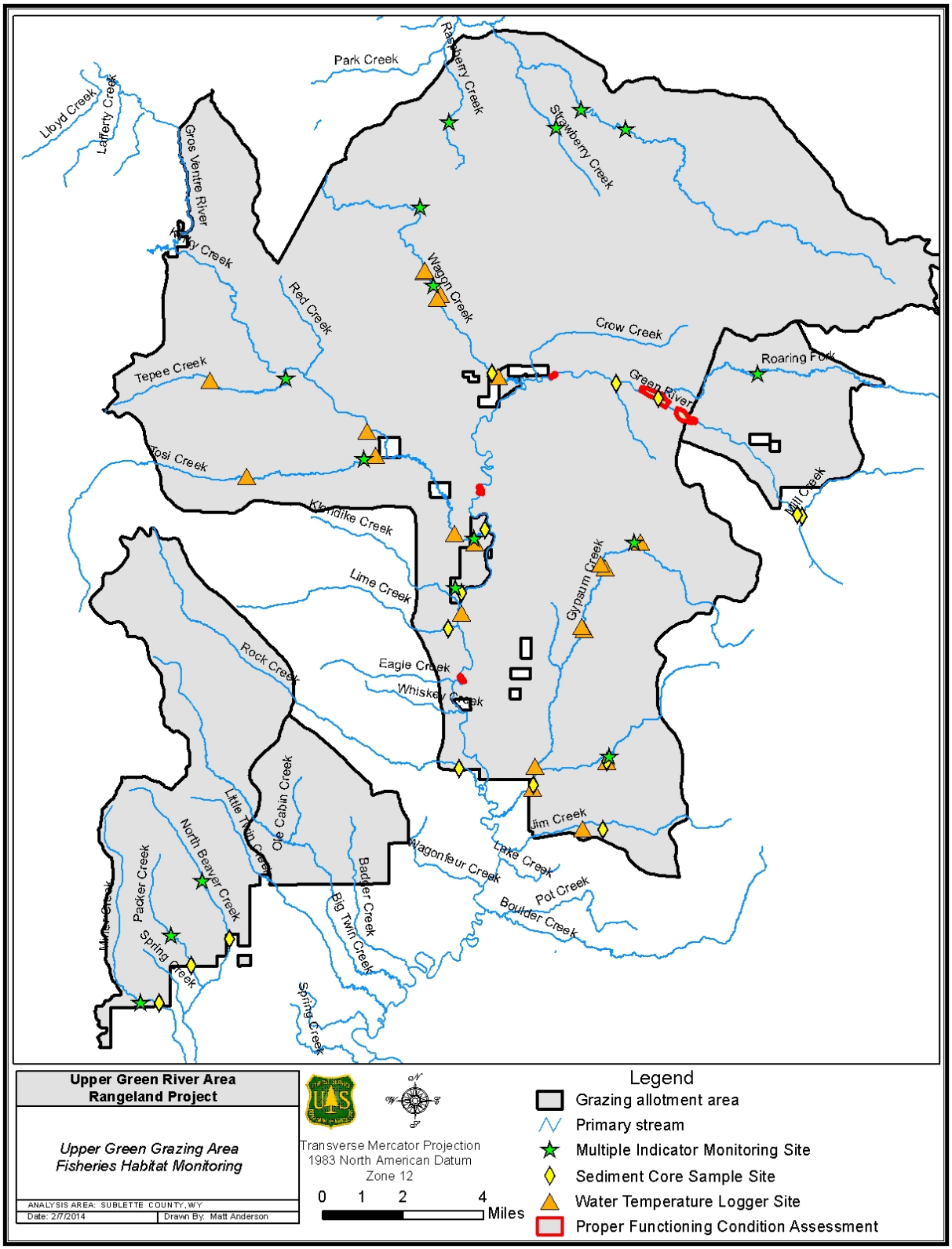

Figure 69. Fisheries habitat monitoring locations for MIM sites, sediment core sample sites, water temperature logger sites, and proper functioning conditions assessment locations

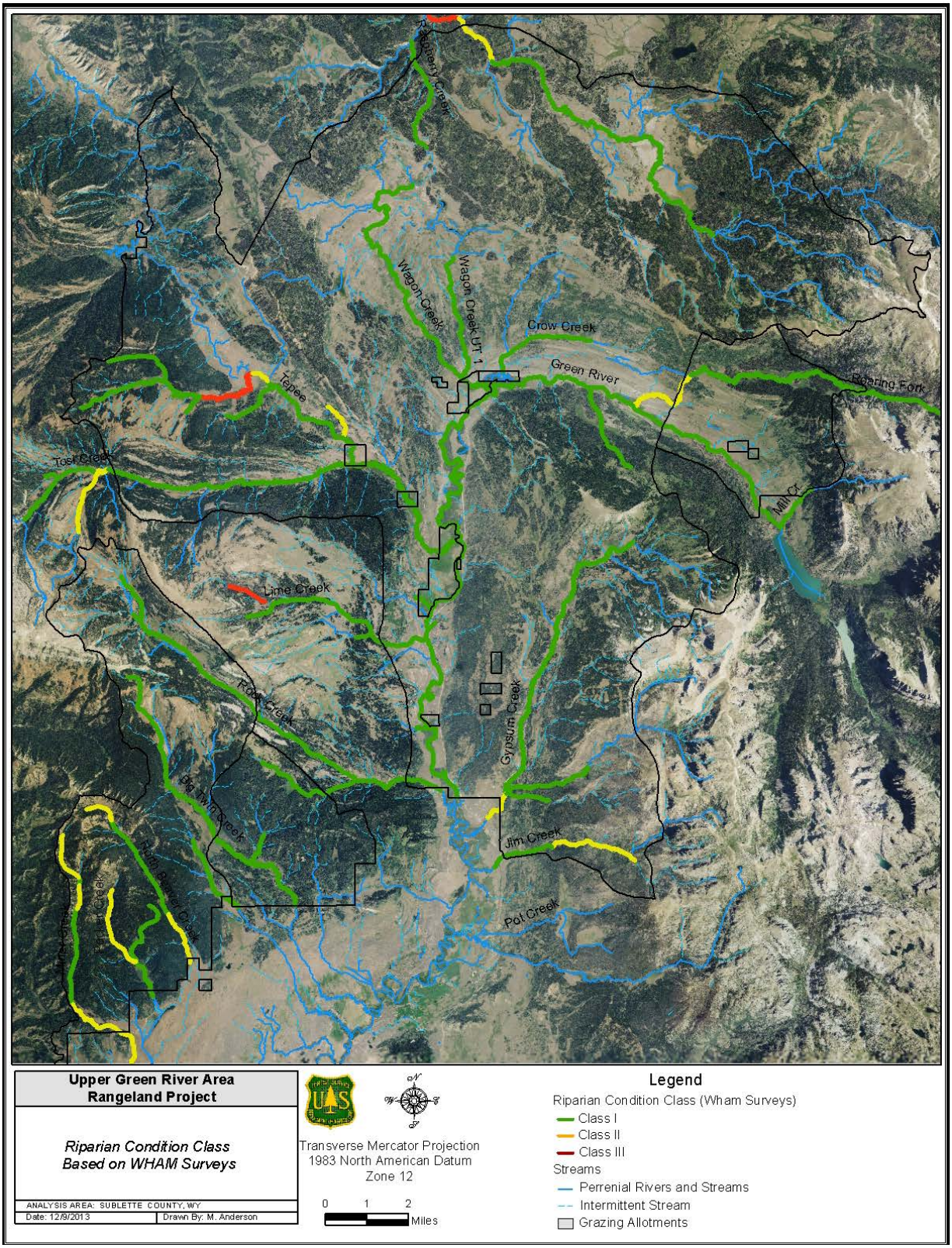

Figure 70. Riparian condition class assessment of the Upper Green River Rangeland analysis area

Bank Stability

Stream bank condition is a good indicator of the health of a stream channel and fish habitat and can be affected by overgrazing or grazing during seasons in which banks are more susceptible to damage. Stream bank instability can be initiated by natural events (extreme floods, wildfires, mass wasting) or human disturbances (improper livestock grazing, logging, roads, urban developments, etc.) that change discharge, sediment load, and channel stability. Bank material and vegetation type and density also affect the stability of stream banks (Platts 1989). Unstable stream banks can lead to accelerated bank erosion and subsequent channel widening, increased sediment supply, and decreased sediment transport capability, which has the effect of reducing stream depths, interstitial gravel spaces, and pool volumes (Platts 1991). Eroding stream banks support little or no riparian vegetation, resulting in a reduction of stream shading, bank undercut, and terrestrial insect drop in to the stream. Such degraded riparian and channel conditions can affect fish by increasing summer stream temperatures, reducing winter temperatures resulting in anchor ice, reducing cover through lack of undercut banks or overhead vegetation, and decreasing terrestrial and aquatic fish food items (Platts 1991).

Bank stability is high throughout most of the project area based on WHAM surveys and MIM key sites; however, there are areas within the project area where bank stability is not meeting objectives. Many of the streams in the project area are steep gradient (>4 percent) with forested or well-developed willow riparian communities and are not highly susceptible to bank erosion. As a result, more intensive survey efforts were focused on lower gradient streams in open valleys that were more susceptible to grazing impacts. Bank stability was monitored at 16 sites across the project area (Figure 41 and Figure 69). The sites were selected by the interdisciplinary team either because the site was an area of known concern (focus area) or as an area that would be sensitive to management that was representative of other sensitive stream and riparian areas in the allotment (key area). Stream bank stability monitoring results are presented in the Riparian Areas section and summarized in Table 23.

Fine Sediment

Fine sediment deposition in streams can adversely affect fish and fish habitat, particularly for trout, by reducing the quantity and/or quality of spawning habitat, reducing food supply by impacting invertebrate habitat, reducing interstitial habitat, thereby decreasing egg-to-fry survival, and reducing pool quality and quantity (Irving and Bjornn 1984). Livestock grazing can influence fine sediment in streams by reducing vegetation cover in the upland or riparian areas and reducing bank stability through altering riparian vegetation or physical bank trampling (Clary and Webster 1989).

Sediment samples were collected from riffles near the mouth of the stream or near the Forest boundary on sixteen streams in the Upper Green (Figure 70). Samples were collected using the barrel sampler method (Bunte and Abt 2001). However, because the samples are not connected to known spawning habitats for trout, no inference from these samples to the quality of the actual spawning habitat is possible (Anderson 2015).

Stream Temperature

Summer water temperatures are critical to cutthroat trout, which prefer water temperatures of 55°F (13°C) and do best when water remains continuously below 68°F (20°C) (Bear et al. 2007, Johnston and Rahel 2004). High water temperatures can negatively affect cutthroat trout growth and fitness and alter inter-specific competitive interactions. Cutthroat can suffer mortality when continuously exposed to high stream temperatures. Experimental studies have found that Bonneville cutthroat suffered 50 percent mortality under 7-day continuous exposure to 24.2ºC (Johnston and Rahel 2004), and westslope cutthroat had 50 percent mortality following a 60-day exposure of 19.2ºC (Bear et al. 2007). Stream temperatures have been found to be a major factor limiting the distribution of cutthroat trout populations in the intermountain west (Sloat et al.

2005, Hirsch 2005). Cutthroat trout have lower optimal growth temperatures and temperature tolerance limits than brook trout, brown trout, and rainbow trout and have been observed to have a competitive disadvantage at warm temperatures (Bear 2007, Staso and Rahel 1994). Survival of cutthroat trout through the winter season is related to the thermal conditions in the summer season. Juvenile cutthroat must have adequate thermal conditions during the summer to build sufficient energy reserves to survive cold (<4ºC) winter conditions (Coleman and Fausch 2007).

Continuous temperature monitoring units were deployed on Gypsum, South Fork Gypsum, and Jim Creeks in 2002, on Gypsum, Clear, Tosi, and Wagon Creeks in 2003, and on Tosi, Tepee, Gypsum, and Wagon Creeks in 2013 (Figure 69). Gypsum, South Fork Gypsum, Jim, and Clear Creeks had peak mean weekly maximum temperatures (MWMT) near or below the desired maximum temperature of 68ºF and exhibited few to no days of a three hour period over 68ºF. The two sites on Wagon Creek, however, had numerous days over 68ºF, and both sites had warmer than desired MWMT. In 2003, Tosi Creek also had mean weekly maximum temperatures exceeding 68ºF and had 10 days over the course of the summer with a three hour period over 68ºF. In 2013, Tosi Creek temperatures were generally cool, although the lowest site was not revisited.

Environmental Consequences

Management activities were evaluated by alternative to determine their potential effects on sensitive, threatened or endangered fish species and their aquatic habitat. The fisheries analysis was conducted to determine whether the actions of each alternative would jeopardize the continued existence or cause adverse modification of habitat for fish species listed or proposed to be listed as endangered or threatened by the U.S. Fish and Wildlife Service and their listed or proposed listed critical habitat. The analysis was also conducted to determine whether the management actions proposed for each alternative would contribute to any sensitive fish species becoming or trending towards federal listing as threatened or endangered. Bridger-Teton management indicator species were used to indicate the effects of habitat changes associated with proposed management activities associated with each alternative.

Issue 1: Effects on Threatened, Endangered, and Sensitive Species, as well as Other Species of Concern

The concern is that livestock grazing may affect the recovery of threatened, endangered, proposed, candidate and sensitive species, in addition to viability and habitat objectives for other species in the project area. The Forest Plan provides direction for these species and management indicator species. Species conservation is directed by laws, regulations, and policies.

Effects indicators for comparison of alternatives

Indicators: Stream bank stability (percent), stream temperature (degrees Fahrenheit), and riparian function (WHAM condition class, properly functioning condition rating, and professional judgment).

Spatial and Temporal Context for Effects Analysis

The affected environment is defined as all areas that could be authorized for grazing or trailing of livestock, as well as aquatic habitat areas downstream where potential effects could occur. Short-term impacts are those impacts that could recover to baseline conditions within 1-3 years; examples could include small volume of sediment deposition, reduced stream vegetative canopy from browse of annual production, and effects to individual fish. Long-term impacts are those that result in a change of state, which could take from 2-50 years to recover to baseline conditions. Examples of long-term impacts include a change in stream channel form or type, a conversion of vegetation community type, a large-scale sediment deposition event, or a change in trend in fish population.

Alternative 1 – No Livestock Grazing (No Action Alternative)

Direct and Indirect Effects by Indicator

Riparian Condition

Most of the riparian areas in the project area are currently in functioning condition, identified as riparian condition Class I, and meet the riparian function objective. These riparian areas would continue to meet the riparian function objective under Alternative 1 – No Livestock Grazing.

Stream Bank Stability

The banks along most of the length of streams in the project area are stable or within the natural range of variability; however, there are areas where cattle grazing has contributed to bank instability and are not meeting resource condition objectives (identified as focus areas). Numerous sources in the literature indicate that removing or significantly reducing grazing pressure can lead to a rapid improvement in bank stability where grazing is the primary factor in destabilizing banks (Myers and Swanson 1995, Platt 1991). Alternative 1 – No Livestock Grazing would lead to a quick recovery of bank stability in most stream reaches that are not currently meeting resource objectives. Some streams that have bank stability problems and are seriously incised, such as Tepee Creek focus area in the Lower Tepee Pasture and Tosi Creek focus area in the Noble Pasture 1, would require a long period of time to recover, although the bank stability recovery would likely be fastest under the no grazing alternative.

Fine Sediment

Removing cattle from the project area would result in a reduction of fine sediment entering the streams. Currently, part of the fine sediment entering streams in the project area is generated from the uplands in areas where grazing decreases ground cover (see Soils section), from stream banks due to bank alteration and reduced bank stability (see Hydrology section), and from disturbance to stream beds. In many streams, the impacts that cattle have on fine sediment entering streams are minimal, as evident by good ground cover, intact riparian vegetation, high bank stability, and minimal bank alteration; therefore, this alternative would have a limited beneficial effect to the quantity of fine sediment in those streams. Where problems with these parameters exist, many of which have been identified as focus areas, Alternative 1, the No Livestock Grazing Alternative, would have a beneficial effect by removing the disturbance to the soil and vegetation.

Stream Temperature

Alternative 1 – No Livestock Grazing would have some beneficial effects to water temperature conditions for native fish populations. The only streams monitored with any indication of elevated stream temperatures were Wagon Creek, Tosi Creek, and Gypsum Creek. Reduced grazing of streamside herbaceous and woody vegetation on these streams would result in a modest increase of summer shade to stream channels, which could moderate summer high temperatures. Improved stream channel function and riparian vegetation could play an important role for native fisheries in buffering the effects of global warming to stream temperature conditions.

Direct and Indirect Effects by Fish Species

Determinations

The project as described in Alternative 1 – No Livestock Grazing would have "**No Impact**" on the sensitive Colorado River cutthroat trout, although Colorado River cutthroat trout may continue to decline within the project area, the alternative would have "**No Impact**" on Yellowstone cutthroat trout and rainbow trout; AND is "**Not Likely to Adversely Affect or Adversely Modify Proposed Critical Habitat**" of the endangered Kendall Warm Springs dace.

Kendall Warm Springs Dace

The current management of Kendall Warm Springs, the only known habitat of the Kendall Warm Springs dace, allows access to the springs by native ungulates, but excludes access to livestock. Relative population density of the Kendall Warm Springs dace is believed to have declined since monitoring began in 1997, but the population appears to have stabilized since 2007. The cause of the decline is unknown, but a narrowing and deepening of the stream has been noted which reduces the shallow, small pools valuable to dace. These channel changes may be related to effective exclusion of domestic livestock; however, native ungulates can easily pass the fence and still have access to the springs. This alternative would remove livestock grazing, which would effectively maintain the current management by excluding livestock from the springs with fencing. As a result, this alternative would not be likely to adversely affect the Kendall Warm Springs dace or their habitat.

Colorado River Cutthroat Trout

Overall, Alternative 1 – No Livestock Grazing Alternative would benefit Colorado River cutthroat trout by improving habitat conditions; however, because many of the populations are limited by competitive relationships with introduced trout species, any improvements to habitat would likely have limited benefits to the species' status or distribution (Quist and Hubert 2005).

Because there would be no physical presence of cattle in the project area under Alternative 1, there would be no direct effects to fish. Scientific literature provides abundant documentation of the positive effects on riparian and stream habitat conditions and trout population responses upon eliminating streamside grazing of domestic livestock (Platts 1981, Li et al. 1994, Myers and Swanson 1995). Trout populations have been reported to increase in response to improved stream habitat once livestock grazing is removed. Platts (1981) reported that fish densities were more than ten times higher in lightly grazed or no grazing areas in comparison to heavily grazed stream sections; however, since none of the stream sections in the project area meet the author's definition of a heavily grazed stream, a smaller response would be expected. It is highly probable that the desired conditions and riparian objectives listed for the project would be met at most locations within ten years of implementing Alternative 1. Some stream and riparian conditions, such as the Tepee Creek focus area, may have a timeframe for recovery that is longer than ten years. Therefore, implementation of Alternative 1 would result in improving current habitat conditions for cutthroat trout populations within the project area. Improved stream function and riparian function could help moderate the effects of global warming on stream temperatures.

Cutthroat trout populations within the project area are declining, and the primary factor for that trend is invasion by non-native trout, particularly brook trout (Hirsch et al. 2006). Because the invasion of non-native trout is the constraining factor in cutthroat trout distribution and abundance in degraded and highly-functioning habitats alike, the habitat elements that would improve under the no grazing alternative may do little to recover cutthroat trout or affect the current downward trend (Quist and Hubert 2005). Within the project area, Colorado River cutthroat trout are found in Rock Creek, Klondike Creek, Tepee Creek, Gypsum Creek, and Jim Creek (Figure 68). Currently, there is little effect of livestock grazing on Rock Creek; therefore, Alternative 1 would not affect this Colorado River cutthroat trout population.

Yellowstone / Snake River Fine-spotted Cutthroat Trout

Alternative 1 would have a beneficial impact on Yellowstone cutthroat trout. There would be no mechanism for direct affects to Yellowstone cutthroat trout in Alternative 1. Fisheries sampling in Fish Creek in September 2012 found a mix of Yellowstone cutthroat trout and brook trout. The no livestock grazing alternative may result in habitat conditions that favor the persistence of Yellowstone cutthroat trout. Strawberry Creek has both Yellowstone cutthroat trout and brook trout and has been found to have some grazing impacts on riparian conditions. This alternative could have a benefit to the Yellowstone cutthroat

trout in this stream. A stream reach sampled on Raspberry Creek found only Yellowstone cutthroat trout, and the fish density was quite high. Habitat and MIM surveys have indicated light grazing impacts to this stream, but Alternative 1 may have some beneficial effect on this stream's Yellowstone cutthroat trout population.

Rainbow Trout

Within the project area, rainbow trout are found in the Green River and in the lowest segments of some of the tributaries. The reaches of the Green River above the river bend have low natural productivity and very little natural recruitment, so this has historically been maintained with stocking. There is some rainbow trout spawning in the lower reaches of the tributaries to the Green River. Alternative 1 may eventually cause a reduced level of fine sediment in these stream segments, which could have a beneficial effect to egg and fry survival of rainbow trout.

Cumulative Effects

The spatial boundary for the cumulative effects analysis is the project area. The temporal boundary for this analysis is ten years into the past and future. This temporal boundary was selected because ten years is the life of a typical term grazing permit.

Improved habitat conditions for trout species as a result of removing domestic livestock grazing under Alternative 1 would slightly offset other factors negatively impacting the aquatic environment such as road/stream crossings, recreational impacts, timber sales, and fire. The projected time for improved stream habitat conditions could be three to ten years. Fish population trends would be expected to mirror the habitat conditions with a one to three year delay.

The effects of Alternative 1, when combined with the cumulative effects of these past, current, and reasonably foreseeable future actions cumulatively would not contribute to a trend toward listing because the alternative would result in improving habitat conditions for the Colorado River cutthroat trout populations. The effect of the project on Yellowstone/Snake River fine-spotted cutthroat trout, when combined with cumulative the effects of these past, current, and reasonably foreseeable future actions cumulatively would not contribute to a trend toward listing because Yellowstone/Snake River fine-spotted cutthroat trout would be expected to continue to be well-distributed both on the Forest and within the project area.

Ability to Address Issues

Issue #1- Effects on Threatened, Endangered, and Sensitive Species, as well as Other Species of Concern: Determination: The project as described in Alternative 1 – No Livestock Grazing would have a beneficial impact on the Sensitive Colorado River cutthroat trout; although Colorado River cutthroat trout may continue to decline within the project area; the alternative would have a beneficial impact Yellowstone cutthroat trout and rainbow trout. Alternative 1 would not be likely to adversely affect the endangered Kendall Warm Springs dace.

Effects Common to All Action Alternatives (Alternatives 2, 3 and 4)

Livestock grazing would have direct and indirect effects on fisheries within the project area. Direct effects include immediate interaction of livestock with fish. Since livestock enter streams, for drinking, crossing streams in route to other forage or for a cool place on the landscape, they can be in near-contact with fish. Because they are in streams, livestock could trigger avoidance or flight behavior or impact fish redds (i.e., spawning areas) where there are temporal and spatial overlap of active redds and livestock utilization. Livestock grazing can also negatively affect fish habitat by altering watershed or riparian conditions. Grazing impacts to streamside vegetation can result in increased summer water temperatures from lack of cover and increased icing during winter months (Platts and Nelson 1989). Widening of stream channels and reduction of bank stability can occur due to bank impacts from physical alteration or reduction of deep-rooted

vegetation in the riparian area (Platts 1984). Where grazing reduces vegetation cover and increases runoff and sediment delivery to streams, there would be subsequent reduction in stream function and modified fish habitat.

Grazing can be managed to have neutral or beneficial impacts to streams and riparian areas when carefully controlled and managed in accordance with other ecosystem and resource objectives (Leonard 1997). When managing stream and riparian ecosystems, key elements that would maintain ecosystem integrity include providing sufficient channel and floodplain roughness to slow velocities, maintaining a sediment transport balance, providing sufficient root strength to maintain channel form and bank stability, and providing adequate riparian vegetation canopy to shade the stream and support riparian macroinvertebrate communities. While it is possible to achieve these functions while allowing grazing, overgrazing or poor grazing management can have negative effects on stream and riparian ecosystem integrity (Clary and Webster 1989). Poorly managed riparian grazing can also have negative effects on fisheries (Li et al. 1994, Knapp and Matthews 1996). The most frequent recommendations for compatible grazing with riparian systems is to limit timing, intensity, frequency, and duration of grazing to mitigate impacts to riparian plant vigor, soil compaction, physical bank damage, and water quality. Recommended strategies for appropriate management include developing appropriate grazing systems (Platts 1984), limiting intensity based on stubble height, utilization (Clary and Webster 1989), and bank alteration (Cowley 2002, Bengeyfield 2006), managing timing, providing structural improvement, and improving livestock distribution (Perry 2005).

Grazing systems or grazing strategies are an important element in grazing management because they affect the timing, duration, and to some extent distribution based on seasonality. Although there are numerous factors and additional elements that can modify or mitigate the effects, Platts (1984) rated the compatibility of different grazing systems with fisheries resources from 1 (poorly compatible) to 10 (highly compatible). The grazing systems that would be authorized under Alternative 2 rank from 1 to 5, and include continuous season-long (1), deferred rotation (2), and rest-rotation (5). The only other system under this alternative is a two-herd, multiple-pass rotation on irrigated pasture, which is not evaluated by Platts (1984). Under Alternatives 3 and 4, the grazing systems that would be authorized rank from 2 to 5: deferred rotation (2); rest-rotation (5); and a two times over rotation on irrigated pasture, which was not evaluated by Platts (1984).

Percent utilization and stubble height measurements are monitoring parameters that are used to gauge grazing intensity. Stubble height is a measure of residual height of herbaceous vegetation and numerous authors have advocated a particular stubble height in riparian areas to accomplish both plant vigor and stream bank protection (Leffert 2005). Clary and Webster (1989) state that a minimum stubble height of 4 or 6 inches should be maintained on all riparian areas to maintain plant vigor, stream bank protection, and bank roughness. Clary (1999) examined important habitat parameters for trout, including width-depth ratios, embeddedness, bank stability and willow growth, and found general improvement to historically over-grazed riparian areas with 4-inch stubble height retention and an improvement of all parameters with 6-inch stubble height retention in mountain meadow riparian areas in central Idaho.

Utilization is a measurement of the percent of the annual vegetative growth taken by grazing animals. Again, numerous authors have recommended limiting utilization to moderate impacts to riparian areas. Clary and Webster (1989) state that “the level of utilization on the site – including riparian areas – is the most important consideration” in evaluating good grazing practices. The authors felt that utilization limits should be set based on the season (65 percent in spring, 40-50 percent in summer, and 30 percent in fall) due to the relative ability of the plants for post-grazing regrowth. After reviewing the literature, Leffert (2005) concluded that the literature supported riparian utilization rates less than 50 percent with higher utilization acceptable on streams in good ecological condition and those that are less sensitive to grazing impacts. Lower levels of utilization should occur on streams that need improvement or are highly sensitive. It is important to note that stubble height and alteration should not be used as long-term riparian goals but are monitoring parameters of

annual operations to be used to gauge intensity and to be adjusted where riparian objectives are not being met.

Bank instability is often the first sign of overgrazing impacts on a stream (Platts 1991). The direct effects of hooves on stream banks can modify the shape of banks and reduce the ability of those banks to resist erosion during subsequent high flows (Trimble and Mendal 1995). Bengeyfield (2006) stated, “the most widespread impact livestock have on riparian areas is trampling stream banks,” and found that bank alteration criteria were often met before stubble height criteria. If bank alteration is used as an criteria for moving livestock off a pasture, it is typically recommended to limit annual-year alteration to some level less than 30 percent (20 percent or even 10 percent maximum alteration have been suggested). Cowley (2002) indicates that the level of alteration that is acceptable on a given stream reach will vary based on site conditions and the level should be adjusted based on the response of long-term indicators such as bank stability or width-depth ratios. Levels of bank alteration should not be considered a riparian goal but should be used as a short-term indicator of use in riparian areas.

Noble Pastures Water Diversions

The Forest Service owns water rights for irrigating the Noble Pastures Allotment on Klondike Creek and Tosi Creek. The diversions do not have fish screens and there is no proposal to screen the ditches. Sampling in the ditches during the summer of 2012 indicated that mottled sculpin and brook trout were present in the ditches. Flood irrigating the pastures can result in stranding and mortality of brook trout and sculpin that are carried onto the pastures with irrigation water. However, the impact to the brook trout and sculpins populations would not be substantial. No Colorado River cutthroat trout were found in the ditches and cutthroat trout entrainment in the ditches would be a rare occurrence since Tosi Creek is not currently considered occupied habitat. There are cutthroat in Tepee Creek, which is a tributary to Tosi Creek, and it is possible that individuals may stray from that population and could potentially be entrained in the ditches. Klondike is a similar situation in which Colorado River cutthroat trout are located upstream, but it is an isolated population. It appears that a large beaver dam upstream of the diversion is the primary reason that the Klondike Creek Colorado River cutthroat trout population has not been invaded by brook trout. For that reason, any Colorado River cutthroat trout that move downstream from the beaver dam would be unable to return to the population. However, this would be a very rare occurrence and would not have population-level impacts. This effect would be common to all action alternatives and Alternative 1 (No Action Alternative) as the Forest Service would maintain the water right even if grazing was discontinued.

Kendall Warm Springs Dace

Grazing livestock would be excluded from Kendall Warm Springs except when cattle are allowed through the exclosure while herding the cattle to the allotment or back off the Forest. When cattle are allowed in the exclosure (under the action alternatives), they would be required to be actively herded through to the other side. Based on current management, the permittees would often opt to herd the cattle around the exclosure or allow them to drift around the exclosure. When cattle are being herded through the exclosure, there would be some bank and channel alteration, which some believe could have a beneficial effect to the dace habitat but could also cause dace to temporarily switch habitat, elevate turbidity, and alter submergent vegetation cover. The Forest Service is responsible for maintaining the exclosure fence, but at times, the fence could fail and cattle could access the springs, which could result in livestock-related impacts. The action alternatives (Alternatives 2, 3, and 4) would not be likely to adversely affect the Kendall Warm Springs dace or their habitat.

Alternative 2 – Grazing as Currently Permitted and Current Management

Alternative 2 would continue current permitted grazing management practices. This means that the Forest would continue to authorize the same maximum livestock numbers, seasons, and grazing systems, and

utilization would continue to be capped at 50-60 percent for uplands and 55-65 percent for riparian, depending upon the pasture. The environmental consequences of this alternative may result in different conditions compared to the existing conditions. Over the past decade, livestock have not been run in full numbers in all cases, and the utilization has often been below maximum allowable utilization levels (Chapter 2). While it is likely that utilization would be close to the same level as it has in the recent past, it is important to analyze the potential effects of each alternative assuming maximum utilization and grazing intensity.

Direct and Indirect Effects by Indicator

Riparian Condition

Alternative 2 has a maximum utilization of 65 percent in riparian areas and there are no limits set on stubble height. Range monitoring data suggest that actual upland utilization based on these stocking rates and season in the recent past has been well below the maximum allowable. Prior to the cooperative permittee and Forest Service monitoring effort, there are few records of annual utilization, and so it is possible utilization levels were much higher than have been recorded in more recent years. If vegetation conditions or permittee management changed dramatically, this alternative would allow for a near-doubling of utilization levels experienced in recent years. Under Alternative 2- Grazing as Currently Permitted, downward trends in riparian vegetation conditions and bank stability would be expected. Under maximum utilization, riparian conditions classes depicted across the project area would be expected to begin to trend downward where there are stream segments that are sensitive to livestock management and are in capable and suitable grazing areas. If vegetation conditions and permittee management were consistent with the past decade as proposed under Alternative 2 - Current Management, current trends in riparian condition across the project area would be expected to continue.

Steam Bank Stability

Stream bank stability, which currently is generally high across the project area according to the WHAM surveys, would be expected to remain high in much of the project area because there are many miles of high gradient stream with large substrates and intact riparian willow communities. However, more sensitive stream reaches could see declining bank stability under Alternative 2- Grazing as Currently Permitted. With utilization rates as high as 65 percent, stubble height would be expected to be below 3 inches (Clary and Webster 1989). Hall and Bryant (1995) suggest that damage to stream banks and riparian willow communities are likely to increase rapidly as stubble height goes below 3 inches. At high levels of grazing in riparian areas, vegetation would be expected to have a reduced ability to hold banks and bank alteration from trampling would be expected to be high on low gradient reaches with stream banks composed of fine sediment sizes. Cattle grazing, as prescribed by Alternative 2 – Grazing as Currently Permitted, would have impacts on bank stability in each of the streams within the allotments; cattle watering areas, trails crossing streams, and streams near fence lines and roads would continue to be heavily used, which would result in bare and eroding soils. Focus areas with bank stability problems would remain in a degraded condition, and areas that have seen recovery may trend downward under the full levels of utilization.

Fine Sediment

Maximum allowable utilization under Alternative 2 – Grazing as Currently Permitted would result in an increase in fine sediment levels in streams since bank stability would decline in sensitive stream reaches. This alternative would result in continued erosion from areas with unstable or uncovered banks and bare ground. Areas with reduced ground cover related to livestock grazing would continue to be prevalent near fence lines, roads, and trailing areas. Increased fine sediment in streams may reduce the habitat quality of trout spawning areas.

Stream Temperature

According to global warming predictions, stream temperatures in the intermountain region are expected to increase regardless of which alternative is selected; however, this alternative could have a negative impact on the resiliency of aquatic ecosystems. Fully functioning stream and riparian area have extensive refugia and are able to buffer stream temperature fluctuation (Poole and Berman 2001). Although most streams in the project area are currently in a highly functioning condition that would enable resilience to stream temperature increases, Alternative 2 could lead to simplified channels, altered banks, or reduced riparian vegetation that can cause less stream shading and less stream-groundwater exchange under maximum levels of riparian utilization. This alternative would not lead to improved stream and riparian conditions in the areas that have been identified as having resource concerns (Table 1).

Direct and Indirect Effects of Alternative 2 by Fish Species

Determination

The project as described in Alternative 2 "**will impact individuals or habitat with a consequence that the action may contribute to a trend towards federal listing or cause a loss of viability to the population or species of sensitive Colorado River cutthroat trout, may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species of Yellowstone/ Snake River cutthroat trout, and MIS rainbow trout species;** AND is **not likely to adversely affect or adversely modify proposed critical habitat of the Endangered Kendall Warm Springs dace**".

Kendall Warm Springs Dace

See the Effects Common to All Action Alternatives (Alternatives 2, 3 and 4) section.

Colorado River Cutthroat Trout

Alternative 2 would have both direct and indirect effects to Colorado River cutthroat trout within the project area. Where cattle are able to enter streams during the period and in the locations that cutthroat trout have active redds (i.e., spawning areas) there is a risk of trampling redds and reducing egg survival (Greggory and Gamet 2009). For this alternative, cattle are allowed on the allotments by June 14th. For Colorado River cutthroat trout, spawning can occur from May until July, and fry emergence is typically in late July or early August (Young 1995). Colorado River cutthroat trout spawning would occur within the grazed area on Rock Creek, Tepee Creek, Gypsum Creek, Jim Creek, Klondike Creek, and an unnamed tributary to the Green River.

Under Alternative 2 - Grazing as Currently Permitted, cutthroat trout habitat could see declining conditions since high utilization levels (up to 65 percent) could reduce stream bank stability in sensitive reaches and could lead to increased impact to riparian vegetation. Much of the habitat for cutthroat populations is currently in good condition, and in high-gradient streams with cobble or boulder-dominated bed and banks, this would not be expected to change. The focus areas would be likely to remain below desired condition, and in some cases would have further degraded conditions. Due to projected climate trends, stream temperature would be expected to rise, and this alternative would do the least out of the four alternatives to buffer the effects of climate change on stream temperatures. Because the alternative fails to address bank stability concerns, some cutthroat trout habitat would have slightly higher levels of fine sediment as compared to the other alternatives. Although many of the populations of cutthroat trout that are being invaded by brook trout may have little chance of long-term persistence under any of the alternatives, the fact that this alternative does not address resource concerns at focus areas, improve grazing systems to benefit riparian and aquatic conditions, may further reduce the likelihood of cutthroat trout populations persisting under the competitive pressure of non-native trout.

Because this alternative would lead to reduced habitat conditions, specifically increased stream temperature and fine sediment deposition, which would likely favor brook trout over cutthroat trout (Staso and Rahel 1994, Shepard 2004), this alternative may impact individuals and habitat and would contribute to a decline in populations within the project area. At the Forest level, these impacts would reduce the level at which Colorado River cutthroat trout were well-distributed across the planning area. As a result, the alternative **"may contribute to a trend toward federal listing".**

Yellowstone / Snake River Fine-spotted Cutthroat Trout

Alternative 2 – Grazing as Currently Permitted could affect Yellowstone/Snake River fine-spotted cutthroat trout in Raspberry, Strawberry, and South Fork Fish creeks, and in the Gros Ventre River. Although the stream habitat conditions were found to be relatively intact with fairly light grazing impacts except for a couple of local areas under current management, 65 percent utilization in the riparian areas under grazing as permitted could cause riparian and stream habitat conditions to decline. The populations in Raspberry and Fish creeks are fairly robust, but the Strawberry Creek population has a high percentage of brook trout. Because this project could reduce the Yellowstone/Snake River fine-spotted cutthroat trout population within the project area, but would not likely lead to an extirpation, and because the project area accounts for a relatively small fraction of the habitat provided for this sub-species of cutthroat trout on the Forest, Yellowstone/Snake River fine-spotted cutthroat trout would still be well-distributed, maintain connectivity, and maintain a resilient population on the Forest. Therefore, although this alternative **"may impact individuals and habitat, it would not contribute to a trend toward federal listing"**.

Rainbow Trout

Alternative 2 – Grazing as Currently Permitted would generally reduce riparian function and bank stability and increase fine sediment contributions to streams which rainbow trout rely on for spawning. As a result, this alternative **"would contribute to current downward trends for rainbow trout"**.

Cumulative Effects Common to All Action Alternatives

Cumulative effects are the incremental impacts of the action when added to the impacts from past, present, and reasonably foreseeable future actions and that overlap with those impacts in space and in time. Table 26 displays the effects of past, present, and reasonably foreseeable future actions on indicators applicable to the fisheries resource.

Summary of Cumulative Effects

Past, current, and reasonably foreseeable future actions contribute to cumulative effects on the fisheries resource in the project area. Activities that have a cumulative effect on fisheries in the Upper Green project area include past livestock grazing, forest road construction and maintenance, Upper Green River Corridor Project, fish stocking, and angling. The largest cumulative effect to fisheries habitat is past livestock grazing. There are numerous locations within the project that have been impacted by livestock grazing. Alternatives 3 and 4 address some of those impacted areas specifically, but some impacts are inherent to authorized livestock grazing including trailing areas, impacted areas near fence lines, and watering areas. Forest roads also have impacts on watershed processes and generate fine sediment that, in some cases, is delivered to streams that would be affected by the action alternatives. Because most of the cutthroat populations are above roaded areas or have contributing watersheds that have low road densities, these road impacts to sensitive cutthroat trout would be light. Fish stocking has had the greatest contribution to reduction of native cutthroat trout populations due to competition and hybridization. Without these impacts, cutthroat trout would be much more well-represented and well-connected on the Forest. Angling has some cumulative effects on fish populations in the project area. The greatest impact are to harvest fish species in the Green River and on South Fork Fish Creek, although angling pressure occurs on the major fish-bearing tributaries to the Green River and the Gros Ventre River as well.

The effects of Alternative 2 when combined with the effects of these past, current, and reasonably foreseeable future actions cumulatively may contribute to a trend toward listing for Colorado River cutthroat trout because Alternative 2 would degrade existing habitat conditions for populations that have been severely reduced due to the cumulative effects of other activities. The effects of Alternative 3 or 4, when combined with the effects of these past, current, and reasonably foreseeable future actions cumulatively would not contribute to a trend toward listing because the alternative would result in either maintaining or, in most cases, improving current habitat conditions for the Colorado River cutthroat trout populations. The effect of the project on Yellowstone/Snake River fine-spotted cutthroat trout, when combined with the effects of these past, current, and reasonably foreseeable future actions cumulatively would not contribute to a trend toward listing because Yellowstone/Snake River fine-spotted cutthroat trout would be expected to continue to be well-distributed both on the Forest and within the project area.

Ability to Address Issues

Issue #1- Effects on Threatened, Endangered, and Sensitive Species, as well as Other Species of Concern. Determination: The project as described in Alternative 2 – Grazing as Currently Permitted may impact individuals and may contribute to a trend toward listing or loss of viability to the population of sensitive Colorado River cutthroat trout, may impact individuals or habitat but will not likely contribute to a trend towards federal listing or loss of viability to the population or species of Yellowstone/ Snake River cutthroat trout, and rainbow trout species (management indicator species); AND is not likely to adversely affect or adversely modify proposed critical habitat for the endangered Kendall Warm Springs dace.

Table 26. Effects of past, present, and reasonably foreseeable future actions on indicators applicable to the fisheries resource

Project/ Activity	Potential Effects	Overlap in Time	Overlap in Space	Measurable Effect?	Causal Factors and Extent	Aquatic Species or Habitat Effect
Forest road construction/ maintenance	Fine sediment	Y	Y	Y	Both forest road construction and maintenance produce fine sediment and, where those roads are hydrologically connected to fish-bearing streams, can cause increased levels of fine sediment deposition	All fish species including, but not limited to, cutthroat trout, rainbow trout, and brook trout. Fine sediment can reduce egg incubation success by smothering and reducing oxygenation of embryos and reduce habitat for juvenile rearing by filling interstitial spaces between larger substrates and filling pools.
Past timber harvest and fuels management	Fine sediment	N	Y	N	Sediment past timber activities have impacted streams in the affected area of this project from soil disturbance in the units and associated activities, such as road and landing construction, but those activities are no longer contributing further impacts to the stream. Although there may be some residual effects to fisheries habitat, they are indistinguishable from background conditions and are dealt with as existing conditions.	NA
Current and future timber harvest and fuels management	Fine sediment	Y	Y	N	Current timbers sales have sufficient design features and mitigation measures to have minimal effects on the aquatic environment.	NA
Past livestock grazing	Riparian condition, bank stability, stream temperature, and fine sediment	Y	Y	Y	Historically, grazing intensity was much higher in the project area and there are residual effects to stream and riparian conditions that are still detectable in some areas in the project area. Some of the areas that have been identified as having low bank stability and impaired riparian vegetation conditions are on a recovery trajectory from cumulative grazing impacts. These areas that have long-term grazing impacts are	Riparian vegetation, bank condition, fine sediment deposition have all been impacted in some areas that have been historically overgrazed. Because they are related to past grazing effects, the most notable of these locations have been identified as focus areas. In addition to the focus areas there are areas that have long-term impacts near fence lines and well-established livestock trailing areas.

Project/ Activity	Potential Effects	Overlap in Time	Overlap in Space	Measurable Effect?	Causal Factors and Extent	Aquatic Species or Habitat Effect
					limited in extent across the project area and most have been identified as focus areas including Tepee Creek, Wagon Creek, Klondike Creek, and Tosi Creek focus areas.	
Current sheep grazing	Fine sediment	Y	Y	N	Current sheep grazing occurs on the west side of the analysis area in the headwaters of Tosi, Klondike, Rock Creek, and other small tributaries of the Green River. The sheep grazing has and continues to reduce ground cover in the uplands, which accelerates erosion. Much of that sediment is likely filtered as most of the sheep impacts are not adjacent to stream channels; however, some sediment related to erosion from sheep grazing would enter stream channels.	Only a small increase in sediment delivery to streams is expected from sheep grazing compared to natural background erosion rates in these watersheds. As a result, there are not expected measurable impacts to aquatic habitats or fish populations.
Green Corridor Recreation Planning	Riparian condition, bank stability, and fine sediment	Y	Y	Y	The project would involve eliminating some camping and stream access locations, while developing other location. Overall, it would be designed to reduce recreational impacts to riparian vegetation and bank stability.	Although the project may have some local detrimental effect to riparian vegetation, there would be a net beneficial impact to riparian conditions along the Green River from the project.
Past fish stocking	Fish populations	Y	Y	Y	Past fish stocking has done more to shape the current condition of fisheries in the project area than all other activities combined. Widespread changes to fish community assemblages have resulted from fish stocking.	Brook trout, rainbow trout, and brown trout stocking have resulted in competitive pressure that has caused the current downward trend in cutthroat trout populations in the project area. Rainbow trout and non-native strains of cutthroat have also lead to hybridization of native cutthroat trout populations. The change from a cutthroat fishery to a fishery dominated by non-native trout has impacts on aquatic food webs and may have broader ecosystem impacts.

Project/ Activity	Potential Effects	Overlap in Time	Overlap in Space	Measurable Effect?	Causal Factors and Extent	Aquatic Species or Habitat Effect
Angling	Fish populations	Y	Y	Y	Individuals are removed from the population or are injured, stressed, or killed by anglers. Most Colorado River cutthroat trout populations are in headwaters streams that tend to receive less angling pressure than the Green River or lower sections of tributaries. YSCT in SF Fish Creek receive relatively heavy angling pressure.	Angling affects native cutthroat trout and whitefish and non-native rainbow trout, brook trout, and brown trout. The greatest angling pressure is on the Green River and as a result, non-native trout receive the greatest impact.

Alternative 3 – Modified Grazing Management (Proposed Action)

Direct and Indirect Effects by Indicator

Riparian Condition

Many of the effects of Alternative 3 on riparian conditions are similar to those described for Alternative 2 - Grazing as Currently Permitted; however, there are numerous changes to management under this alternative, which would modify the level of effects to fisheries, riparian areas, and aquatic ecosystems. Livestock grazing under Alternative 3 would negatively affect some aspects of watershed and riparian conditions. Grazing livestock would reduce streamside vegetation resulting in erosion and reduced stream shading in some locations. Physical alteration of stream banks from livestock trampling would occur where capable grazing areas overlapped with streams. Across the project, there is a utilization limit that would require a pasture move before riparian vegetation along the greenline of streams was grazed below 4-inch stubble height. In some cases, where resource problems have been identified, this alternative limits those impacts based on site specific designs including bank alteration limits, 6-inch minimum greenline stubble heights, or livestock exclusion fences resulting in improved riparian function and areas of concern moving towards the riparian function objective and desired conditions. In addition, if desired conditions are not met, adaptive management is in place to reduce impacts by reducing utilization levels.

The types of effects of Alternative 3 to fisheries habitat are similar to Alternative 2, including a risk of reduced bank stability, reduced riparian canopy cover, increased stream temperature, and fine sediment deposition in stream compared to Alternative 1 (No Livestock Grazing), but there are a number of design features in Alternative 3 that are intended to reduce those impacts compared to Alternative 2. The effects of Alternative 3 will be compared to the effects of Alternative 2 and will refer to the literature summary on the effects of grazing intensity on riparian areas detailed in the effects analysis of Alternative 2.

Under Alternative 3, grazing across the project area would be limited to 50 percent utilization in the uplands and the riparian areas, and there would be a minimum stubble height requirement of 4-inch stubble height left in riparian areas. Clary and Webster (1989) recommend that a minimum of 4-inch stubble height should be left on all riparian areas, regardless of the grazing system, to help maintain riparian plant vigor and help prevent other impacts to streams that are caused by grazing riparian areas too intensively. Clary (1999) found that most measures of habitat variables important for trout moved closer to desirable conditions with 4-inch stubble height and virtually all measures improved with 6-inch stubble height. Livestock grazing preference has been found to switch from herbaceous to woody vegetation at a 3-inch stubble height or less; therefore, a 4-inch minimum would result in minimal woody species browse (Hall and Bryant 1995). Clary (1995) found that grazing intensities up to 50 percent utilization resulted in improving riparian trends on streams that had been subjected to heavy grazing historically. Based on this literature, it appears that 4-inch minimum stubble height and 50 percent maximum utilization would be sufficient to maintain conditions in stream and riparian areas that are in high ecological status, which is the case across most of the project area, and in most cases would even result in improving trends in condition in locations that are impaired due to historical overgrazing.

Riparian conditions would continue to be monitored at MIM key sites and adaptive management (i.e. adjust to utilization and stubble height) would be implemented as needed if downward trends in riparian conditions associated with livestock grazing were detected. Implementation of adaptive management would be expected to improve stream bank stability and riparian function, moving these indicators towards the project resource objectives and desired conditions.

Stream Bank Stability

Stream bank stability, which is generally high across the project area according to the WHAM surveys, would remain high in much of the project area because there are many miles of high gradient streams with large substrates and intact riparian willow communities. Sensitive stream reaches would be expected to maintain bank stability at or above the desired conditions for bank stability by stream type due to the minimum stubble height proposed under Alternative 3 and 50 percent maximum riparian utilization limits (Clary and Webster 1989). Because the proposed action limits riparian grazing to light or moderate levels, stream-side vegetation would be expected to be maintained sufficiently to hold banks and bank alteration from trampling to reasonably low levels, thus maintaining bank stability. Key MIM sites would be monitored at three to five year intervals to ensure that bank stability conditions were being maintained on streams within the project (Appendix C). Cattle grazing, as prescribed by this alternative, would have impacts on bank stability in each of the streams within allotments; cattle watering areas, trails crossing streams, and streams near fence lines and roads would continue to be heavily used, which would result in bare and eroding soils. However, these trailing and watering impacts would generally be expected to be lighter under Alternative 3 compared to Alternative 2 because grazing intensity would be limited by the lower maximum utilization limits. Focus areas with bank stability problems are expected to show improvement under Alternative 3 and adaptive management would be implemented if conditions did not improve. Specifically, Tosi Creek, Tepee Creek, Klondike Creek, Strawberry Creek, and Fish Creek would have bank stability monitoring and would improve over the timeframe of the project.

Fine Sediment

Under Alternative 3, livestock impacts would continue to cause erosion that contributed to the level of fine sediment in streams; however, fine sediment delivery to streams would decrease from existing conditions as stream bank conditions improved where they are currently elevated near focus areas. Since bank stability is expected to be maintained where it meets the desired condition or improved in the focus areas where it has been found to be below desired conditions, erosion and fine sediment deposition would decrease under this alternative. As with Alternative 2, there would continue to be areas with low ground cover associated with livestock trails, watering areas, and near fence lines.

Stream Temperature

This alternative implements minimum stubble height and riparian utilization limits that would help leave some herbaceous vegetation mats immediately adjacent to streams and reduce the likelihood that livestock would apply much browsing pressure to willows and other woody vegetation. As a result, streams should be able to maintain undercut banks in many locations and sedge and willow canopies would continue to contribute shade to the stream. While the grazing pressure under Alternative 3 would reduce the stream-shading canopy in some cases, the streams would be expected to receive as much or more shade under this alternative as the existing conditions. As a result, stream temperature conditions would be similar to those discussed in the existing conditions. In the long-term, stream temperatures are expected to rise under predicted global climate change scenarios, and this alternative would provide moderate resiliency to those climate-level impacts.

Direct and Indirect Effects by Fish Species

Determination

The project as described in Alternative 3 "**may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species (MIIH)** AND is **not likely to adversely affect or adversely modify proposed critical habitat of the Endangered Kendall Warm Springs dace**".

Kendall Warm Springs Dace

See the Effects Common to All Action Alternatives (Alternatives 2, 3 and 4) section.

Colorado River Cutthroat Trout

Direct effects of cattle trampling Colorado River cutthroat trout redds (i.e. spawning areas) would be similar under this alternative as compared to Alternative 2, but the extent of the effects would be reduced because the lower utilization and added stubble height requirements would reduce grazing intensity in the riparian area. In addition, changes to grazing strategies in some allotments or rotations would result in changes in the timing during which livestock would have access to streams with cutthroat redds.

Alternative 3 would have some impact on Colorado River cutthroat trout habitat caused by damage to stream channels and banks from trailing and watering areas, increase fine sediment deposition, and decrease stream shade from riparian vegetation. However, the design features in place for this alternative, including maximum forage utilization, minimum stubble heights, site-specific management elements, and structural improvements at focus areas, and adaptive management, would help ensure that stream habitat and riparian conditions are maintained in high ecological condition or trend toward improved conditions where conditions are less than satisfactory.

This alternative would generally maintain or improve existing fisheries habitat conditions, but would have some direct effects and would cause some continuing habitat disturbance and impacts. Therefore, it would impact individuals and habitat but would not contribute to a decline in populations within the project area. Because most of the Colorado River cutthroat trout populations within the project area are being invaded by brook trout and are currently believed to be in decline, the improvements in the habitat are unlikely to have a substantial effect on the population density or distribution of the species (Quist and Hubert 2005). At the Forest level, the impacts from this alternative would not reduce the level at which Colorado River cutthroat trout or their habitat would be well-distributed across the planning area. As a result, the alternative **"may impact individuals and habitat but would not contribute to a trend toward listing".**

Yellowstone/Snake River Fine-spotted Cutthroat Trout

Alternative 3 would have some, although limited, risk of cattle trampling of Yellowstone/Snake River fine-spotted cutthroat trout redds. The majority of the Yellowstone/Snake River fine-spotted cutthroat trout habitat is found in the Fish Creek Pasture, which is grazed July 15th to September 15th each year. Since cutthroat trout fry emergence occurs in late July or early August, there would be a short window of temporal overlap between livestock grazing and egg incubation.

Similarly to Colorado River cutthroat trout, this alternative would result in continued impacts to stream habitat associated with livestock crossings, watering areas, and riparian grazing. Limiting the grazing intensity would moderate these effects and lead to overall maintenance of function stream and riparian conditions and recovery of degraded conditions. Both the Fish Creek focus area and Strawberry Creek would have minimum 6-inch stubble height requirements, which will result in limited grazing intensity in these riparian areas. As a result of the broad restrictions to grazing intensity and the proposed improvements near focus areas, fisheries habitat would improve from existing conditions. The population dynamics between Yellowstone/Snake River fine-spotted cutthroat trout and brook trout in these streams has not been evaluated, so a trend in these local Yellowstone/Snake River fine-spotted cutthroat trout populations is not known. However, since this alternative would maintain or improve habitat conditions, the project would not reduce the level at which Yellowstone/Snake River fine-spotted cutthroat trout or their habitat would be well-represented or well-distributed on the Forest. As a result, the alternative **"may impact individuals and habitat, but would not contribute to a trend toward listing"**.

Rainbow Trout

Within the project area, rainbow trout are found in the Green River and in the lowest segments of some of the tributaries. The reaches of the Green River above the river bend have low natural productivity and very little natural recruitment, so this has historically been maintained with stocking. There is some rainbow trout spawning in the lower reaches of the tributaries to the Green River. Alternative 3 is expected to maintain or reduce the level of fine sediment in these stream segments, which could have a minor beneficial effect to egg and fry survival of rainbow trout.

Cumulative Effects

See discussion of Cumulative Effects Common to All Action Alternatives under Alternative 2.

Ability to Address Issues

Issue #1- Effects on Threatened, Endangered, and Sensitive Species, as well as Other Species of Concern. Determination: The project as described in Alternative 3 **"may impact individuals or habitat but will not likely contribute to a trend towards federal listing or loss of viability to the population or species of Colorado River cutthroat trout, Yellowstone/Snake River cutthroat trout, and rainbow trout species"** (management indicator species); AND **"is not likely to adversely affect or adversely modify proposed critical habitat for the endangered Kendall Warm Springs dace".**

Alternative 4 – Modified Grazing Management with Riparian Emphasis

Direct and Indirect Effects by Indicator

Riparian Condition

The types of effects of Alternative 4 to riparian condition are similar to Alternatives 2 and 3; however, the management elements included in Alternative 3 to reduce impacts to riparian areas are included also in this alternative as well as a maximum utilization of 35 percent in most riparian areas (some areas would maintain a maximum riparian utilization of 50 percent), which would modify the level of effects to fisheries, riparian areas, and aquatic ecosystems. Livestock grazing under this alternative would negatively affect some aspects of watershed and riparian conditions. Grazing livestock would impact streamside vegetation resulting in erosion and reduced stream shading in some locations. Physical alteration of stream banks from livestock trampling would occur where capable grazing areas overlapped with streams. Across the project, there is a limit that would require a pasture move before riparian vegetation along the greenline of streams was grazed below 4-inche average greenline stubble height. In some cases, where resource problems have been identified, this alternative limits those impacts based on site specific designs including bank alteration limits, 6-inch minimum for average greenline stubble heights, or livestock exclusion fences. In addition, if desired conditions are not met, adaptive management is in place to reduce impacts by reducing utilization levels.

The types of effects of Alternative 4 to fisheries habitat are similar to Alternatives 2 and 3, including livestock impacts to bank stability, riparian canopy cover, stream temperature, and fine sediment deposition in stream, but there are a number of design features in Alternatives 3 and 4 that are intended to reduce those impacts. The effects of this alternative will be compared to the effects of Alternatives 2 and 3 and the No Action Alternative and will refer to the literature summary on the effects of grazing intensity on riparian areas detailed in the effects analysis of Alternative 2.

Under this alternative, grazing across the project area would be limited to 50 percent utilization in the uplands, and there would be a minimum average greenline stubble height requirement of 4-inches. Clary and Webster (1989) recommend that a minimum of 4-inch greenline stubble height should be left on all streams, regardless of the grazing system, to help maintain riparian plant vigor and help prevent other impacts to

streams that are caused by grazing riparian areas too intensively. Clary (1999) found that most measures of habitat variables important for salmonids moved closer to desirable conditions with 4-inch greenline stubble height and virtually all measures improved with 6-inch greenline stubble height. Livestock grazing preference has been found to switch from herbaceous to woody vegetation at or below 3-inch greenline stubble height, so a 4-inch minimum would result in minimal woody species browse (Hall and Bryant 1995). Clary (1995) found that grazing intensities up to 50 percent utilization resulted in improving riparian trends on streams that had been subjected to heavy grazing historically. Based on this literature, it appears that 4-inch minimum greenline stubble height and 35-50 percent maximum utilization would be sufficient to maintain conditions in stream and riparian areas that are in high ecological status, which is the case across most of the project area, and in most cases would even result in improving trends in condition in locations that are impaired due to historical overgrazing. By limiting riparian utilization to 35 percent across most of the project area (except Wagon Allotment, Noble Pastures Allotment, and Mosquito NW and SW pastures), intensity of livestock use near streams will be lower than Alternative 3 except where greenline stubble height is the initial indicator to trigger moving livestock off of a pasture. As a result, it is expected that there would generally be less impacts to stream and riparian conditions.

Stream Bank Stability

Bank stability, which is generally high across the project area according to the WHAM surveys (see existing conditions), would be expected to remain high in much of the project area. There are many miles of high gradient stream with large substrates and intact riparian willow communities, which are generally resistant to livestock grazing impacts. Sensitive stream reaches, low gradient streams with fine channel and bank substrate that are currently stable would be expected to maintain bank stability at or above the desired conditions for the bank stability by stream type due to the minimum greenline stubble height and maximum riparian utilization limits (Clary and Webster 1989). Because this alternative limits riparian grazing to light or moderate levels, stream-side vegetation would be expected to be maintained sufficiently to hold banks, and bank alteration would generally be expected to be at reasonably low levels. Key MIM sites would be monitored at 3-5 year intervals to ensure that bank stability conditions were being maintained on streams within the project (see monitoring recommendations). Cattle grazing, as prescribed by this alternative, would be expected to have impacts on bank stability in each of the streams with allotments; cattle watering areas, trails crossing streams, and streams near fence lines and roads would continue to be heavily used, which would result in localized areas of bare and eroding soils. However, these trailing and watering impacts would generally be expected to be lighter under this alternative compared to Alternative 2 or Alternative 3 because grazing intensity would be limited by the lower maximum utilization limits in riparian areas. Focus areas with bank stability problems are expected to show improvement under this alternative and adaptive management would be implemented if conditions did not improve. Specifically, Tosi Creek, Tepee Creek, Klondike Creek, Strawberry Creek, and Fish Creek, will have bank stability monitoring and will be expected to improve over the timeframe of the project (see monitoring recommendations).

Fine Sediment

Under Alternative 4, livestock impacts would continue to cause erosion that would contribute to the level of fine sediment in streams; however, fine sediment delivery to streams would be expected to decrease as stream bank conditions improved where they are currently elevated near focus areas. Since bank stability is expected to be maintained where it is at acceptable levels, or improved in the focus areas with below desired conditions, erosion and fine sediment deposition are expected to decrease under this alternative. As with Alternatives 2 and 3, there will continue to be areas with low ground cover associated with livestock trails, watering areas, and near fence lines. This alternative would result in the lowest contribution of fine sediment to streams as compared to all other alternatives except Alternative 1- the No Action Alternative.

Stream Temperature

This alternative implements minimum greenline stubble height and riparian utilization limits that will help leave some herbaceous vegetation mats immediately adjacent to streams and reduce the likelihood that livestock will substantially browse willows and other woody vegetation. As a result, streams should be able to maintain undercut banks in many locations and sedge and willow canopies will continue to contribute shade to the stream. While livestock grazing under this alternative will have some impacts on stream-shading canopy, the streams would be expected to receive as much or more shade under this alternative as the existing conditions. As a result, stream temperature conditions are expected to maintain or improve relative to the existing conditions. In the long-term, stream temperatures are expected to rise under predicted global climate change scenarios, and this alternative would provide moderate to high resiliency to those climate-level impacts.

Direct and Indirect Effects by Fish Species

Determination

The project as described in Alternative 4 "**may impact individuals or habitat. but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species of Colorado River cutthroat trout, Yellowstone/ Snake River cutthroat trout, and MIS rainbow trout species**"; AND "**is not likely to adversely affect or adversely modify proposed critical habitat of the Endangered Kendall Warm Springs dace**".

Kendall Warm Springs Dace

See the Effects Common to All Action Alternatives (Alternatives 2, 3 and 4) section.

Colorado River Cutthroat Trout

Direct effects of cattle trampling Colorado River cutthroat trout redds would be similar under this alternative as compared to Alternative 2 and Alternative 3, but the extent of the effects would be reduced because of the lower utilization and added greenline stubble height requirements which would reduce grazing intensity in the riparian area. As described in the effects of Alternative 3, changes to grazing strategies in some allotments or rotations would result in changes in the timing during which livestock would have access to streams with cutthroat redds as compared to Alternative 2.

This alternative would have some impact on Colorado River cutthroat trout habitat which has experienced damage to stream channels and banks from trailing and watering areas, increased fine sediment deposition, and decreased stream shade from riparian vegetation. However, the design features in place for this alternative, including maximum riparian forage utilization, minimum greenline stubble heights, site-specific management elements and structural improvements at focus areas, and adaptive management, would help ensure that stream habitat and riparian conditions are maintained in high ecological condition or trend toward improved conditions where conditions are currently less than satisfactory. Although the alternative would impact stream and riparian areas greater than the No Action Alternative, those impacts would be modestly less than Alternative 3 and substantially less than Alternative 2.

Because this alternative would generally maintain or improve existing fisheries habitat conditions, but would have some direct effects and would cause some continuing habitat disturbance and impacts, the alternative would impact individuals and habitat but would not contribute to a decline in populations within the project area. Because most of the Colorado River cutthroat trout populations within the project area are being invaded by brook trout and are currently believed to be in decline, the improvements in the habitat are unlikely to have a substantial effect on the population density or distribution of the species (Quist and Hubert 2005). At the Forest level, the impacts from this alternative would not reduce the level at which Colorado

River cutthroat trout or their habitat would be well-distributed across the planning area. As a result, Alternative 4 **"may impact individuals and habitat but would not contribute to a trend toward listing".**

Yellowstone/Snake River Fine-spotted Cutthroat Trout

This alternative would have some, although limited, risk of cattle trampling Yellowstone cutthroat trout redds. The majority of the Yellowstone cutthroat trout habitat is found in the Fish Creek Pasture, which is grazed July 15th to Sept 15th each year. Since cutthroat trout fry emergence occurs in late July or early August, there would be only a short window of temporal overlap between livestock grazing and egg incubation.

Similarly to Colorado River cutthroat trout, this alternative would result in continued impacts to stream habitat associated with livestock crossings, watering areas, and riparian grazing. Reducing maximum riparian utilization would reduce these effects compared to the other action alternatives and lead to overall maintenance of stream function and riparian conditions and recovery of degraded conditions. Both the Fish Creek focus area and Strawberry Creek would have minimum 6-inch greenline stubble height requirements, which may result in further limiting grazing intensity in these riparian areas. As a result of the broad restrictions to grazing intensity and the proposed management near focus areas, fisheries habitat would improve from existing conditions. However, since this alternative would maintain or improve habitat conditions for Yellowstone cutthroat trout, the project would not reduce the level at which Yellowstone cutthroat trout or their habitat would be well-represented or well-distributed on the Forest. As a result, Alternative 4 **"may impact individuals and habitat, but would not contribute to a trend toward listing"**.

Rainbow Trout

Within the project area, rainbow trout are found in the Green River and in the lowest segments of some of the tributaries. The reaches of the Green River above the river bend have low natural productivity and very little natural recruitment, so this has historically been maintained with stocking. There is some rainbow trout spawning in the lower reaches of the tributaries to the Green River. Alternative 4 may eventually be expected to maintain or reduce the level of fine sediment in these stream segments, which could have a **minor beneficial effect** to egg and fry survival of rainbow trout.

Cumulative Effects

See discussion of Cumulative Effects Common to All Action Alternatives under Alternative 2.

Ability to Address Issues

Issue #1- Effects on Threatened, Endangered, and Sensitive Species, as well as Other Species of Concern. Determination: The project as described in Alternative 4 **"may impact individuals or habitat but will not likely contribute to a trend towards federal listing or loss of viability to the population or species of Colorado River cutthroat trout, Yellowstone/Snake River cutthroat trout, and rainbow trout species"** (management indicator species); AND **"is not likely to adversely affect or adversely modify proposed critical habitat for the endangered Kendall Warm Springs dace".**

Wildlife

Several supplemental wildlife specialist reports (Murphy 2016, Roberts 2016, DeLong, A. 2015, Wilmot 2015, DeLong, D. 2016, and Egan 2015) collectively address the existing conditions and the environmental effects of each alternative for the Upper Green River Area Rangeland Project on threatened, endangered, sensitive, management indicator, and migratory bird species. The best available science was used in the identification of species present in the project area and of potential effects. The information provided in this Wildlife section was summarized from these reports. Adaptive management was referred to as "progressive design features" in the supplemental wildlife specialist reports. The term "progressive design features" is synonymous with "adaptive management" in this document and is described in this DEIS beginning on page 71 and 112 for Alternatives 3 and 4, respectively.

Federally listed species and their critical habitats in Sublette County, Wyoming appeared on the U. S. Fish and Wildlife Service's May, 2015 list of federally listed animals and critical habitats. The Forest Service objective (FSM 2670.21) for threatened and endangered species management is to manage National Forest System habitats and activities for threatened and endangered species to achieve recovery objectives so that special protection measures provided under the Endangered Species Act are no longer necessary. Federally listed species and/or critical habitat in the Upper Green River project area are the grizzly bear, gray wolf, Canada lynx and Canada lynx critical habitat.

Sensitive species are defined by the Regional Forester as those plant and animal species for which population viability is a concern, as evidenced by a (1) significant current, or predicted, downward trend in population numbers or density; or (2) significant current or predicted, downward trend in habitat capability that would reduce a species' existing distribution (FSM 2670.5). The Forest Service objective (FSM 2670.22) for sensitive species management is to 1) develop and implement management practices to ensure that species do not become threatened or endangered because of Forest Service actions; 2) maintain viable populations of all native and desired nonnative wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System lands; and 3) develop and implement management objectives for populations and/or habitat of sensitive species.

Management indicator species are any species, group of species, or species habitat element selected to focus management attention for the purpose of resource production, population recovery, maintenance of population viability, or ecosystem diversity (FSM 2605). Thus, population changes of management indicator species are believed to indicate the effects of management activities (36 CFR 219.19). Maintaining habitat for viable populations of management indicator species is identified in management prescription for numerous Desired Future Condition areas on the Forest, including most in the project area (U.S. Forest Service 1990). There are 23 management indicators on the Forest, including seven mammals, four birds, three fish, two amphibians, and seven plants. Several management indicator species are found in the project area.

The wildlife biologists analyzed pertinent wildlife species that occurred in the project area and were identified as a threatened or endangered species by the U.S. Fish and Wildlife Service, a sensitive species as determined by Intermountain Region (Region 4) of the Forest Service (2015), a management indicator species as determined by the Forest Plan (U.S. Forest Service 1990) or migratory birds as determined by the Migratory Bird Treaty Act (1918) (16 U.S.C. 703-712).

The wildlife analyses summarized in this DEIS were conducted to: 1) determine whether the actions of each alternative would jeopardize the continued existence or cause adverse modification of habitat for endangered or threatened species and their listed critical habitat; and 2) determine whether the actions of each alternative would contribute to any sensitive species becoming or trending towards federal listing as threatened or endangered or contribute to a loss of viable populations throughout their range on the Bridger-Teton National

Forest. Management indicator species were analyzed to indicate the effects of the alternatives population trends, population viability and the condition of habitats at the project and Forest scale. Likewise, the effects of the alternatives on migratory birds and their habitats were also evaluated.

Overview of Issues Addressed

Issue 1: Effects on threatened, endangered, and sensitive species (TES), as well as other species of interest

The concern is that livestock grazing may affect the recovery of threatened, endangered, proposed, and sensitive species, in addition to viability and habitat of other species in the project area. The Forest Plan provides direction for threatened, endangered, sensitive species and management indicator species. Species conservation is directed by laws, regulations, and policies.

The subsequent wildlife section presents the existing conditions and the environmental effects (direct, indirect and cumulative effects) of each alternative by wildlife species or group of species. Indicators used to compare alternatives are identified by species. In addition, each alternative is evaluated on its ability to comply with the Forest Plan and other relevant laws, regulations, policies and plans.

The Forest Plan's Desired Future Condition (DFC) 10 and 12 comprises 84 percent of the project area. The management emphasis of DFC 10 is to "provide long-term and short-term habitat to meet the needs of wildlife managed in balance with timber harvest, grazing, and minerals development" (U.S. Forest Service 1990, p. 235). The management emphasis for DFC 12 is "on providing such important habitat as winter ranges, feedgrounds, calving areas, and security areas" (U.S. Forest Service 1990, p. 242). As defined in Forest Plan, Management Prescriptions are a "set of land and resource management policies that, as expressed through standards and guidelines, creates a Desired Future Condition over time" (U.S. Forest Service 1990, p. 3). It is the resource prescriptions, standards, and guidelines for each DFC in the project area that provides the operational direction for resource management.

Table 27 presents threatened, endangered, sensitive species, and management indicator species, as well as other species of interest that were considered for analysis and identifies which species was carried forward for further analysis.

Table 27. Wildlife species considered for analysis

Species	Status	Species' Presence in project area	Habitat present	Habitat/Comments
Grizzly bear (*Ursus arctos horribilis*)	Threatened; Bridger-Teton T & E Management Indicator	Present	Yes	Present; carried forward for further analysis. (Murphy 2016)
Gray wolf (*Canis lupus*)	Experimental, non-essential, Sensitive	Present	Yes	Present; carried forward for further analysis. (Murphy 2016)
Canada lynx (*Lynx Canadensis*)	Threatened	Present	Yes	Present; carried forward for further analysis. (Murphy 2016)
Canada lynx critical habitat	Designated	Present	Yes	Present; carried forward for further analysis. (Murphy 2016)
Yellow-billed cuckoo (*Coccyzus americanus)*	Threatened	Not known to occur	No	Not known to occur in the project area. The principal habitat of this species, mature cottonwood stands > 50 acres in size and with dense deciduous understories, does not occur in the project area. The alternatives would have no impact on this species. Not carried forward for further analysis. (Murphy 2016)
Yellow-billed cuckoo critical habitat	Proposed	Not proposed for the project area		The alternatives would have no impact on this species' proposed critical habitat. Not carried forward for further analysis. (Murphy 2016)
Piping plover (*Charadrius melodus*)	Threatened	Does not occur	No	This species and its habitat do not occur in Wyoming. The alternatives would have no impact on this species. Further analysis is unwarranted. The alternatives would have no impact on this species. Further analysis is unwarranted. (Murphy 2016)
Least tern (*Sternula antillarum*)	Endangered	Does not occur	No	This species and its habitat do not occur in Wyoming. The alternatives would have no impact on this species. Further analysis is unwarranted. (Murphy 2016)
Whooping crane (*Grus americana*)	Experimental, non-essential; Bridger-Teton T & E Management Indicator l;	Not known to occur	Yes	Considered extirpated in Wyoming. The alternatives would have no impact on this species. Further analysis is unwarranted. (Murphy 2016)

Species	Status	Species' Presence in project area	Habitat present	Habitat/Comments
Columbia spotted frog (*Rana luteiuentris*)	Sensitive	Present	Yes	Habitat primarily includes oxbow ponds (without fish) with emergent sedges located in wet meadows at the edge of lodgepole pine forests. Occupied spotted frog habitat is present in the project area. Carried forward for further analysis. (Murphy 2016)
Boreal toad (*Anaxyrus boreas*)	Sensitive & Management Indicator Species	Present	Yes	Boreal toads occupy montane forest habitats between 7,000' and 12,000' elevation. Requires breeding ponds, summer range, and winter refugia. This species is present within the project area. Carried forward for further analysis. (Murphy 2016)
Boreal chorus frog (*Pseudacris triseriata*)	Management Indicator Species	Present	Yes	This species inhabits small streams and non-flowing bodies of water, such as marshes, ponds, and small lakes. This species is present in the project area. Carried forward for further analysis below.
Greater sage-grouse (*Centrocercus urophasianus*)	Sensitive	Present	Yes	This species is dependent on widespread areas of sagebrush habitats. Greater Sage-grouse nesting and brood-rearing habitat is present within the project area. Carried forward for further analysis. (A. DeLong 2015)
Trumpeter swan (*Cyngnus buccinator*)	Sensitive	Present	Yes	They nest on a wide variety of freshwater ponds, lakes and occasionally rivers, and prefer areas with abundant and diverse communities of aquatic plants. Swan nesting/foraging habitat is present in the project area. Carried forward for further analysis. (Roberts 2016)
Bald eagle (*Haliaeetus leucocephalus*)	Recovered, Sensitive & MIS. Bird of Conservation Concern	Present	Yes	This species requires nesting trees/platforms near large rivers or lakes and available fish and water bird species prey. Nesting habitat and foraging habitat is present in project area; cattle grazing potentially affects habitat for fish, a primary bald eagle prey. Carried forward for further analysis. (Roberts 2016)
American peregrine falcon (*Falco peregrinus anatum*)	Recovered, Sensitive & MIS. Bird of Conservation Concern	Present	Yes	Nesting requirements include vertical cliff habitat with large potholes or ledges that are inaccessible to land predators and are preferentially located near habitat that has a high avian prey population such as wetlands, large bodies of water, or rivers. Cliff nesting/roosting habitat is present near the project area. Cattle grazing potentially affects the habitat of many passerine birds, primary prey for peregrine falcons. Carried forward for further analysis. (Roberts 2016)
Great gray owl (*Strix nebulosa*)	Sensitive	Likely present	Yes	This species has been found to prefer mature or old growth Douglas fir forest on flat ground for nesting, but it is generally associated with the lodgepole pine/ Douglas fir/aspen forest zone. This project area contains potential nesting and foraging habitat. Cattle grazing potentially affects the habitat of meadow voles and pocket gophers, primary prey of great gray owls. Carried forward for further analysis. (Roberts 2016)

Species	Status	Species' Presence in project area	Habitat present	Habitat/Comments
Northern goshawk (*Accipiter gentilis*)	Sensitive	Known	Yes	This species prefers mature forests with large trees, relatively closed canopies, and open understories for nesting, diverse habitat conditions for foraging. Habitat exists in the project area. Cattle grazing potentially affects the habitat of birds and small mammals that serve as prey for goshawks. Carried forward for further analysis. (Roberts 2016)
Boreal owl (*Aegolius funereus*)	Sensitive	Suspected	Yes	This species inhabits large expanses of contiguous forests that are typically structurally complex Engelmann spruce/ subalpine fir habitats and adjacent transition forest; with the mean stand size of 538 hectares. This habitat is available in the project area; however, cattle utilization typically does not overlap with their preferred habitat type. Therefore, alternatives would have No Impact on this species. Not carried forward for further analysis. (Murphy 2016)
Flammulated owl (*Otus flammeolus*)	Sensitive	Not Suspected	Yes	This species is most commonly associated with ponderosa pine forests, but is sometimes found in Douglas fir stands mixed with aspen. Flammulated owls prefer to forage in open and semi-open forest, small openings, and the edges of meadows. There is potential habitat in the project area; however, they are not known in this part of Wyoming and cattle utilization typically does not overlap with their preferred habitat type. Therefore, the alternatives would have No Impact on this species. Not carried forward for further analysis. (Murphy 2016)
North American Wolverine (*Gulo gulo*)	Sensitive Proposed	Present	Yes	Tracks detected in 2013 and 2014, and photos taken at a camera site in Tosi Creek during winter 2015. Carried forward for further analysis; see wildlife specialist report for wolverines, swans, and raptors.
Three-toed woodpecker (Picoides tridactylus)	Sensitive	Present	Yes	Habitats consisting of recent beetle-killed conifers are present in the project area. This species is known to be present in the area; however, cattle utilization typically does not overlap with their preferred habitat type. Therefore, the alternatives would have No Impact on this species. Not carried forward for further analysis. (Murphy 2016)
Harlequin duck (*Histronicus histronicus*)	Sensitive	Suspected	Yes	Nesting habitat includes very low gradient streams with dense shrubs, braided channels, swift currents, and water with abundant aquatic insects. This habitat is present in the project area; however, cattle utilization typically does not overlap with their preferred habitat type. Therefore, the alternatives would have No Impact on this species. Not carried forward for further analysis. (Murphy 2016)
Common loon (*Gavia immer*)	Sensitive	Suspected	Yes	Breeding habitat includes secluded lakes more than 10 acres in size between 6000 and 8,000 feet and that have clear water with a high fish population. Some lakes are present in the project area; however, cattle utilization typically does not overlap with their preferred habitat type. Therefore, the alternatives would have No Impact on this species. Not carried forward for further analysis. (Murphy 2016)

Species	Status	Species' Presence in project area	Habitat present	Habitat/Comments
Bighorn sheep (*Ovis canadensis*)	Sensitive & Management Indicator Species - Ecological (High mountain meadow)	Present	Yes	This species prefers to graze in open grasslands and forb-lands near rocky, precipitous escape terrain. Spatial overlap between capable cattle range and modeled (potential) summer and occupied bighorn sheep range was negligible (926 acres and 1,000 acres, respectively; 1% of capable). Similarly, overlap between capable cattle range and crucial (winter and other critical habitats) bighorn sheep range identified by the Wyoming Game and Fish Department was also negligible (51 acres). Areas of potential overlap between cattle and bighorn sheep range are all at high elevations and support no concentrated livestock use, no low-elevation riparian, and no fences. Therefore, the alternatives would have No Impact on this species. Not carried forward for further analysis. (Murphy 2016)
Fisher (*Martes pennanti*)	Sensitive	Not Suspected	Yes	This species prefers extensive, mature to old-growth spruce-fir forests with high levels of canopy closure. This species has not been documented in the project area. Little suitable habitat for fisher is present. Cattle typically do not use preferred habitats of this carnivore. Therefore, the alternatives would have No Impact on this species. Not carried forward for further analysis. (Murphy 2016)
Spotted bat (*Euderma maculatum)*	Sensitive	Not Suspected	No	This species occupies desert to montane habitats. In Wyoming, spotted bats typically occur below 4,000 feet. Spotted bats primarily. Steep, high cliffs are the preferred roosting habitat that does not occur in the project area. Therefore, the alternatives would have No Impact on this species. Not carried forward for further analysis. (Murphy 2016)
Western big-eared bat (*Corynorhinus townsendii*)	Sensitive	Not Suspected	Yes	Occupies a diversity of habitats and uses caves and abandoned mine shafts for day and hibernation roosts. In Wyoming, this species occurs at about 7,000 feet elevation. Habitat is available, but this species has never been recorded in the project area. Therefore, the alternatives would have No Impact on this species. Not carried forward for further analysis. (Murphy 2016)
American marten (*Martes americana*)	Management Indicator Species - Ecological (old-growth)	Present	Yes	Primarily inhabits old-growth coniferous forest dominated by spruce/fir with well-developed understories and abundant coarse woody debris. Cattle do not typically use old growth forest. Cattle capable lands include forests with < 30% canopy cover, stands not well suited to pine marten. Therefore, the alternatives would not have an effect on this species. Not carried forward for further analysis. (Murphy 2016)
Boreal chorus frog (*Pseudacris triseriata*)	Management Indicator Species - Ecological (wetland)	Present	Yes	This species inhabits small streams and non-flowing bodies of water, such as marshes, ponds, and small lakes. This species is present in the project area. Carried forward for further analysis. (Murphy 2016)

Species	Status	Species' Presence in project area	Habitat present	Habitat/Comments
Elk (*Cervus elaphus nelsoni*)	Management Indicator Species - Harvest	Present	Yes	Elk are habitat generalists that summer throughout the Bridger-Teton National Forest (BTNF) and winter at and below the lowest elevations on the Pinedale Ranger District. The project area provides elk habitat. Carried forward for further analysis. (Wilmot 2015)
Mule deer (*Odecoileus hemionus*)	Management Indicator Species - Harvest	Present	Yes	This species is a habitat generalist. Summers throughout the BTNF and winters at and below the lowest elevations on the Pinedale Ranger District. The project area provides habitat. Carried forward for further analysis. (Wilmot 2015)
Moose (*Alces alces shirasi*)	Management Indicator Species - Harvest	Present	Yes	There is year-round habitat for this species on Pinedale Ranger District. It is closely associated with riparian areas. The project area provides habitat. Carried forward for further analysis. (Wilmot 2015)
Pronghorn (*Antilocarpa americana*)	Management Indicator Species - Harvest	Present	Yes	This species prefers low elevation sagebrush and grassland habitats. Habitat exists within the project area, as does a crucial migration corridor. Carried forward for further analysis. (Wilmot 2015)
Brewer's Sparrow (*Spizella breweri breweri*)	Management Indicator Species - Ecological (sagebrush)	Present	Yes	This species prefers sagebrush habitat. Habitat exists within the project area. Carried forward for further analysis. (Egan 2015)
Migratory Birds	Migratory Bird Treaty Act	Present	Yes	Bird species inhabiting willow habitat, meadow and silver sagebrush habitat, upland rangeland habitat, aspen habitat, beaver ponds/other wetlands and/or steams, and conifer forestland habitat were carried forward for further analysis. (D. DeLong 2016)

Methodology and Data Sources

Potential effects on species and their habitats due to livestock grazing, range improvements, and disturbance by cattle or livestock operators, and other grazing-related actions were discussed. For each wildlife species, indicator(s) and management objectives (as appropriate) were identified to gauge the relative effects of each alternative, considering the frequency, intensity, duration, or distribution of effects. Determinations for each alternative were identified as appropriate. Data sources for the wildlife analysis included the 2007 satellite imagery (BTNF 2007 existing vegetation layer), capable and suitable cattle grazing model, grazing utilization plots, wildlife surveys, and riparian habitat surveys such as Multiple Indicator Monitoring measurements.

Incomplete and Unavailable Information

Surveys were not completed for all species to determine the status of populations or habitat in the project area. Sample sizes supporting some population and habitat analyses were limited due to constraints on manpower and resources. Other incomplete and unavailable information is identified by wildlife species.

Grizzly Bear (Ursus arctos) - Threatened and Management Indicator

The grizzly bear section presents the indicators addressed in this analysis, the existing condition, and the environmental effects of each alternative on grizzly bears. Information provided in this section was summarized from the Supplemental Wildlife Specialist Report (Murphy 2016).

Indicators Used for Comparison of Alternatives

- Number of grizzly bear mortalities due to livestock-related control actions

Affected Environment

Legal Status

In 1975, the grizzly bear was listed as threatened in the Yellowstone Ecosystem under the 1973 Endangered Species Act (U.S. Fish and Wildlife Service 2007). Robust population growth, coupled with State and Federal cooperation to manage mortality and habitat, widespread public support for grizzly bear recovery, and the development of regulatory mechanisms enable delisting of the species in the Yellowstone Ecosystem during 2007, and the establishment of the Greater Yellowstone Area Distinct Population Segment (U.S. Fish and Wildlife Service 2007). During September, 2009, a District Court vacated the final delisting rule, and the protections for the species were reinstated (U.S. Fish and Wildlife Service 2010).

Distribution and Occupancy of the Yellowstone Ecosystem

The project area occurs within habitat biologically suitable for grizzly bears and is identified as occupied habitat (Bjornlie et al. 2013), but does not occur within the Recovery Zone identified for the Yellowstone grizzly bear (U.S. Fish and Wildlife Service 1993, Figure 71). The northern portion of the project area is approximately 15 miles southeast of the southern margin of the Recovery Zone located at the southern boundary of the Buffalo Ranger District of Bridger-Teton National Forest. The most recent estimate of the area occupied by grizzly bears in the Yellowstone Ecosystem is 19,413 mi^2 (Bjornlie et al. 2013). Grizzly bears continue to expand outward. Their distribution increased 38 percent from 2004 to 2010, with most expansion in the northern and southern regions.

The supplemented Grizzly Bear Recovery Plan (U.S. Fish and Wildlife Service 2007) identified the following demographic recovery goals for the Greater Yellowstone Grizzly bear population:

- Demographic Recovery Criterion 1: maintain a minimum of 48 females with cubs-of-the-year in the Yellowstone Ecosystem, as measured by the model-averaged Chao2 estimate for that year. The number of females with cubs of the year cannot drop below 48 for any 2 consecutive years.
- Demographic Recovery Criterion 2: 16 of 18 bear management units within the Recovery Zone must be occupied by females with young, with no two adjacent bear management units unoccupied during a 6-year sum of observations. This criterion ensures that reproductive females occupy the majority of the Recovery Zone, rather than merely a portion.
- Demographic Recovery Criterion 3: For independent females (≥2 years of age), the current annual mortality limit, not to be exceeded in two consecutive years and including all sources of mortality, is 9 percent of the total number of independent females. For independent males (≥2 years of age), the current annual mortality limit, not to be exceeded in 3 consecutive years and including all sources of mortality, is 15 percent of the total number of independent males. For dependent young (< 2 years of age), the current annual mortality limit, not to be exceeded in 3 consecutive years and including only known and probable human caused mortalities, is 9 percent of the total number of dependent young.

In 2013, the revised demographic criteria (U.S. Fish and Wildlife Service 2007) were proposed for updates (U.S. Fish and Wildlife Service 2013b) as follows:

1. Update Criterion 1 to reflect the demographic goal of maintaining a minimum population size of 500 animals and at least 48 females with cubs, and eliminate the criterion's dependence on a specific method (e.g., Chao2) to rapidly implement improved scientific methods as they become available in the peer reviewed literature.

2. Update Demographic Criterion 3 to require sustainable mortality rates (i.e., rates that will avoid population declines). Instead of specifying what the sustainable mortality rates for independent females, independent males, and dependent young, rates would be calculated by the Interagency Grizzly Bear Study Team and modified as warranted by new data. In order to demonstrate how this will be objective and measurable, as of 2012, the sustainable mortality limit for independent females was 7.6 percent, while the limits for independent males and dependent young were 15 percent and 7.6 percent, respectively.

3. Designate a Demographic Monitoring Area within which all demographic criteria are assessed. This requires a revision of the area within which mortalities are counted against the mortality limits for independent females, males, and dependent young so the area where population size is estimated is the same area where mortalities are counted. This means the Interagency Grizzly Bear Study Team would no longer count mortalities of bears against sustainable mortality limits in areas outside the Demographic Monitoring Area. Conversely, in this approach bears observed outside this Monitoring Area it would not count toward estimates of population size.

These demographic criteria were proposed for the area defined as the "Demographic Monitoring Area", previously areas within a biologically suitable polygon for grizzly bears identified by the U.S. Fish and Wildlife Service, with minor modifications. The project area lies within the Demographic Monitoring Area and within occupied habitat (Bjornlie et al. 2013), but outside the Recovery Zone (Figure 71). However, collared animals that use the Recovery Zone may also use the project area (Tables 11 and 12), along with un-collared individuals.

Since 2007, the Revised and Updated-Revised Demographic Criteria #1 and #2 (above) were met every year. From 2007 to 2011, mortality limits (Criteria #3) were intermittently exceeded for independent females and males. During 2012 and 2013, mortality was exceeded under current limits for independent males in 2012, but the population otherwise met all other current and proposed limits.

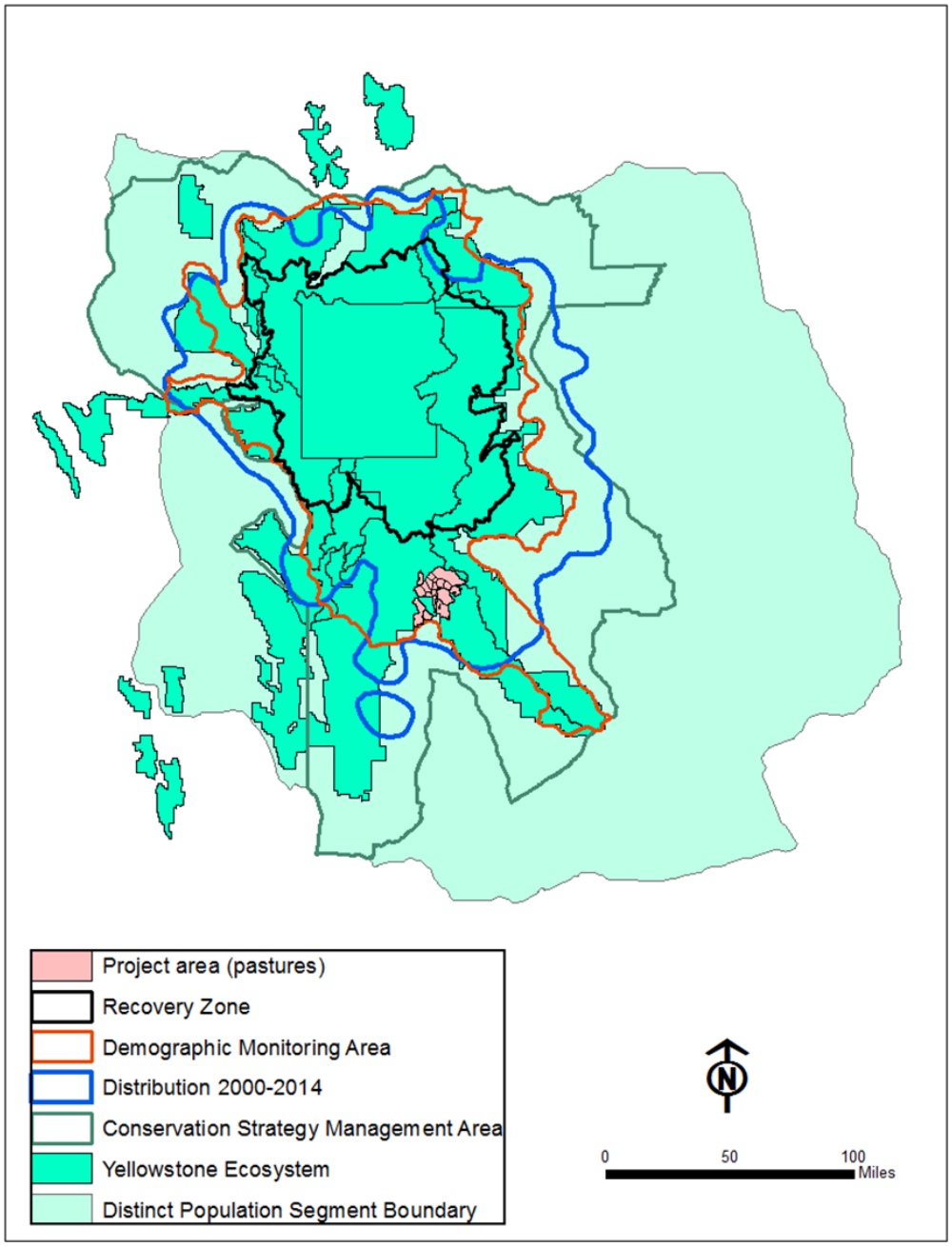

Figure 71. Habitat boundaries for grizzly bears in the Yellowstone Ecosystem

Grizzly Bear-Human Conflicts in the Yellowstone Ecosystem and Western Wyoming

Grizzly bear conservation depends upon the successful management of grizzly bear-human interactions. Humans are the primary cause of death among grizzly bears in the Yellowstone Ecosystem, the case for most grizzly bear populations (Schwartz et al. 2010). Bear removal by wildlife managers or killing by humans for other reasons (e.g., big game hunters) is common. Human presence can limit the bear's use of its habitat, create bear tolerance of humans that leads to a risk of bear mortality, and can attract bears to unnatural or unsecured food sources, increasing the risk of food conditioning to unnatural foods and eventually to conflict with humans.

Grizzly bear-human conflicts include incidents where grizzly bears injure people, damage property, or kill or injure livestock. All conflicts reported to state and federal agencies are entered into state databases and complied annually by Yellowstone National Park and reported in the Interagency Grizzly Bear Study Team Annual Report.

The frequency of grizzly bear-human conflicts is inversely associated with the abundance of natural bear foods (Gunther et al. 2004). When native bear foods are abundant, there tend to be few grizzly bear-human conflicts involving property damage and anthropogenic foods. When native bear foods are scarce, incidents of grizzly bears damaging property and obtaining anthropogenic foods increase, especially during late summer and fall when bears are hyperphagic (Gunther et al. 2004). However, livestock depredations tend to occur independently of the availability of natural bear foods. Where cattle and sheep are available, some grizzly bears will prey on them regardless of the abundance of natural foods. Historically, numbers of grizzly bear-human conflicts and management actions tend to decrease during years with good white bark pine cone production (Haroldson and Podruzny 2010). There is an increase in hunter-grizzly bear conflicts and mortalities in poor seed years.

Sources of grizzly bear-human conflicts in Western Wyoming are similar to those in the Yellowstone Ecosystem. Property damage, orchards, and improperly stored human foods (garbage) are leading sources of interactions. However, livestock depredation by grizzly bears, primarily on cattle, are a major and increasingly important (since 2010) source of conflict in Western Wyoming (Interagency Grizzly Bear Study Team 2014). Conflicts due to sources other than cattle are widely distributed throughout grizzly bear range in Western Wyoming, but are concentrated along major rivers such as the North and South Forks of the Shoshone, the Clark Fork of the Yellowstone, the Upper Wind, and Upper Green Rivers. Conflicts stemming from cattle management are similarly distributed, but most frequent in the Upper Green, Wind River, and Owl Creek watersheds.

In 2012, conflicts in Western Wyoming outside of the Recovery Zone comprised the majority (87 percent) of incidents, and they occurred on private lands (49 percent) at similar rates to those on lands administered by the State or Federal government (51 percent) (DeBolt et al. 2013). Several grizzly bears were trapped in conflict situations far from occupied habitat, and up to 76 miles from the Grizzly Bear Recovery Zone (DeBolt et al. 2013). The majority of conflicts on Forest Service lands occurred on the Bridger-Teton National Forest, including the Upper Green River watershed (livestock depredation).

Grizzly Bear Mortality in the Yellowstone Ecosystem and Western Wyoming

During 2012, 55 known or probable grizzly bear mortalities were documented in the ecosystem (Haroldson and Frye 2013); 7 (21 percent) were associated with livestock depredation. Twelve grizzly bear deaths occurred on the Bridger-Teton National Forest. Among the 10 human-caused losses, 4 (40 percent) were directly or indirectly related to self-defense, 3 (30 percent) were associated with livestock depredation, and 3 (30 percent) were due to defense of property. Two natural mortalities were recorded. Losses associated with livestock depredation included 1 adult female and 2 adult males (Haroldson and Frye 2013).

During 2013, 29 known or probable grizzly bear mortalities were documented in the Greater Yellowstone Ecosystem, including 1 that occurred in a previous year (Haroldson and Frye 2014). Of 23 human-caused losses, 8 (35 percent) involved management removals due to livestock depredation (2 males and 2 females in the project area), and 2 (9 percent) involved site conflicts. Five (22 percent) losses were caused by hunters, including 1 black bear hunter (mistaken identity) and 4 other hunters acting in self-defense. The remaining human-caused losses were from vehicle strikes (13.0 percent, n = 3), malicious killings (4.3 percent, n = 1), defense of life not associated with hunting (13.0 percent, n = 3), and capture-related mortality (4.3 percent, n = l). Three natural mortalities and 2 deaths due to undetermined causes were documented (Haroldson and Frye 2014).

Trends in numbers of grizzly bear mortalities due to cattle management in Western Wyoming were stable from 2010 to 2014. Among grizzly bear mortalities in Western Wyoming, losses associated with cattle management and hunting-related human self-defense accounted for most known human-caused grizzly bear deaths. Similarly to conflicts, grizzly bear deaths not associated with cattle management were widely distributed throughout Western Wyoming, with most losses occurring along major rivers. Of 27 cattle-related grizzly bear mortalities from 2010 to 2014 in Western Wyoming, 14 (52 percent) occurred in the project area alone.

Grizzly bear conflicts, mortality, and relocations from the project area

Cattle management is by far the most significant source of grizzly-bear human conflicts and grizzly bear deaths on the project area (Table 28; U.S. Forest Service 2010). Among cattle-related grizzly bear deaths from 2010 to 2014, nearly all were due to management removals by Wyoming. During the five grazing seasons, 10 male and 4 female grizzly bears were removed from the project area as a result of conflicts with livestock. In addition, 1 death occurred when a camper shot a grizzly bear in self-defense that had been feeding on the domestic calf (cattle) killed by wolves. A total of 5 other grizzly bears died in the project area during this period, including 3 in cases of human self-defense.

Table 28. Number of grizzly bear mortalities on the Upper Green River project area from 2010-2014

Source of grizzly bear mortality	2010	2011	2012	2013	2014
Cattle-related	1	4	3	4	2
Self defense	1	1	1		
Natural, unknown		1		1	

Nearly all conflicts and grizzly bear deaths in the project area, including those associated cattle management, occurred in the Upper Green River livestock allotment, and occurred near open roads. Conflicts typically increased from June to August, then declined to October, suggesting that offending bears were removed and not quickly replaced by new bears that preyed on livestock (U.S. Forest Service 2013, Anderson et al. 2002). A more in-depth summary of cattle-grizzly bear interactions in the project area, and other domestic sheep and cattle allotments nearby is provided in U.S. Forest Service 2014 (biological assessment) and U.S. Fish and Wildlife Service 2014 (biological opinion).

Eighteen grizzly bears were relocated from the project area from 2010–2014. All relocations were due to cattle depredation. With two exceptions (Grand Teton National Park, Caribou-Targhee National Forest), all relocations were to release sites directly west or northwest of Cody, Wyoming, a city approximately 92 miles north of the project area. Of the 18 bears, three returned to the project area and were removed due to conflicts related to livestock.

Habitat Conditions for Grizzly Beas in the Project Area

The project area provides abundant and widely distributed food and cover for grizzly bears during the late spring, summer, and fall. Offspring of elk, moose, mule deer, and pronghorn are preyed upon. When present (June to October), cattle and sheep (adjacent allotments) are taken and provide carrion as well. Ants and roots and tubers of yampa and biscuitroot are other important foods (Interagency Grizzly Bear Study Team 2013). The Green River and the lower reaches of its tributaries flow through open valleys and support well-developed willow riparian communities with abundant herbaceous vegetation (forbs, grasses, sedges) eaten by bears. The bottomlands in the project area also support dense patches of conifers available as bedding and security habitat. Seeds of whitebark pine are an important food source for grizzly bears in the Yellowstone

Ecosystem (Gunther et al. 2014). Almost 15,000 acres of whitebark pine grows in pure and mixed stands at high elevations throughout the project area (Johnson 2014).

The project area is distant from large human population centers (about 30 road miles from Pinedale, Wyoming), supports few roads that are in good condition, and supports little recreational activity during the late spring and summer outside of the Green River corridor (campgrounds, dispersed camping, fishing). These factors reduce human-caused disturbance to grizzly bears and limit human-grizzly bear conflicts. During late summer and fall, the potential for surprise encounters with grizzly bears and the potential for conflicts triggered by poor food storage increase due to an influx of big game hunters.

Secure Grizzly Bear Habitat in the Project Area

The availability of habitat that is secure from human disturbance (> 500 m from a physically-passable forest system or user-created routes, and other caveats) is an important factor affecting grizzly bear survival in the Yellowstone Ecosystem (Schwartz et al. 2010). Although the Interagency Grizzly Bear Study Team monitors secure bear habitat throughout the ecosystem, national forests are not required to limit the loss of secure habitat to road development or use outside the Recovery Zone, including the project area. However, road management standards in the Bridger-Teton forest plan limit open road density in some Desired Future Condition land areas.

An analysis of grizzly secure habitat in the 2014 Section 7 (Endangered Species Act) consultation area (project allotments and nearby domestic sheep and cattle allotments) based on new road mapping was required by conservation measure # 17 in the 2014 biological assessment for grizzly bears (U.S. Forest Service 2014). During 2013 and 2014 forest staff mapped all system roads, gates, and (illegal) user-created routes on the forest. Grizzly bear secure habitat was calculated and mapped for the consultation area. This area included the project area, 4 adjacent domestic sheep allotments, and 2 cattle allotments to the southeast. Two scenarios of motorized access were evaluated: (1) use of only Forest System roads by all travelers, with no access by Forest personnel behind gated roads for administrative access, and no use of non-system (illegal) user-created routes; and (2) use of all known (mapped) routes, including system roads open to the public, system roads closed to the public (but used by Forest staff), and user-created routes. These two scenarios provided for the least motorized use of roads (scenario 1; maximum secure habitat) and the maximum possible use of routes, both legal and illegal (scenario 2; least secure habitat). The road analysis tool and procedures developed by the Greater Yellowstone Grizzly Bear Habitat Modelling Team (2014) were used for tracking changes in grizzly bear secure habitat.

As expected, the percent of secure habitat available to grizzly bears in the consultation area declined from scenario 1 to scenario 2 because the linear distance of roads available for motorized use increased. The decrease in secure habitat from scenario 1 to 2 ranged from 0 percent in Badger Creek Allotment within the project area and in the Tosi Creek domestic sheep allotment to 16 percent in the Rock Creek domestic sheep allotment. Overall, secure habitat in the consultation area differed only about 7 percent between the two scenarios. The Upper Green River Allotment provided the largest area of secure habitat by virtue of its large size, rather than by an absence of roads and user-created routes.

Female Grizzly Bear Survival in the Project Area

Survival of adult female grizzly bears in the Greater Yellowstone Area is the most important factor influencing population trend (Hovey and McLellan 1996, Eberhardt 2002, and Harris et al. 2006 in Schwartz et al. 2010). Schwartz et al. (2010) used data from radio-marked bears to model annual survival of grizzly bears (1983–2003). They identified landscape features that best accounted for rates of grizzly bear mortalities, mapped differences in grizzly bear survival in the Yellowstone Ecosystem, and demonstrated how their model could identify source and sink habitats. In their model, survival of independent grizzly bears improved as secure habitat and elevation increased, but declined as road density, and number of homes and

site developments increased. Although Schwartz et al. (2010) accounted for cattle-related grizzly bear deaths, modelled differences in survival on the landscape were not explained by the amount of time bears spent on cattle or sheep allotments in the Yellowstone Ecosystem. The survival estimates used in their model were estimated using grizzly bears that were not involved in conflicts. "Conflict" bears were considered a biased subset, and were not used to infer female survival in the population.

Female survival was evaluated for the project area by M. Haroldson, Interagency Grizzly Bear Study Team, based on the analysis of female grizzly bear survival performed by Schwartz et al. (2010). Only the Badger Creek Allotment had mean female survival estimates over 91 percent, a threshold that identified source habitat. Tosi Creek, an adjacent domestic sheep allotment, also showed a mean female survival estimate that exceeded 91 percent. The threshold for source habitat was based on the estimate of sustainable mortality that resulted in increasing population growth for the Yellowstone grizzly bear population. All other allotments (Beaver-Twin, Noble Pastures, Roaring Fork, Wagon Creek, and Upper Green River allotments) were below this threshold, indicating a sink habitat (Schwartz et al. 2010).

Land and Resource Management Plan Direction for Grizzly Bear Habitat Management

Forest-wide grizzly bear recovery objectives are identified in the 1990 Bridger-Teton National Forest Land and Resource Management Plan (U.S. Forest Service 1990):

- Provide suitable and adequate amounts of habitat for recovery of a viable grizzly bear population in the Greater Yellowstone Area as identified in the Grizzly Bear Recovery Plan. Long-term forest habitat management should provide vegetation diversity, approximate natural conditions, and include all successional stages important to the grizzly bear.
- Prevent needless encounters between grizzly bears and people, and prevent grizzly bears from gaining access to attractants such as food and garbage.

The grizzly bear is also a management indicator species. Monitoring requirements include compliance with Interagency Grizzly Bear Guidelines (Interagency Grizzly Bear Committee 1986), including compliance with food storage regulations. Livestock grazing permits in the project area and several other portions of the Forest require implementation of grizzly bear conservation measures and terms and conditions listed in the current biological assessment (U.S. Forest Service 2014) and biological opinion (U.S. Fish and Wildlife Service 2014). These requirements are included as part of all action (grazing) alternatives for the proposed project.

Biological Assessments and Biological Opinions in the Project Area

A detailed history of removals and relocations of grizzly bears associated with livestock grazing is provided in the current and previous biological assessments (U.S. Forest Service 2010, 2013, 2014) and biological opinions (U.S. Fish and Wildlife Service 2011, 2013c, and 2014). The most current biological assessment was completed in March, 2014 (U.S. Forest Service 2014) and subsequently modified by letter in May, 2014 (U.S. Forest Service 2014b). The consultation area was comprised by the six cattle-horse grazing allotments within the project area, four nearby domestic sheep allotments (near the project area), and two other cattle allotments located south-east and adjacent to the project area. The Forest Service re-initiated consultation during 2014 because the anticipated incidental take of grizzly bears due to livestock depredation on the consultation area during the 2013 grazing season closely approached the limits of incidental take provided in the 2013 biological opinion provided by U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service 2013). The incidental take anticipated in the 2013 opinion was 11 grizzly bears within any consecutive three-year period, with the proviso that no more than three bears within a three-year period could be females' greater or equal to two years of age. The biological opinion was valid for a period of five years, beginning at the onset of grazing during spring of 2013. During the 2013 grazing season, four grizzly bears were trapped and lethally removed for livestock depredation within the consultation area, all within the project area. Of

these losses, two were females two years of age or younger. The possibility that a female grizzly bear might be removed during the 2014 grazing season thus prompted the 2014 consultation before onset of grazing. Two male grizzly bears were removed during the 2014 grazing season, and before completion of the 2014 biological assessment provided after formal consultation with the U.S. Fish and Wildlife Service.

The 2014 biological assessment and 2014 modification letter provided a list of non-discretionary conservation measures that were required in annual operating instructions to permittees for Forest Service allotments within the consultation area. These conservation measures would be implemented if any of the grazing alternatives are selected in the record of decision.

In its September, 2014, Biological Opinion, the Service opined that the anticipated take was not likely to jeopardize the continued existence of the grizzly bear. This was in part based on measured population parameters in past years that met established recovery plan levels and grizzly bear mortalities that typically were below threshold levels identified in the recovery plan. In addition to proving an Incidental Take Statement, the Service provided required terms and conditions to be implemented by the Forest Service, and provided optional conservation recommendations as well. Similarly to the conservation measures, the U.S. Fish and Wildlife Service terms and conditions would be implemented as part of all grazing alternatives. Optional conservation recommendations were considered in the Bear-Friendly Alternative, but not analyzed in detail.

Technical Information Request to the Interagency Grizzly Bear Study Team

During April 2014, the Bridger-Teton National Forest asked the Interagency Grizzly Bear Study Team to address numerous questions (below, those directly related to the grizzly bear population) concerning the effects of livestock-related removals in the project area and vicinity on the grizzly bear population in the Yellowstone Ecosystem; on grizzly bear numbers, behavior, and movement in the project area; and, on grizzly bear-livestock relationships. The study team is the primary science team charged with monitoring the grizzly bear population in the Yellowstone Ecosystem and other factors that affect the species' recovery.

<u>Population-related questions for the study team:</u>

1. The current rates of grizzly bear removal (mortality) for livestock predation in the Upper Green River watershed are about 2–4 adult/sub adults per year, including 0–2 adult females annually. At this rate, and given the current female grizzly bear numbers and vital rates for the Ecosystem, would removals in this watershed significantly and negatively affect grizzly bear population growth at the ecosystem scale? Would Demographic Recovery Criteria (using both current and proposed definitions) be met? Or, is the numerical impact of removal of adult females in the watershed just too small to affect the population? We have the same question for all the allotments in the entire Ecosystem; could livestock related grizzly mortalities that occur within all allotments within the Yellowstone Ecosystem as a whole significantly slow population growth rates and tip the (currently-stable) population into negative growth? Could such losses affect whether or not the recovery criteria are achieved?

2. Related to #1 above, Schwartz et al. 2010 did not find that time spent in cattle allotments was a significant factor explaining grizzly bear survival (data 1983-2003) in the Yellowstone Ecosystem. Would this still be true if the analysis was repeated again and included the current rates of grizzly bear losses for the Upper Green River watershed (and other allotments in the ecosystem) where bear mortalities have increased since 2008?

3. Could you provide a table for all recent years that summarizes whether or not the Demographic Recovery Criteria have been achieved, using both the current and proposed criteria definitions?

The Study Team response (Interagency Grizzly Bear Study Team 2014b) addressed all of the Forest's questions to the extent grizzly bear and livestock data were available.

Study team response (abridged summary)

Losses of grizzly bears from the Upper Green River area and from the Greater Yellowstone Ecosystem due to conflicts with livestock contribute to the total mortality within the entire ecosystem. To this end, losses associated with allotments in the ecosystem, together with any other documented mortalities, could result in total estimated mortality that exceeds annual mortality limits, and could negatively affect population growth. The most recent demographic review (Interagency Grizzly Bear Study Team Demographic Workshop Report, Interagency Grizzly Bear Study Team 2012b) indicated that recent (up to, and including data for 2011) levels of mortality in the entire ecosystem were sustainable, although population growth slowed from the period 1983–2001 to 2002–2011. Since the *2007 Demographic Criteria for Ecosystem-wide Mortality Limits* have been in place, they have been exceeded (under criteria in place at the time; Table 3 and its footnotes a and c). They have been exceeded for 4 years for independent-aged (≥2 years old) males and for 3 years for independent females.

Not observing a decline in survival of independent-aged bears from the period of 1983–2001 to 2002–2011, the Study Team hypothesized that slowed population growth resulted primarily from reduced cub and yearling survival. Survival of adult males, the cohort most often involved in cattle depredation, increased during the past decade, and survival of adult females did not change for several decades. Therefore, at the ecosystem level, there was no evidence that changes in any mortality factor, including removals in response to cattle depredation, contributed to a detectable change in survival of independent-aged individuals.

Losses of grizzly bears to removal actions associated with cattle allotments in the ecosystem typically represented a small fraction of female (0–13 percent) and male (0–35 percent) estimated total mortality for the period of 2004 to 2013. Likewise, removal actions in the Upper Green River cattle allotments alone for this period represented only 0–11 percent and 0–12 percent of estimated annual mortality of females and males, respectively.

The number of mortalities associated with livestock depredation increased in the Yellowstone Ecosystem beginning in 2010, particularly outside the Grizzly Bear Recovery Zone, and inside the project area. This change was likely associated with an increase in grizzly bear numbers and range expansion outside the Zone. Female grizzly bear losses from 2011 to 2013 in the Upper Green cattle allotments represented an increased percentage (range 0–11 percent) of estimated total mortality in the ecosystem versus previous years (consistently 0 percent; 2004–2009). Among male grizzly bears in the Upper Green cattle allotments, losses occurred intermittently from 2004 to 2013, and may have increased as a fraction of deaths in ecosystem during the 2010–2013 period (range 2–12 percent) over that of 2004–2009 (0–10 percent).

Environmental Consequences

Effects Indicator, Management Objective, and Threshold of Concern

The effects indicator is livestock-related mortality of grizzly bears, typically removals by the Wyoming Game and Fish Department and U.S. Fish and Wildlife Service in response to cattle depredation. Removals were the most important effect of the grazing alternatives on grizzly bears, and could readily be assessed in context with the population trend for the species' in the Yellowstone Ecosystem. The grizzly bear management objective was to minimize livestock-related grizzly bear mortality. The threshold of concern for the determination was whether or not grizzly bear delisting in the Yellowstone Ecosystem was achievable despite the livestock-related grizzly bear mortality in the project area. Thus, the threshold of concern was linked to the Forest Plan goal of achieving grizzly bear recovery (U.S. Forest Service 1990). This threshold

was applied in the analysis of the direct, indirect, and cumulative effects, and the species as a management indicator.

Alternative 1 – No Livestock Grazing (No Action Alternative)

Direct and Indirect Effects

Indicator 1 – Number of grizzly bear mortalities due to livestock-related control actions: The direct and indirect effects of livestock grazing management on grizzly bears in the project area would be nearly eliminated, at least after grazing permits were phased out. The objective of minimizing livestock-related grizzly bear losses would be achieved. Cattle-related grizzly bear management removals (currently two–four adults; zero–two adult females annually), relocations to other areas of Western Wyoming (currently zero–seven annually), and conflicts and would cease after grazing permits expired. The short-term abundance of grizzly bears in the project area, and in adjacent areas also used by Upper Green River bears (e.g. Gros Ventre and Upper Wind River watersheds), would not be reduced because no grizzly bears would be removed after the two phase out years, except by other sources of grizzly bear-human conflicts. As compared to the three grazing alternatives, Alternative 1 best supports the Forest Plan goal of supporting grizzly bear delisting in the Yellowstone Ecosystem.

Because of the absence of livestock-related grizzly bear mortalities, this alternative would help alleviate the mortality sink for adult female grizzly bears associated with a dearth of secure grizzly bear habitat identified by Interagency Grizzly Bear Study Team (see Female Grizzly Bear Survival in the Project Area, Affected Environment).

Because livestock would be absent, the conservation measures provided in the most current biological assessment (Forest Service) and the terms, conditions and incidental take statement included in the most current biological opinion (U.S. Fish and Wildlife Service) for livestock grazing in the project area would not apply. However, these elements would apply to cattle and domestic sheep allotments outside the project area. Research and monitoring work addressing forest conservation measure # 16 (improve grizzly bear information) would likely continue, at least to the extent necessary to support data needs pertaining to the other (non-project) cattle and sheep allotments in the Upper Green River watershed.

Other effects – Most disturbance-related effects associated with existing livestock management operations such as herding; range improvement work; and use of support vehicles, rider cabins, and facilities would be eliminated. The use of motorized vehicles such as trucks and 4-wheelers to access and remove approximately 62 miles of fence over 10 years would potentially increase human disturbance and displace grizzly bears from fence removal sites. However, this disturbance effect would be minor because work in each area would be very short-term (hours to a few days at most) and would occur only one time over a limited area within the collective allotments. Access to fences would be allowed under supervision of the Pinedale Ranger District, and no damage to vegetation or soils would occur. Once accomplished, the removal of fences would benefit passage of grizzly bears and other wildlife that serve as their prey. The Forest's food storage order would apply to fence workers, and would greatly reduce chances that bears would accidently obtain human food and subsequently be removed to protect human safety or property.

Similarly, removal of water developments, rider cabins, and water crossings could carry temporary disturbance effects.

Because no changes in motorized use of roads is proposed in this alternative, there would be no effects on open or total motorized route densities, or secure grizzly bear habitat, factors that increase grizzly bear mortality risks (Schwartz et al. 2010). Removal of fences using trucks or 4-wheelers would not lead to a temporary reduction in secure grizzly bear habitat (as per the definition; Interagency Grizzly Bear

Conservation Strategy Team 2007) because the vehicles would typically travel overland, that is, they would not travel on existing or closed roads, and would not create permanent or temporary roads. Likewise, this activity would not change densities of open or total motorized routes.

Any effects stemming from competition between cattle and grizzly bears for herbaceous forage such as grasses and forbs would be eliminated in Alternative 1 (see more discussion in the analogous sections for the grazing alternatives). However, this beneficial effect would be minor because: 1) the forage allocation analysis (Wilmot 2015) indicated that sufficient herbaceous forage was available for cattle and wild ungulates; and (2) the most recent Biological Opinion (U.S. Fish and Wildlife Service 2014) concerning the effects of livestock grazing in the project area and vicinity did not identify forage competition between livestock and grizzly bears as an important effect.

Grizzly bears that currently do not habitually prey on livestock, but benefit from cattle carrion resulting from predation (bears or wolves) or other sources of cattle deaths, would lose cattle carrion as a food supply and would be negatively affected after cattle were removed. Such bears are not necessarily predisposed to prey on cattle after they feed on carrion (Anderson et al. 2002). Based on data from 2000 to 2004 in Sommers et al. (2010), the biomass of carrion available to grizzly bears in the project area from deceased cattle calves is substantial, exceeding 62,000 lbs. annually, based on average losses of 155 calves to all sources of death.

Cumulative Effects

Cumulative effects would occur only in the two-year phase out period. After grazing stops, there would be no direct or indirect effects on grizzly bears and therefore, Alternative 1 would have no cumulative effects.

The number of known or expected grizzly bear mortalities associated with cumulative actions was used as an indicator, similarly to the analysis of the direct and indirect effects. The Yellowstone Ecosystem in Western Wyoming defined the cumulative effects analysis area. Based on the telemetry data provided through Wyoming research and management actions, adult male bears often travel throughout Western Wyoming to den, forage, and mate and individually use the project area and adjoining areas in the Buffalo Fork (Upper Snake), Gros Ventre, and Wind River watersheds on an annual basis. In addition, grizzly bears that preyed on cattle in the project area were frequently relocated by the state of Wyoming to the Upper Clark Fork and Shoshone River watersheds in the northern portion of Western Wyoming. These bears were subject to mortality risks associated with both the presence of livestock in the project area during the late spring, summer, and early fall and to a variety of risks associated with other governmental and private land uses (described below) that were distant from the project area. Thus, the project area alone was too small to encompass all the important hazards for individual bears that only used the project area for part of the year. The temporal bound of the analysis was the period of 2010 to the end of the term grazing permit (approximately 2025). The year 2010 marked the approximate year grizzly bear losses due to livestock depredation increased in Western Wyoming and the project area (Interagency Grizzly Bear Study Team 2014b). The end of the term grazing permit (2015) was used because grizzly bear losses beyond the term of the grazing permit could not be predicted, especially because new range allotment planning might trigger changes in livestock management.

Table 29 summarizes the principal past, present, and reasonably foreseeable cumulative actions that affect mortality of grizzly bears in Western Wyoming, including the project area. Schwartz et al (2010) documented the important risk factors that accounted for grizzly bear deaths in the Yellowstone Ecosystem from 1983 to 2003. They concluded that ungulate hunting seasons (hunter self-defense), rural housing and site developments, lack of secure habitat, and high road densities within un-secure bear habitat were important factors that reduced grizzly bear survival in the Yellowstone Ecosystem, including Western Wyoming. Their identification of risk factors was consistent with the cumulative actions for Western Wyoming and the project area, although grizzly bear use of livestock allotments and the presence of human disturbance factors such as the trailheads and backcountry campsites did not explain grizzly bear survival for that time period.

Table 29. Effects of past, present and foreseeable future activities on grizzly bears and gray wolves

Past, present and foreseeable future activities	Effects on grizzly bears	Effects on gray wolves
Scale: Western Wyoming		
Big, trophy, and game bird hunting (human self-defense); commercial site, agricultural, and housing development on private lands (food or garbage storage issues or human safety risks); livestock management in sheep and cattle allotments on private, state lands, in Western Wyoming; road development (ongoing).	Strongly contribute to grizzly bear mortality, and disturbance effects (see text and Schwartz et al. 2010) (---). The cumulative effects analysis area for wolves does not include the entirety of Western Wyoming.	Not applicable—the cumulative effects analysis area for wolves does not include the entirety of Western Wyoming.
Management actions by federal, state, tribal, and private entities to conserve grizzly bears through guidance in the recovery plan and the conservation strategy. Current actions include coordinated ecosystem-scale food storage regulations, limits and monitoring of risk factors (e.g., developments, livestock allotments), public education, law enforcement, access restrictions and road closures, research and monitoring.	Strongly contributes to grizzly bear survival, reproduction, and habitat security (see text and Schwartz et al. 2010). (+++). Improves population trend and provides for the species' federal delisting and recovery.	Grizzly bear protections also improve habitat conditions for wolves in the project area.
Scale: project area and vicinity		
Local domestic Sheep Grazing—Predator removal by federal agencies, sheep management operations, and special road access; effects on vegetation (ongoing).	Strongly contributes to grizzly bear mortality (see text) (---). Rest-rotation grazing of 1,150–1,300 domestic sheep on the Rock, Lime, Elk Ridge, and Tosi allotments (west side of the Green River) from early July to late September. Use of trucks on roads closed to the public) to set up camp (connector between #612 and 614; Whiskey Cr) so as to avoid impassable spring snowpack. Sheep grazing affects vegetation cover and community function in riparian zones and uplands, habitats needed by wild ungulate prey eaten by grizzly bears.	Strongly contributes to wolf mortality (see text) (---). Rest-rotation grazing of 1,150–1,300 domestic sheep on the Rock, Lime, Elk Ridge, and Tosi allotments (west side of the Green River) from early July to late September. Use of trucks on roads closed to the public) to set up camp (connector between #612 and 614; Whiskey Cr) so as to avoid impassable spring snowpack. Sheep grazing affects vegetation cover and community function in riparian zones and uplands, habitats needed by wild ungulate prey eaten by wolves.
Activities and management of private lands south of the project area (ongoing).	Contributes to grizzly bear mortality and disturbance effects (-). Private lands are used for livestock grazing, growing crops, housing, commercial development, and transportation in the form of roads.	Contributes to wolf mortality and disturbance effects (-). Private lands are used for livestock grazing, growing crops, housing, commercial development, and transportation in the form of roads.
Wyoming State gray wolf hunting seasons (past)	Wyoming State gray wolf hunting seasons (past)	Wolves were legally taken in the Wyoming Game and Fish Green River gray wolf hunt area during

Past, present and foreseeable future activities	Effects on grizzly bears	Effects on gray wolves
		2012 and 2013, including losses from the project area (-). This area includes the cattle and sheep allotments and adjacent private lands to the south.
Legal black bear baiting (ongoing)	Potentially contributes to grizzly mortality. No documented cases occurred from 2010 to 2014 in Western Wyoming based Wyoming Game Fish Department records (project record; but numerous cases "under investigation" were unclear as to the source of human-caused bear mortality). (0)	No effect on wolves.
Recreational uses such as camping, fishing, berry picking, hunting, and sight-seeing.	Contribute indirectly to grizzly bear deaths through the cumulative actions described above, and to disturbance effects (-). See Schwartz et al. 2010.	Contributes to wolf disturbance effects, particularly at wolf den sites. Reduces habitat effectiveness for wolves.
Long-term fire suppression, project wide (ongoing).	Impedes natural disturbance cycles that ultimately improve foraging habitat (e.g., whitebark pine regeneration, soft mast crops) for grizzly bears and promote habitat for their large prey (-).	Impedes natural disturbance cycles that ultimately improve foraging habitat for wolf prey such as elk (-).
Fire suppression activities, local scale.	Locally increases human disturbance effects and degrades (fire-lines, camps) habitat of large prey (-).	Locally increases human disturbance effects and degrades (fire-lines, camps) habitat of large prey (-).
Six timber sale or fuels reduction projects, local scale (past, present, and future)	Increases local human disturbance effects (-), but may benefit prey by promoting vegetation in early stages of succession (+).	Increases local human disturbance effects (-), but may benefit prey by promoting vegetation in early stages of succession (+).
Upper Green River Lakes Feedground, local scale (ongoing).	Degrades riparian function that benefits grizzly bear foraging (-), but sustains prey population by increasing winter survival and provides carrion as food (+).	Sustains prey population by increasing winter survival and provides carrion as food (+).
Proposed Upper Green River gravel pit and ongoing maintenance of main roads, local scale.	Locally increases disturbance of grizzly bears (-).	Locally increases disturbance of wolves (-).
Water regulation at Mud Lake (ongoing), local scale.	Locally improves riparian function benefits grizzly bears and their ungulate prey (+).	Locally improves riparian function that benefits habitat of wolf prey (+).
Climate change	Affects distribution, survival, and age structure of common food sources in the project area such as whitebark pine by facilitating pathogens (blister rust) and high-intensity, stand-replacing fires (see text) (-).	Increases in drought conditions reduce summer forage and reproductive condition (calving) of important wolf prey such as elk (see text) (-).

+ minor positive effect; - minor negative effect; 0 no effect.
+++ major positive effect; --- major negative effect;

Self-defense actions by hunters and miscellaneous other causes were responsible for 33 (29 percent of total) and 50 (44 percent) grizzly bear deaths in Western Wyoming from 2010 to 2014, respectively. Poor garbage security accounted for four (3 percent) deaths. Cattle-related removals of grizzly bears numbered 27 (24 percent) during this period. These factors were also important sources of conflicts for grizzly bears in Western Wyoming and the project area.

Cattle were also the predominant source of conflicts for grizzly bears in the project area. Sources of grizzly bear deaths from 2010 to 2014 within the project area included self-defense (3 cases; 16 percent of total), natural or unknown (two cases; 10 percent), and cattle (14 cases; 74 percent). There were no losses of grizzly bears due to livestock management (cattle or sheep on Forest Service allotments near the project area from 2010 to 2014, although one grizzly bear was removed for both cattle (counted above for project area) and sheep depredation in 2011. Grizzly bear losses to all the above factors is expected to continue at similar rates because livestock on federal, state, and private lands in Western Wyoming will likely continue; the Wyoming Game and Fish Commission will continue to allow big game hunting; and other risk factors such as site developments and roads will likely persist. Ongoing black bear hunting associated with baits and past gray wolf hunting activity (Wyoming management) did not cause grizzly bear deaths in the project area from 2010 to 2014.

Active fire suppression, timber sales, and other forest management activities, particularly those associated with roads or site developments displace grizzly bears from foraging or resting habitats and indirectly contribute to grizzly bear mortality (Table 29, Schwartz et al. 2010). Climate change during the planning period (through 2025) may negatively affect grizzly bear food sources such as whitebark pine that are rendered vulnerable to high-intensity wildfires and non-native white pine blister rust, although grizzly bears are highly adaptable and could alternatively use many other food sources (Gunther et al. 2014). In sum, the cumulative effects of the actions are negative, primarily because they directly or indirectly cause substantial grizzly bear mortality, eliminate habitat, or reduce habitat security over a large area (Western Wyoming).

Determination, Rationale and Management Indicator Analysis

There would be no substantial, adverse direct or indirect effects of Alternative 1 that would be additive to the past, present, and foreseeable further actions described above. From 2002 to 2011, grizzly bear numbers in the Yellowstone Ecosystem were stable or increasing up to 2 percent annually (Haroldson and Dickinson 2012, Haroldson and van Manen 2012). Through a large reduction in livestock-related grizzly bear mortality, Alternative 1 helps meet the demographic monitoring criteria and furthers the Forest Plan goal of achieving recovery of the species. The elimination of livestock-related management removals and relocations from the project area contribute positively to the existing growth or stability of the grizzly bear population in Western Wyoming and the Yellowstone Ecosystem. Grizzly bears would have substantially less carrion available annually, but would not be removed due to conflicts with livestock. With respect to a determination of effects made during Section 7 (Endangered Species Act) consultation with the U.S. Fish and Wildlife Service, Alternative 1 "**may affect, but is not likely to adversely affect**" grizzly bears.

Alternative 2 - Grazing as Currently Permitted and Current Management

Direct and Indirect Effects

Indicator 1 – Number of grizzly bear mortalities due to livestock-related removal actions: In Alternative 2, cattle-related grizzly bear management removals and conflicts, and relocations to other areas of Western Wyoming would continue because large numbers of livestock, primarily cattle, would be accessible to grizzly bears in the project area. Grizzly bears would be removed per interagency management guidelines (Interagency Grizzly Bear Committee 1986). Although current, and likely new, conservation actions developed under Section 7 consultation with the U.S. Fish and Wildlife Service would be implemented in the future as part of this alternative, additional losses of grizzly bears due to livestock-related conflicts would

likely occur at similar or reduced levels, with the number of bear removals dependent upon the effectiveness of the conservation measures and the U.S. Fish and Wildlife Service's terms and conditions. Thus, the limits of incidental take could be closely approached or reached under this (and the other) grazing alternative, triggering additional Section 7 (Endangered Species Act) consultation with the U.S. Fish and Wildlife Service. Numbers of grizzly bears removed due to cattle depredation in the project area varied from 1 to 4 annually for the period of 2010 to 2014. These losses occurred despite the implementation of minimization measures by the Forest and U.S. Fish and Wildlife Service terms and conditions. Such losses have, and would continue to constitute an adverse effect on individual grizzly bears in the project area. The removals of grizzly bears under this and the other grazing alternatives contrast sharply with those in Alternative 1 where few or no losses would occur.

Because adult female bears were removed under recent grazing management (e.g., two individuals in 2013), and because some additional female mortality during the course of the grazing permit would be expected, Alternative 2 would further contribute to the existing mortality sink for female grizzly bears that occurs throughout much of the project area (see section on Female Grizzly Bear Survival in the Project Area, Affected Environment).

Removal and relocation of grizzly bears would also likely result in the short-term (seasonal) reduction of grizzly bear abundance in the project area itself, and to some extent its vicinity, at least until new bears are recruited into the area through routine movement or wholesale emigration from distant, peripheral areas. The bears may also return to the project area following relocation. Radio-marked bears captured for research and conflict management in the project area frequently move across the project's northern and western boundary into the Gros Ventre and Upper Wind River watersheds. Thus, bears removed for conflicts with livestock in the project area are also lost to the "population" in these adjacent areas. Similarly, grizzly bear removals from the project area could seasonally affect bear numbers on adjacent private lands south of the project area and on adjacent sheep and cattle allotments.

Cattle-related relocations of grizzly bears from the project area, historically to sites on the northern portion of the Shoshone National Forest (up to 101 miles distant), could predispose bears to food stress or other risk factors, particularly female bears with cubs-of-the-year. Relocations could thus contribute to human-bear conflicts and grizzly bear deaths associated with livestock, private property, recreationists (e.g., big game hunters), and natural mortalities near bear release sites; and as bears move about the ecosystem. However, of 18 bears relocated from the project area from 2010 to 2014, only one died soon thereafter (hunter self-defense). Three bears returned to the project area, preyed on livestock, and were removed.

The adverse effects of removal and relocation of grizzly bears described above would not vary by the level of forage utilization by livestock in the project area, that is, whether or not livestock were grazed in pastures at levels of existing use (current management) or at the maximum levels allowed (grazing as permitted) in this alternative. Redistributing cattle to change forage utilization by moving animals from pasture to pasture would likely have little effect on rates grizzly bears preyed on livestock because bears are highly mobile and have an excellent sense of smell, and would readily locate cattle regardless of their location.

Because the abundant livestock (9,089 head) in the collective allotments may serve as a concentrated food source that attracts grizzly bears (Anderson et al. 2002), Alternative 2 could indirectly contribute to property damage; surprise encounters with big game hunters, black bear hunters, fisherman, and campers; and recreational livestock losses that indirectly lead to bear injuries or mortalities through management removals in and near the project area. From 2010 to 2014, two grizzly bears were lost in cases of human self-defense in the project area.

Other effects – the design features, management systems, limited focus area prescriptions (e.g., Waterdog Lake), and range improvements would have a range of minor positive and negative effects, or no effect, on

grizzly bears. In general, features of this alternative that improve rangeland condition (e.g., through more intensive cattle herding), particularly in riparian zones, would be beneficial for grizzly bears because of increased availability of herbaceous forage, and because cattle would be less available for grizzly bears that use riparian zones for cover while hunting.

Livestock management operations such as the use of vehicles on project roads and livestock herding would have some disturbance and displacement effects. These would be in addition to those associated with other (recreational) users of Forest System roads. Use of roads in support of livestock management operations would be comparatively light and insufficient by itself to carry important disturbance effects. Grizzly bears also appear to be somewhat conditioned to vehicle and human activity, based on frequent observations of bears and their scats along project area roads. Vehicles would be used by herders living in five established camps in the project area, but herders would typically leave and return to the camps primarily via horseback, with the exception of several work days each month when they would drive to join other personnel originating from outside the project area to move cattle between pastures. Herders also use vehicles one-two days per week when they leave the project area for their days off of work. Further, much of the project area (17 percent) such as the Badger, Beaver-Twin and Roaring Fork allotments is almost entirely un-roaded. In these areas, levels of vehicle-related disturbances to grizzly bears due to livestock management would be insignificant.

Alternative 2 would have no effects on the acreage of secure habitat available to grizzly bears, or densities of open or total motorized routes, because no changes to motorized use of roads are proposed. Although occasional off-road (overland) travel using motorized vehicles (e.g., four-wheelers) would be allowed to maintain the existing 76 miles of livestock fences, such use would not constitute a reduction in secure habitat as defined and monitored by the Interagency Grizzly Bear Study Team. Likewise, such use would not affect densities of open or total motorized roads.

Livestock grazing and mechanical trampling of herbaceous vegetation would reduce the biomass of key grasses, forbs, and sedges that serve as food for grizzly bears during May and June. Grizzly bears use herbaceous vegetation in riparian zones and mesic sites as a food source (Mattson et al. 1991, Gunther et al. 2014). Should forage competition between grizzly bears and livestock occur, grazing at maximum permitted use (versus the current levels of use) would intensify the negative effect of livestock grazing on grizzly bears, especially if cattle concentrated in riparian zones and depleted herbaceous forage. Competition for herbaceous forage between grizzly bears and livestock is most likely in allotments with season-long grazing (e.g., Badger Creek and Beaver-Twin) and focus areas (e.g., Tosi and Klondike Creeks) that lack protection from the effects of grazing at maximum allowable use.

However, the effects of cattle grazing on foraging conditions for grizzly bears under Alternative 2 would be minor overall because: (1) livestock would remove about 63.4 million pounds of forage (primarily grasses, sedges, and forbs) from uplands and riparian communities, about 61 percent of all that produced on lands capable of supporting cattle grazing (Wilmot 2015), with the balance available to bears and wild ungulates; (2) areas outside suitable and capable sites (44 percent) and areas not used by cattle would yield herbaceous forage for grizzly bears as well; and (3) grizzly bears in the Yellowstone Ecosystem show limited forage overlap with livestock, relying on ungulate and small mammal prey, roots, tubers, ants, whitebark pine seeds, and berries—fauna and flora not used by cattle and horses (Mattson et al. 1991, Gunther et al. 2014). Cattle and horses would be unlikely to deplete soft mast food sources commonly used by grizzly bears, such as berries of huckleberry, buffalo berry, and mountain ash. No negative effects of grazing would extend to whitebark pine forests or moth sites (Johnson 2014), important grizzly bear food sources. Approximately 15,000 acres of whitebark pine grow largely in forested portions of the project area that are not within areas identified as capable for livestock grazing. Cattle-capable grazing areas, nearly by definition, do not include high-elevation areas that support whitebark pine. Thus, it is highly unlikely that livestock grazing or trampling would affect this grizzly bear food source. No army cutworm moth sites occur on the project area.

In its 2014 Opinion, the U.S. Fish and Wildlife Service (2014) did not identify competition with cattle for herbaceous forage as a negative effect on grizzly bears.

Alternative 2 benefits grizzly bears that do not habitually prey on livestock, but incidentally use carrion resulting from predation by other bears or wolves, or other sources of livestock deaths. Such bears would likely not be removed in management actions because they would not necessarily be subsequently predisposed to prey on cattle (Anderson et al. 2002). Based on data from 2000 to 2004 (Sommers et al. 2010), the biomass of carrion available to grizzly bears in the project area from deceased cattle calves was estimated at 62,000 lbs. annually (see analogous discussion under Alternative 1).

Cumulative Effects

Grizzly bear expected mortality would be one to four bears annually from the direct and indirect effects of the grazing alternative within the project area. This bear mortality level would be combine additively with losses expected from the other cumulative actions operating at the scale of Western Wyoming (Table 29), such as those caused by hunters (self-defense), poor food and garbage storage, miscellaneous other causes, and the presence of livestock (depredation) outside the project area. Losses of grizzly bears in Western Wyoming from 2010 to 2014 due to causes other than project-area cattle ranged annually from 11 to 28 individuals (76–96 percent of all annual losses).

The cumulative effects of Alternative 2 combined with other activities would be adverse to individual grizzly bears in the aggregate and the population of grizzly bears at the western Wyoming scale, despite many conservation actions (e.g., food storage regulations and road use restrictions) by federal, state, tribal, and private entities. Further, the cumulative effects obviously and strongly detract from grizzly bear population growth in western Wyoming and in the Yellowstone Ecosystem. However the cumulative effects would remain below the threshold of concern because Alternative 2 and other past, present and foreseeable future activities would allow for the continued recovery of the species, provide for a grizzly bear population that meets its demographic recovery criteria, and maintain population growth or stability.

Determination, Rationale and Management Indicator Analysis

The removals and relocations of grizzly bears that would occur under implementation of Alternative 2 would result in adverse effects on individual grizzly bears. This alternative also carries negative, indirect effects associated with human disturbance and the attraction offered by a large number of livestock that contribute to other sources of grizzly bear mortality. The alternative's direct and indirect effects are additive to substantial mortality effects of the cumulative actions described above. With respect to a determination of effects made during Section 7 (Endangered Species Act) consultation with the U.S. Fish and Wildlife Service, Alternative 2 **"may affect, and is likely to adversely affect grizzly bears".**

However, Alternative 2 and its cumulative effects allow for the continued recovery of the species, provide for a grizzly bear population that meets its demographic recovery criteria, and maintains population growth or stability. As such, this alternative meets desired conditions. The direct and indirect effects of Alternative 2, and its cumulative effects, do not cause the grizzly bear population to cross the threshold of concern, that is, cause a downward trend in the population.

The livestock-related management removals and relocations from the project area expected in Alternative 2 detract from positive grizzly bear population growth or stability in the Yellowstone Ecosystem (Interagency Grizzly Bear Study Team 2014b). This is in strong contrast to the effects of Alternative 1 which contributes essentially no grizzly bear mortality. Although Alternative 2 carries adverse effects to individuals and to the short-term numbers of grizzly bears in the local (project area and vicinity) population, the expected removals (0–4 individuals annually, based on past history and incidental take anticipated by the U.S. Fish and Wildlife Service), would not trend this threatened species away from consistently achieving the demographic recovery

criteria identified for the Yellowstone Ecosystem population, from maintain population stability or slow growth, and from achieving a positive trajectory toward delisting. This conclusion was reached because (1) the current demographic data for Yellowstone grizzly bears indicates that the population was stable to slightly increasing for the period of 2002 to 2011 and has consistently met nearly all demographic recovery criteria since 2006, despite accelerated livestock-related bear mortality in project area and the ecosystem beginning in 2010; (2) the onset of a period of slowed population growth (about 2002) that occurred well before the onset of increased livestock losses (2010) in the project area and the ecosystem (Haroldson 2012, Haroldson and van Manen 2012; (3) the absence of evidence at the ecosystem level that recent changes in any mortality factor, including removals in response to cattle depredation, contributed to a detectable change in adult (breeding) grizzly bear survival in the Yellowstone Ecosystem—survival of independent bears was stable or even increased during the 2002–2011 time period, thus a decline in survival of independent-age bears would not explain recent slowed population growth; (4) removal actions in the Upper Green River cattle allotments (2014 consultation area) for the period of 2004 to 2013 represented only 0–11 percent and 0–12 percent of estimated total mortality of females and males in the Yellowstone Ecosystem, respectively (Interagency Grizzly Bear Study Team 2014); and (5) the current biological opinion which stated that the expected incidental take in the project area and vicinity (2014 consultation area) associated with future livestock-related grizzly bear removals would not jeopardize the continued existence of the grizzly bear population in the Yellowstone Ecosystem (U.S. Fish and Wildlife Service 2014). Because adult males comprise the majority of livestock-related grizzly bear losses in the project area (versus breeding adult females—the most important population segment), the negative effects of bear removals on population growth are reduced.

Alternative 3 - Modified Grazing Management

Direct and Indirect Effects

Indicator 1 – Number of grizzly bear mortalities due to livestock-related control actions: Similarly to Alternative 2, livestock-related grizzly bear management removals and relocations to other areas of western Wyoming would continue with implementation of Alternative 3. Although slightly fewer livestock would be present in Alternative 3 (8,819 cow/ calf pairs and horses versus 9,089 in Alternative 2), grizzly bear losses stemming from cattle depredation would occur at a similar rate, and despite the application of the current Forest Service conservation measures and Fish and Wildlife Service terms and conditions designed to minimize losses. Changes in grazing management in Alternative 3, as compared to Alternative 2, would not reduce grizzly bear mortalities, except possibly for improved cattle herding that reduces the amount of time cattle spend in riparian zones. The strong sense of smell and mobility of grizzly bears would still allow them to effectively locate and prey on cattle. Thus, the limits established as incidental take could be closely approached or reached under Alternative 3 and potentially triggering additional Section 7 consultation with the U.S. Fish and Wildlife Service.

Under Alternative 3, a large number of livestock would increase the potential of bear mortality and/or relocation due to interactions with hunters (big game and black bear), recreationists, or residences in or near the project area.

Other effects – as with Alternative 2, the design features, management system, numerous focus area prescriptions, and range improvements would have minimum effects on grizzly bears. Alternative 3 proposes improvements in livestock management over Alternative 2 such as reduced forage utilization levels, increased focus area protections, and changes in management systems that further improve riparian and upland function, a benefit to grizzly bear foraging.

Alternative 3 would have no effect on the acreage of secure habitat available to grizzly bears. The 875 foot, two-track spur off of Forest Road # 370691 that would be ripped, seeded, and barricaded occurs within the

500-meter buffer of insecure habitat associated with two existing roads that would remain open to motorized use. Thus, removal of the spur route would not increase secure grizzly bear habitat within the project area. Likewise, the removal of the unauthorized spur would not affect open and total motorized route densities in the project area because these parameters are not calculated using user-created routes. The reduction in the number and mileage of user-created routes in the project area due to closure of this spur route would be very minor because the spur route is very short.

Because livestock permittees and Forest Service employees would be allowed passage through the new gate proposed near Wagon Creek, levels of secure grizzly bear habitat would not change. Although occasional off-road (overland) travel using motorized vehicles (e.g., four-wheelers) would be allowed to maintain or install new livestock fences (82 miles total length), such use would not constitute a reduction in secure habitat as defined and monitored by the Interagency Grizzly Bear Study Team. Similarly, overland travel would not change mileages of open and total motorized route densities.

Alternative 3 benefits those grizzly bears that opportunistically feed on livestock carrion provided by other bears and wolves, but that do not develop cattle predation habits themselves and are not removed in cases of mistaken identity. The estimated biomass of carrion from deceased cattle calves available to grizzly bears in the project area would be substantial, exceeding 62,000 lbs. annually (Sommers et al. 2010; see analogous discussion under Alternative 1).

Cumulative Effects

The cumulative effects associated with Alternative 3 are similar to those associated with Alternative 2 because the combined direct and indirect effects and effects of other actions (Table 29) are nearly the same. The reduction in livestock numbers (270 fewer head) in the Mosquito Lake rotation of Upper Green River Allotment, the generally more conservative livestock use of herbaceous forage in riparian and upland habitats, new fencing, and application of design features proposed under Alternative 3 would have little, if any, effect on numbers of livestock-related grizzly bear deaths. Thus, the cumulative effects associated with Alternative 3 would also have strong adverse effects on grizzly bears at the project, Western Wyoming, and Yellowstone Ecosystem scales, despite many conservation actions (e.g., food storage regulations, and road use restrictions) by federal, state, tribal, and private entities designed to reduce human-grizzly bear conflicts. However the cumulative effects would remain below the threshold of concern because Alternative 3 and other activities would support the continued recovery of the species, provide for a grizzly bear population that meets its demographic recovery criteria, and maintains population growth or stability.

Determination, Rationale and Management Indicator Analysis

The determination and rationale for Alternative 3 is the same as for Alternative 2 because changes in livestock management, as described above, would not reduce grizzly bear mortalities. The direct and indirect effects associated with implementing Alternative 3 are additive to substantial mortality effects of the other cumulative actions identified in Table 29. With respect to a determination of effects made during Section 7 (Endangered Species Act) consultation with the U.S. Fish and Wildlife Service, Alternative 3 "**may affect, and is likely to adversely affect grizzly bears**".

Although the removals of grizzly bears in the project area would clearly have adverse effects on individual grizzly bears, the alternative and its cumulative effects allow for the continued recovery of the species and provides for a grizzly bear population that meets the demographic recovery criteria (see Determination, Rationale and Management Indicator Analysis for Alternative 2) and maintains slow population growth or stability. As such, this alternative would meet desired conditions. The cumulative effects associated with Alternative 3 and other past, present, and foreseeable future activities would not cross the threshold of concern, that is, cause a downward trend in the population. The cumulative effects would allow for a grizzly

bear population that meets its demographic recovery criteria, and would maintain population growth or stability.

Alternative 4 - Modified Grazing Management with Riparian Emphasis

Direct and Indirect Effects

Indicator 1 – Number of grizzly bear mortalities due to livestock-related control actions: Reductions in maximum forage utilization from Alternative 3 (50 percent) to Alternative 4 (35 percent) may result in a shorter grazing season for cattle in several allotments (e.g., Roaring Fork), reducing cattle exposure to grizzly predation and associated control actions. However, because the number of livestock present would be the same as in Alternative 3 (8,819 cow/calf pairs and horses), and only slightly less than Alternative 2 (9,089 cow/calf pairs), livestock-related grizzly bear removals and relocations to other areas of Western Wyoming would continue. Grizzly bear losses stemming from cattle depredation would occur despite the application of conservation measures, terms, and conditions designed to minimize losses because grizzly bears would still effectively locate and prey on cattle. The limits established as incidental take could be closely approached or reached under Alternative 4 and this would trig additional Section 7 consultation with the U.S. Fish and Wildlife Service.

Similarly to the other grazing alternatives, under Alternative 4, a large number of livestock would increase the potential of bear mortality and/or relocation due to bear interactions with hunters (big game and black bear), recreationists, or residences in or near the project area.

Other effects – The design features, management system, numerous focus area prescriptions, range improvements, and minor changes in road access would have minimal effects similar to those of Alternative 3. The reduced maximum forage use riparian zones (35 percent, down from typically 50 percent in Alternative 3) would further benefit grizzly bear foraging habitat. This alternative also benefits those grizzly bears that opportunistically feed on livestock carrion provided by other bears and wolves, but that do not develop cattle predation habits themselves (see analogous discussion under Alternative 1).

The reduced limit on livestock use in riparian zones (35 percent forage utilization) in Alternative 4 may lead to a shorter livestock grazing season and fewer removals and relocations of grizzly bears. Should this occur, the adverse effects of livestock-related removals in this alternative would be reduced.

Alternative 4 would have no effect on the acreage of secure habitat available to grizzly bears. The 875 foot, two-track spur off of Forest Road # 370691 that would be ripped, seeded, and barricaded occurs within the 500-meter buffer of insecure habitat associated with two existing roads that would remain open to motorized use. Thus, removal of the spur route would not increase secure grizzly bear habitat within the project area. Likewise, the removal of the unauthorized spur would not affect open and total motorized route densities in the project area because these parameters are not calculated using user-created routes. The reduction in the number and mileage of user-created routes in the project area due to closure of this spur route would be very minor because the spur route is very short.

Because livestock permittees and Forest Service employees would be allowed passage through the new gate proposed near Wagon Creek, levels of secure grizzly bear habitat would not change. Although occasional off-road (overland) travel using motorized vehicles (e.g., four-wheelers) would be allowed to maintain or install new livestock fences (62 miles total length), such use would not constitute a reduction in secure habitat as defined and monitored by the Interagency Grizzly Bear Study Team. Similarly, overland travel would not change mileages of open and total motorized route densities.

Alternative 4 benefits those grizzly bears that opportunistically feed on livestock carrion provided by other bears and wolves, but that do not develop cattle predation habits themselves and are not removed in cases of

mistaken identity. The estimated biomass of carrion from deceased cattle calves available to grizzly bears in the project area would be substantial, exceeding 62,000 pounds annually (Sommers et al. 2010; see analogous discussion under Alternative 1).

Cumulative Effects

The cumulative effects associated with Alternative 4 are similar to those associated with Alternatives 2 and 3 because the cumulative effect of direct and indirect effects associated with each alternative and the other past, present and reasonably foreseeable future actions (Table 29) are nearly the same. The cumulative effects associated with Alternative 4 are clearly adverse to individual grizzly bears and the population of grizzly bears at the project, western Wyoming, and Yellowstone Ecosystem scales, and obviously slow grizzly bear population growth (but see Interagency Grizzly Bear Study Team 2014b). However the cumulative effects would remain below the threshold of concern because the cumulative effect of Alternative 4 and other activities would allow for the continued recovery of the species, provide for a grizzly bear population that meets its demographic recovery criteria, and maintain population growth or stability.

Determination and Rationale

Implementation of Alternative 4 would result in management removals of grizzly bears, a clear adverse effect to individual bears. This alternative would result in negative effects to bears associated with human disturbance and conflicts between bears that are attracted to large numbers of livestock and recreationists that use the project area. Alternative 4's direct and indirect effects are additive to substantial mortality effects of the other past, present and foreseeable actions (Table 29). With respect to a determination of effects made during Section 7 (Endangered Species Act) consultation with the U.S. Fish and Wildlife Service, Alternative 4 "**may affect, and is likely to adversely affect grizzly bears**".

However, implementation of Alternative 4 would allow the grizzly bear population to consistently meet its demographic recovery criteria, maintain population growth or stability, and allow for future delisting of the species (see discussion under Alternative 2 Determination, Rationale and Management Indicator Analysis). As such, this alternative would meet desired conditions. The cumulative effects associated with Alternative 4 and the other past, present, and foreseeable future activities would not cause the grizzly bear population to cross the threshold of concern, that is, cause a downward trend in the population.

Gray Wolf (Canis lupus) - Experimental, Non-essential, and Sensitive

The gray wolf section presents the indicators addressed in this analysis, the existing condition, and the environmental effects of each alternative on gray wolves. Information provided in this section was summarized from the Supplemental Wildlife Specialist Report (Murphy 2016).

Indicators Used for Comparison of Alternatives

- Number of wolf mortalities due to livestock-related control actions

Affected Environment

Population Status in the Northern Rocky Mountains and Wyoming

As of the end of 2014, the Northern Rocky Mountain (Montana, Idaho, and Wyoming) gray wolf population exceeded 1,657 individuals and 282 packs (including >85 breeding pairs) (USFWS et al. 2015). The Wyoming population consisted of 333 wolves in 44 packs (25 breeding pairs). The population outside of Yellowstone and Wind River Reservation remained above minimum delisting criteria; ≥ 195 wolves in ≥34

packs inhabited Wyoming outside Yellowstone and the Wind River Reservation (WGFD et al. 2015). Sixteen packs successfully reproduced and raised ≥2 pups of the year through September 23, 2014.

Risk Factors and Causes of Wolf Mortality in Wyoming

The primary risk factors for gray wolves that potentially stem from livestock management are control actions associated with livestock depredations, human disturbance at den sites, and reductions in prey through competition with livestock (Fritts et al. 2003 and Boitani 2003).

From January 1 through September 23, 2014, 63 wolves were known to have died in Wyoming outside Yellowstone and the Wind River Reservation (WGFD et al. 2015). Causes of mortality included 31 losses due to control actions in response to confirmed livestock depredation; 12 legal public harvests in the predatory animal area (prior to the species' delisting in September, 2014); 14 other human causes (9 preemptive damage control in the predatory animal area, 2 illegal kills, 1 vehicle strikes, 1 capture mortality, and 1 accidental death); 3 natural, and 3 unknown (WGFD et al. 2015).

Wolf-Livestock Interactions in the Project Area

Wolf-livestock conflicts on the project area date from 2002 when wolves first re-established themselves. These conflicts occur from early summer through fall, the period livestock are present in the project area and in nearby sheep allotments. The Wyoming Game and Fish Department, and U.S. Department of Agriculture, Wildlife Service personnel have commonly removed individual wolves, or entire packs, in response to livestock depredations. From 2002 to 2012, 48 total wolves were removed from the Green River pack in response to losses of 140 cattle, 15 sheep, and other livestock; nearly all in the project area and adjacent sheep allotments. From 2006 to 2012, 13 wolves were removed from the Black Butte pack in response to losses of 6 cattle, 37 sheep, and other livestock. Many of the cattle and losses occurred in the Beaver-Twin cattle Allotment and adjacent sheep allotments. Both the Green River and Black Butte packs increased and/or re-formed following control actions intended to dramatically reduce or eliminate the packs.

Wolves Currently in the Project Area

During 2014, the territory of the Green River wolf pack overlapped the project area. Three individuals were removed from this pack during control operations in response to six cattle depredations (WGFD et al. 2015). No domestic sheep were taken by the pack. By year's end, the pack was reduced to six individuals. The Black Butte pack was not present during 2014.

Biological Assessment

In 2010, the Forest Service initiated Section 7 (Endangered Species Act) consultation with the U.S. Fish and Wildlife Service concerning the effects of livestock management on wolves in the project area and in nearby sheep and cattle allotments (biological assessment: U.S. Forest Service 2010). The U.S. Fish and Wildlife Service concurred with the Forest Service's *Not Likely to Jeopardize the Continued Existence of the Species* determination for wolves (concurrence letter: U.S. Fish and Wildlife Service 2011b, 2011c). The finding was based primarily on the resilience of wolves to high levels of human-caused mortality, and on the rapid increase in wolf numbers following reintroduction in the Northern Rocky Mountains. The consultation remains in effect for current management.

Environmental Consequences

Effects Indicator, Management Objective, and Threshold of Concern

The effects indicator was livestock-related mortality of wolves, typically control actions by the U.S. Fish and Wildlife Service (operationally, USDA Wildlife Services) in response to cattle or sheep depredation. Control actions were the most important effect of the grazing alternatives on wolves, and could readily be assessed in

context with U.S. Fish and Wildlife Service recovery criteria for the species in Wyoming and the Northern Rocky Mountains. A management objective for the indicator was not identified because this species is listed as experimental, non-essential under the Endangered Species Act, a status that carries few protections other than those associated with 10j rules (USFWS 1994). The threshold of concern for the determination was whether or not the expected removals provided for the future recovery of the species in western Wyoming and the Northern Rocky Mountains. This threshold was applied in the analysis of the direct and indirect effects and in the cumulative effects analysis.

Alternative 1 – No Livestock Grazing (No Action Alternative)

Direct and Indirect Effects

The direct and indirect effects of livestock grazing management on wolves would be nearly eliminated. Wolves removed during control actions that result from livestock (chiefly cattle) depredation, currently up to 7 individuals per year with occasional removal of entire packs, would cease after grazing permits expired. Relief from livestock-related control actions would allow additional packs to establish in the project area, similarly to the Black Butte pack, itself lost in 2013 due to control actions. However, removal of wolves in the Green River pack might continue due to the pack's intermittent predation on domestic sheep in the adjacent allotments (see cumulative effects below), and may accelerate in the absence of livestock in the project area. Overall, numbers of gray wolves would likely increase and then stabilize after wolf packs and numbers reached carrying capacity for the area.

Wolves that do not habitually prey on livestock, but benefit from cattle carrion resulting from predation (other bears or wolves) or other sources of cattle deaths, would lose cattle carrion as a food supply and would be negatively affected after cattle were removed. Based on data in Sommers et al. (2010) for the period of 2000 to 2004, an estimated annual biomass of carrion available to wolves and other scavengers from deceased cattle calves was 62,000 pounds. (See analogous discussion under grizzly bears, Alternative 1). This loss of potential food could affect wolf population vital (birth and death) rates and wolf numbers in the project area, although the Green River pack would likely compensate by using alternative food sources such as wild ungulates or domestic livestock on other allotments.

Any current disturbance to wolves, including livestock management activities near wolf dens and rendezvous sites, would be eliminated. The use of motorized vehicles such as trucks and 4-wheelers to access and remove approximately 75 miles of fence over 10 years would potentially increase human disturbance and displace wolves from work sites. However, this disturbance effect would be minor because work in each area would be very short-term (hours to a few days at most) and would occur only 1 time over a limited area within the collective allotments. Fence removal would remove a barrier that could be used advantageously by wolves when pursuing cattle.

Cumulative Effects

The number of expected wolf mortalities associated with the cumulative actions was used as an indicator, similarly to the analysis of the direct and indirect effects. This allowed evaluation of the important cumulative actions (Table 29) in the same context as the direct and indirect effects. The 170,643-acre project area, the adjacent collective 30,577 acre Rock, Lime, Elk Ridge, and Tosi domestic sheep allotments, and the private lands up to 15 miles south of the project area was used to define the cumulative effects analysis area. This area wholly encompassed the territory (and depredations) of the Green River pack, and about half of the territory of the Black Butte pack, a group not present as of 2014. The temporal bounds of the analysis was the period of wolf occupation of the project area (2002) following the wolf reintroduction in Yellowstone National Park (1995 and 1996) to the end of the proposed term grazing permit, approximately 2025. This extent encompassed all of the wolf mortality associated with anthropogenic sources, including those stemming from the direct and indirect effects and the cumulative actions described below.

Mortality of wolves due to control actions (USDA Animal Plant and Health Inspection Service, Wildlife Services in cooperation with the U.S. Fish and Wildlife Service) was the most important contributor of wolf losses. However, because most of the control actions on the Green River and Black Butte packs stemmed from their predation on cattle (as opposed to domestic sheep), this source of mortality was treated as a direct and indirect effect associated with the project-area grazing (see direct and indirect effects for the grazing alternatives). In the annual U.S. Fish and Wildlife Service reports, it was not possible to differentiate the mortality associated with the direct effect (cattle depredation) from the cumulative action (sheep depredation) because both packs sometimes (years 2008 and 2009) preyed on both cattle and domestic sheep during the same year. Depredation on domestic sheep in the allotments immediately adjacent to the project area, although accounted for in direct and indirect effects above, were thus not treated as a cumulative action.

There were only 11 human-caused wolf deaths in the Green River and Black Butte packs from 2002 to 2014 that were not associated with project-area grazing, these stemmed from wolf hunting seasons (Wyoming management; 4 deaths in 2012 and 4 in 2013) and likely from illegal kills (USFWS, personal communication, May 22, 2015). No wolf losses resulted from legal black bear baiting in the project area. Wolf mortality due to trophy hunting in the project area is not expected to occur during the period of the term grazing permit because, as of early 2015, federal wolf delisting of Wyoming wolves and Wyoming management of the species was not reasonably foreseeable through congressional legislation or through revision of the Wyoming Wolf Plan and subsequent acceptance by the U.S. Fish and Wildlife Service. However, should wolf delisting occur and Wyoming management begin, wolf hunting would result in the regulated removal of wolves through trophy hunting at rates similar to previous (above) levels.

Other cumulative actions that could affect wolves included recreation such as horse-back riding and hiking, or camping; or timber, fire suppression, road-related projects. These activities typically carried negative, indirect effects on wolves though human disturbance and loss of habitat effectiveness, but their effects could not be reliably expressed as expected wolf mortality. Climate change contributes to drought conditions that reduce summer forage needed to support the nutritional condition and reproduction of important wolf prey such as elk (Middleton et al. 2013).

Implementation of Alternative 1 would not result in negative cumulative effects on wolves in the analysis area. Federal control actions in response to livestock losses in the project area are currently the predominant source of wolf mortality. This factor would be eliminated, save for continued control actions on wolves in domestic sheep allotments next to the project area and on private lands nearby. Cumulative actions such as illegal wolf mortality and human disturbance account for relatively few wolf deaths and other minor negative influences of wolves, and do not compensate the strong positive direct and indirect effects of Alternative 1 in alleviating cattle-related control actions.

Determination and Rationale

The effects of Alternative 1 do not exceed the threshold of concern; it fully supports recovery of the species and allows for federal delisting of wolves in Wyoming. By eliminating wolf mortality associated with control actions in the project area (after a two-year phase-out of grazing), this alternative contributes positively toward maintaining wolf numbers at or above 10 breeding packs and 100 individuals, the numerical recovery target established by the U.S. Fish and Wildlife Service for each of Wyoming, Idaho, and Montana (USFWS 1987). Gray wolf recovery in the Northern Rocky Mountains and Wyoming has and would continue to be highly successful. Since 2002, the wolf population in the Northern Rocky Mountain population has exceeded recovery targets. As of late 2014, western Wyoming supported 333 wolves in 44 packs with 25 breeding pairs (USFWS et al. 2015). With respect to a determination of effects made during Section 7 (Endangered Species Act) consultation with the U.S. Fish and Wildlife Service, Alternative 1 would not jeopardize the continued existence of the species. With regard to the wolf as a sensitive species, this alternative "**may impact individuals but is not likely to cause a trend to federal listing or loss of viability**".

Alternative 2 - Grazing as Currently Permitted and Current Management

Direct and Indirect Effects

The removal of wolves involved in cattle depredation, currently up to seven individuals within a grazing season, would continue if Alternative 2 is implemented. The removals would reduce wolf numbers in the project area over the short-term (i.e., within the current grazing season) and are likely to disrupt the social (breeding structure) of packs (currently one pack) in the project area when control actions occur and would occasionally (but temporarily) remove entire packs. From the time wolves became established in the project area and vicinity (2002 —Green River pack; 2006—Black Butte pack), wolf control actions by the U.S. Fish and Wildlife Service and USDA Wildlife Services have occurred in response to cattle and sheep depredations and reduced the subsequent fall-winter pack size. From 2002 to 2014, control actions removed 48 wolves from the Green River pack and 13 from the Black Butte pack. These events reduced both the number of wolves in the analysis area and the number of packs from two to one. The Green River pack was completely extirpated and re-formed several times from 2002 and was present at the end of 2014. The Black Butte pack was extirpated at the end of 2013. Through reproduction and ingress from peripheral areas, pack sizes recovered each year, or within two years, and survived attempts to completely remove packs during 2004, 2005, 2006 (Green River), and 2009 (Black Butte). By intermittently removing breeding individuals, control actions may also have limited the reproductive success of packs in the analysis area, and their contribution of dispersing individuals that helped to sustain numbers of breeding individuals in wolf ranges peripheral to the project area. Collectively, the removals constituted adverse effects on individuals and the local wolf population. Given the attraction provided by thousands of cattle in the project area during the grazing season and U.S. Fish and Wildlife Service current management of depredations, this pattern of removal is expected to continue under implementation of Alternative 2.

Because social structures of wolf packs are adaptable, breeding members that die (due to human causes or otherwise) are quickly replaced either from within or outside the pack, and pups can be reared by surviving pack members (Boyd and Jimenez 1994). Thus, despite the control actions that are likely to occur, wolves would continue to persist in the project area much like they have since 2002. Although human-caused mortality is an important factor limiting the distribution and abundance of wolf populations in general, and limiting mortality is a primary challenge to maintaining the Northern Rocky Mountain population, wolves have high resiliency to human caused mortality (USFWS 2012).

The range improvements would have a range of minor positive, minor negative, or no effects on wolves or their prey. Maintenance of the existing fences (76 miles) under Alternative 2 would continue to benefit wolves that use fences to advantage when pursuing prey, including livestock.

Livestock management would cause occasional and minor disturbance effects on wolves under Alternative 2. The use of motorized vehicles on project-area roads in support of livestock management operations may contribute to disturbance levels that cause wolves to avoid road corridors (Mech et al. 1988, Mladenoff et al. 1995). However, roads may also facilitate wolf movements when use is light, wolves may use roads at night. Under Alternative 2, use of project area roads in support of livestock management operations is light and insufficient by itself to carry important disturbance effects to wolves. Vehicles are used by herders living in five herder camps in the project area, but herders typically leave and return to the camps primarily via horseback, with the exception of several work days each month when they drive to join other personnel originating off the project area to move cattle between pastures. Herders also use vehicles one to two days per week when they leave the project area for their days off work. Further, much of the project area (17 percent, calculated from allotment descriptions in Chapter 2, DEIS) such as the Badger, Beaver-Twin, and Roaring Fork allotments almost entirely lacks roads. In these areas, levels of vehicle-related disturbances to wolves due to livestock management are insignificant.

Wolves exhibit tolerance to human disturbance at den and rendezvous sites (Thiel et al. 1998, Argue et al. 2008). However, livestock management activities in the backcountry such as herding cattle and maintaining fences potentially carry disturbance effects on wolves in the backcountry, particularly at wolf dens during April and May (USFWS, personal communication, 5/21/2015). Because livestock management operations would not begin until mid-June at the earliest, no human disturbance during this critical period would occur. Wolf packs may move pups to new locations if disturbed by livestock management after mid-June, but this is unlikely to affect pup survival or pack function (USFWS, personal communication, 5/21/2015). Two natal dens and associated rendezvous sites were used annually in the project area by the Green River and Black Butte packs, but these sites occurred in backcountry areas that were accessible only by foot or horseback. Although herders and cattle occasionally occurred near the den and rendezvous sites, disturbance was not sufficient to cause either pack to relocate to other areas (K. Mills, WGFD, email correspondence, project record). Wolf recovery in the Northern Rocky Mountains was highly successful despite the absence of active protections of wolf den and rendezvous sites on federal lands outside of National Parks and National Wildlife Refuges.

Annually, livestock grazing on the project area would reduce the amount of forage available to wild ungulates on the project area, particularly if high levels of herbaceous use (maximum permitted) by cattle is sustained. However, the analysis of forage offtake by cattle and elk on the project area (see Elk section, Wilmot 2015) indicated that sufficient forage is available under Alternative 2 to support both the numbers of cattle proposed under Alternative 2 and elk, pronghorn, mule deer, and moose that use the project area seasonally or yearlong. Livestock grazing may negatively affect habitat conditions for other wolf prey such as beaver by reducing aspen, cottonwood , and willow cover and regeneration over the long-term (> five years) (see effects analysis for Canada lynx, Alternative 2).

The large numbers of cattle on the collective allotments would provide carrion to wolves, either through predation by other predators (other wolves and bears) or other causes. For wolves not involved in livestock depredation and not subject to removal operations, livestock carrion provided indirectly under Alternative 2 is beneficial. Based on data from 2000 to 2004 in Sommers et al. (2010), the biomass of carrion available to wolves in the project area from deceased livestock calves is substantial, exceeding 62,000 pounds annually (see analogous discussion for grizzly bears, Alternative 1). Grizzly bear conservation measure #8 (remove domestic sheep carcasses from nearby allotments) and #10 (remove cattle carcasses from select locations in the project area; see conservation measures for grizzly bears listed in the Affected Environment section) would reduce carrion available to wolves.

Cumulative Effects

The cumulative effects analysis area (temporal and spatial), cumulative actions, and gray wolf mortality indicator is the same for Alternative 2 as for Alternative 1. The federal control actions on wolves is treated as a direct effect of cattle grazing within the project area, rather than as a cumulative action associated with nearby domestic sheep grazing (see Cumulative Effects section, Alternative 1).

In this alternative, federal wolf control actions from 2002 to 2014 greatly increased mortality of wolves beyond that associated with the other human causes (Table 29, cumulative actions). Control actions (cattle, horses, and sheep depredation, or livestock harassment) are expected to predominate as a source of wolf deaths because the Green River pack resides almost entirely on Forest Service land in the Upper Green River watershed. Cumulative actions such as timber sales, fire suppression, and recreation contribute toward wolf mortality through disturbance effects such as occasional human intrusions to wolf natal dens and reductions in habitat effectiveness, but not as measurable numbers of wolf deaths. Combined, the direct and indirect effects of the control actions and the cumulative actions clearly result in adverse cumulative effects on wolves in the analysis area, reducing the number of individuals and packs in the area. Control actions and other anthropogenic sources of wolf deaths may cause the complete loss of wolves from the analysis area,

similarly to the 2004–2006 period. However, this effect would likely be temporary because wolves would quickly repopulate and breed in the area—similarly to the past—in response to the availability of abundant, vulnerable prey. The cumulative, expected wolf mortalities would not affect the long-term persistence of wolves in the project area and would not impede the continued recovery of the wolf population in the Northern Rocky Mountain region.

Determination and Rationale

Despite ongoing control actions that would likely characterize Alternative 2, wolf packs would persist in the project area through reproduction, ingress from surrounding packs, and recruitment of new breeding individuals, as indicated by their past responses to removal actions. Although removals would temporarily reduce wolves in the project area, they would not cause a long-term decline in wolf numbers in Wyoming or in the Northern Rocky Mountains. Gray wolf recovery in the Northern Rocky Mountains and Wyoming has and would continue to be highly successful despite losses stemming from livestock-related control actions triggered by livestock depredation, including those in the project area. Since 2002, the wolf population in the Northern Rocky Mountain population has exceeded recovery targets. As of late 2014, western Wyoming supported 333 wolves in 44 packs with 25 breeding pairs (USFWS et al. 2015). The area outside Yellowstone and the Wind River Reservation has remained well above the minimum delisting criteria. It is expected that the wolf population levels and trend under Alternative 2 would be similar to those that supported the 1st delisting of the species in 2012 (USFWS 2012), but this would not include wolf losses caused by trophy hunting managed by Wyoming. However, should wolf delisting occur and Wyoming management begin, wolf hunting would result in the regulated removal of wolves through trophy hunting at rates similar to previous (above) levels, but that provide for long-term wolf population growth or stability. Thus, the implementation of Alternative 2 fully provides for the continued recovery of the species in the Northern Rocky Mountains and delisting in Wyoming. Alternative 2 and its cumulative effects do not exceed the threshold of concern, that is, wolf recovery is achievable with implementation of this alternative.

No mitigation or conservation measures by the Forest Service to reduce federal control actions are required or necessary for experimental, non-essential wolves in Wyoming so long as populations remain above recovery targets (USFWS, personal communication, 5/21/2015). However, grizzly bear conservation #13 (night penning of domestic sheep) will help reduce wolf depredation on domestic sheep and control actions on wolves (see conservation measures for grizzly bears listed in the Affected Environment section). None-the-less, frequent removal of wolves or wolf packs is expected with implementation of this alternative. With respect to a determination of effects made during Section 7 (Endangered Species Act) consultation with the U.S. Fish and Wildlife Service, Alternative 2 "**would not jeopardize the continued existence of the species**". With regard to the wolf as a sensitive species, this alternative "**may impact individuals but is not likely to cause a trend to federal listing or loss of viability**".

Alternative 3 - Modified Grazing Management

Direct and Indirect Effects

The effects on wolf mortality due to control actions are similar to those in Alternative 2—the abundance, vulnerability, and easy access to cattle would lead to governmental control actions that would reduce wolf numbers and/or eliminate whole wolf packs on a short term (annual) basis. This would be a short-term (≤ 1 year) adverse effect on the local population. However, the removals would be unlikely to eliminate wolves from the area indefinitely (see analogous discussion in the effects analysis for wolves, Alternative 2). The reduction in cattle in Alternative 3 in the Mosquito Lake rotation, Upper Green River Allotment (minus 270 head versus Alternative 2), would not affect the rate of predation by wolves on cattle in the project area because this prey would remain abundant and vulnerable (8,819 cow/calf pairs).

The adaptive management system, focus area prescriptions, and range improvements would have a range of minor positive or negative effects, or no effects on wolves or their prey. Maintenance of the existing fences (76 miles) and addition of 6 new miles of permanent fence and 1.2 miles of electric fence would benefit wolves that use fences advantageously when pursuing prey, including livestock. As in Alternative 2, this alternative carries the potential for occasional and minor negative disturbance-related effects of livestock management along roads and at den and rendezvous sites.

Habitat conditions for wolf prey (elk, moose, and mule deer) should improve as compared to Alternative 2. Because maximum cattle use of herbaceous forage in Alternative 3 is 50 percent (typical), forage conditions in riparian areas (e.g., willow stands) and aspen communities would be consistently maintained or improved over Alternative 2 (65 percent maximum use) for ungulate prey and small-medium prey such as beavers (see discussion in the effects analysis for the grazing alternatives on lynx). Alternative 3 also carries a slight increase in forage available (see Elk section, Wilmot 2015) to wolf prey because cattle numbers are reduced by 270 head in the Upper Green River allotment. Improvements at focal sites triggered by reduced herbaceous use and increased stubble heights should also locally improve habitat conditions for wolf prey.

As with Alternative 2, the large numbers of cattle present on allotments in Alternative 3 would provide carrion to wolves, either through predation by other predators (other wolves and bears) or through other causes of livestock death. For wolves not involved in livestock depredation and not subject to removal operations, livestock carrion provided indirectly in Alternative 3 is beneficial. Based on data from 2000 to 2004 in Sommers et al. (2010), the biomass of carrion available to grizzly bears in the project area from deceased livestock calves is substantial, exceeding 62,000 pounds annually, based on average losses of 155 calves to all sources of death (see analogous discussion for grizzly bears, Alternative 1).

Cumulative Effects

The cumulative effects analysis area (temporal and spatial), cumulative actions and gray wolf mortality indicator is the same for Alternative 3 as for Alternative 1. The federal control actions on wolves is treated as a direct effect of cattle grazing within the project area, rather than as a cumulative action associated with nearby domestic sheep grazing (see Cumulative Effects section, Alternative 1).

The cumulative effects of Alternative 3 are similar to those in Alternative 2 because the combined direct and indirect effects and cumulative actions (Table 29) are nearly the same. The reduction in livestock (270 fewer head) in the Mosquito Lake rotation, Upper Green River Allotment, generally more conservative livestock use of herbaceous forage in riparian and upland habitats, new fencing, and application of adaptive management features that contrast Alternative 3 with Alternative 2 would have little, if any, effect on numbers of livestock-related wolf deaths. Livestock would still be present in large numbers (8,819 cow/calf pairs) throughout the allotments and readily accessible to wolves, a species well capable of locating and preying on livestock. Here again, control actions and other causes of mortality would frequently reduce wolf numbers and may cause the complete loss (one or more packs) of the species from the analysis area. Thus, the cumulative effects of Alternative 3 are strongly negative. However, the cumulative expected wolf mortalities would not affect the long-term persistence of wolves in the project area and would not impede the continued recovery of the wolf population in the Northern Rocky Mountain region.

Determination and Rationale

For the same reasons discussed in the effects analysis for wolves under Alternative 2, the implementation of Alternative 3 fully provides for the continued recovery of the species in the Northern Rocky Mountains and delisting in Wyoming, and that the effects of the alternative do not reach the threshold of concern. Despite the expected frequent removal of wolves or wolf packs, no mitigation or conservation measures by the Forest Service to reduce federal control actions are necessary or required for experimental, non-essential wolves in Wyoming, so long as populations remain above recovery targets (USFWS, personal communication,

5/21/2015). Grizzly bear conservation measure #13 (night penning of domestic sheep) will reduce wolf depredation on domestic sheep and control actions on wolves (see conservation measures for grizzly bears listed in the section on Section 7 consultations, Affected Environment).

With respect to a determination of effects made during Section 7 (Endangered Species Act) consultation with the U.S. Fish and Wildlife Service, Alternative 3 would not jeopardize the continued existence of the species. With regard to the wolf as a sensitive species, this alternative "**may impact individuals but is not likely to cause a trend to federal listing or loss of viability**".

Alternative 4 - Modified Grazing Management with Riparian Emphasis

Direct and Indirect Effects

Under Alternative 4, control actions in response to livestock depredations would continue similarly to those in Alternatives 2 and 3—removals would reduce the wolf numbers in packs (or eliminate whole wolf packs) on a short term (annual) basis, a clear adverse effect. Based on wolf population responses in the past, however, the control actions would not eliminate wolves from the area indefinitely (see analogous discussion for gray wolves, Alternative 2). Similarly to the situation for grizzly bears, a difference with Alternative 4 (versus Alternatives 2 and 3) is that the reduced maximum use of key riparian forage (35 percent) may result in a shorter grazing season for cattle in several allotments (e.g., Roaring Fork), less cattle exposure to wolf predation, and fewer wolf control actions.

The adaptive management features, management system, focus area prescriptions, and range improvements would have effects similar to those in Alternative 3. This alternative also carries the potential for occasional and minor negative disturbance-related effects of livestock management along roads and at den and rendezvous sites, but benefits for hunting wolves that use existing or new fencing when pursuing prey.

Habitat and foraging conditions for wolf prey (elk, moose, mule deer) should improve compared to Alternative 2, and with more certainty than Alternative 3, based on improved riparian function and increased forage availability (see Amphibian section- below, Booth and Hayward 2015, Robertson 2016, Wilmot 2015), especially in focus areas.

Similar to Alternatives 2 and 3, the large numbers of cattle present on allotments in Alternative 4 would provide carrion to wolves, either through predation by other predators (other wolves and bears) or through other causes of livestock death (see discussion in Alternative 2).

Cumulative Effects

The cumulative effects analysis area (temporal and spatial), cumulative actions and gray wolf mortality indicator is the same for Alternative 4 as for Alternative 1. The federal control actions on wolves is treated as a direct effect of cattle grazing within the project area, rather than as a cumulative action associated with nearby domestic sheep grazing (see cumulative effects, Alternative 1).

The cumulative effects of Alternative 4 are very similar to those for Alternative 3 because the direct and indirect effects and cumulative actions (Table 29) are nearly the same. The more conservative use of herbaceous forage by livestock in riparian and upland habitats in Alternative 4 (typically 35 percent in riparian, 50 percent in uplands) versus Alternative 3 (typically 50 percent, 50 percent) would have no effect

on numbers of livestock-related wolf deaths because livestock would still be present in large numbers (8,819 cow/calf pairs) throughout the allotments and readily accessible to wolves. Control actions and other causes of mortality would reduce wolf numbers and may cause the complete loss of packs. Thus, the cumulative effects of Alternative 4 are strongly negative. However, the cumulative expected wolf mortalities that result

from cattle depredations would not affect the long-term persistence of wolves in the project area and would not impede the continued recovery of the wolf population in the Northern Rocky Mountain region.

Determination and Rationale

Wolf control actions to abate livestock losses that are expected under Alternative 4 carry clear adverse effects to individual wolves. Alternative 4 would carry minor negative disturbance-related effects that are similar to Alternatives 2 and 3, but would also provide beneficial, habitat-related effects on wolf prey by sustaining favorable range conditions. For the same reasons discussed in the effects analysis for wolves under Alternatives 2 and 3, the expected wolf mortalities that result from livestock depredations would not affect the long-term persistence of wolves in the project area and would not impede the continued recovery of the wolf population in the Northern Rocky Mountain region, including Wyoming. Thus, the effects of this alternative do not reach the threshold of concern. Despite the frequent removal of wolves or wolf packs expected with implementation of this alternative, no mitigation or conservation measures by the Forest Service to reduce federal control actions are necessary or required for experimental, non-essential wolves in Wyoming so long as populations remain above recovery targets (USFWS, personal communication, 5/21/2015). Grizzly bear conservation measure #13 (night penning of domestic sheep) will reduce wolf depredation on domestic sheep and control actions on wolves (see conservation measures for grizzly bears listed in the section on Section 7 consultations, Affected Environment).

With respect to a determination of effects made during Section 7 (Endangered Species Act) consultation with the U.S. Fish and Wildlife Service, Alternative 4 would not jeopardize the continued existence of the species. With regard to the wolf as a sensitive species, this alternative "**may impact individuals but is not likely to cause a trend to federal listing or loss of viability**".

Canada Lynx (*Lynx canadensis*) - Threatened and Critical Habitat

The Canada lynx section presents the indicators addressed in this analysis, the existing condition and the environmental effects of each alternative on Canada lynx. Information provided in this section was summarized from the Supplemental Wildlife Specialist Report (Murphy 2016).

Indicator Used for Comparison of Alternatives

- grazing guidelines
- the primary constituent elements lynx critical habitat

Affected Environment

Habitat Requirements, Home Range, Food Habits

Canada lynx are solitary carnivores, generally occurring at low densities in boreal forest habitats of the Northern Rocky Mountains. In most of their range, Canada lynx densities and population dynamics are strongly tied to the distribution and abundance of snowshoe hare (*Lepus americanus*), their primary prey.

Foraging habitat for lynx is typically described in terms of suitability for their primary prey, snowshoe hares. Hares use young conifer stands that are densely stocked with seedlings or saplings, tall enough to provide both cover to avoid predation and browse for above typical winter snow pack (Koehler and Brittel 1990). Buskirk et al. (1999) suggested that snowshoe hare abundance should be high in sapling and old, "gap phase" forests, where tree mortality and snag loss create gaps in the mature forest canopy allowing increased understory production.

Denning habitat is defined by the presence of ground-level structures that provide security and cover for kittens. In Wyoming, two dens were located in 1998 on moderately steep slopes (36 percent) in mature

subalpine fir forest with co-dominant lodgepole pine (Squires and Laurion 2000). The natal den was located in a cave-like tree well with downed logs over the opening. The maternal den was located about 200 meters from the natal den in a depression beside a fallen tree.

Lynx may avoid recent clearcuts that are more than 100 meters wide because they lack sufficient cover (Koehler 1990). Such areas may also not be recolonized by prey species (mainly snowshoe hares) until as much as 20 to 25 years after harvest (Koehler and Brittell 1990). On a landscape scale, Canada lynx habitat includes a mosaic of late seral stands of dense old-growth forest and early seral stands that support snowshoe hare populations and that provide ideal foraging habitat (Squires et al. 2010; Berg et al. 2012).

General Habitat Conditions for Lynx in the Project Area

The best snowshoe hare and lynx denning habitat in the project area occurs on north slopes that support dense conifers and downfall, including abundant subalpine fir, a species that typically retains live and dead branches close to the ground for much of the life of adult trees. Rangelands that are classified as capable of supporting cattle grazing typically do not overlap with dense, late seral forests favored by snowshoe hares (cover) and lynx (denning) because capable lands exclude forests with < 30 percent canopy cover. Dense lodgepole pine and aspen regeneration stands promoted by fire may provide ideal habitat for snowshoe hares (Reudiger et al. 2000). Thereafter, subsequent canopy closure and self-pruning among trees reduces snowshoe hare cover and forage availability during the winter, at least until forests reach maturity and support dense cover in the understory (Reudiger et al. 2000, Squires et al. 2010; Berg et al. 2012).

Canada Lynx Occurrence and Populations on the Forest and the Project Area

Historically, documented lynx occurrences (up to 1983) in Western Wyoming were concentrated in the Wyoming Range (southwest of the project area), the Teton and Gros Ventre Ranges of the Upper Snake River (northwest), the Absaroka and Beartooth Ranges of Yellowstone National Park (north), and the Wind River Range (Reeve et al. 1986). Most observations of lynx in the Wind River Range occurred on the range's west slope (project area) and in the Togwotee Pass area (northwest of the project area). Occurrences in the Wind River Range were associated with elevations > 8,200 feet and in spruce-fir, lodgepole, and unspecified forest types (Reeve et al. 1986).

Nine individuals associated with the effort to re-establish lynx in Colorado migrated north and resided or moved through the Bridger-Teton National Forest from 2004 to 2010. There were 1,049 lynx locations on the Bridger-Teton National Forest. From 2004 to 2006, 44 total locations were recorded for 1 female that spent 2 days on the project area, and 2 males that visited for 7 and 5 days each. Locations were concentrated in the Gypsum Creek watershed, an area that supports conifer and aspen stands with high levels of horizontal cover. Few lynx locations were associated with grassland and sagebrush steppe. None of the lynx remained long enough to establish a home range.

A survey crew documenting habitat conditions for snowshoe hares during 2010 did not document lynx tracks. Surveys were conducted primarily on Pinyon Ridge (northeast Upper Green River allotment). Only a few snowshoe hare tracks were documented here and along the Green River Lakes Road, near Dollar Lake.

As of winter 2015, no lynx are known to reside on the Forest, including the project area. Bridger-Teton National Forest biologists initiated a forest-wide forest carnivore survey during winter 2014–2015 using carrion baits, cameras, and hair snares. Nine detection stations were deployed in or near (< 3 miles) the project area. As of May, 2015, lynx had not been detected.

Management Direction

A final rule listing a distinct population segment of the Canada lynx as a threatened species in the contiguous United States was issued on March 24, 2000 (U.S. Fish and Wildlife Service 2000). The Forest Service

signed a Lynx Conservation Agreement with the USFWS in 2001 to consider the Canada Lynx Conservation Assessment and Strategy (Ruediger et al. 2000) during project analysis and agreed to not proceed with projects that would be “likely to adversely affect” lynx until forest plans were amended. The agreement was renewed in 2005 and amended in 2006 to define occupied habitat and identify national forests that were occupied. The agreement was extended for 5 years, or until all relevant forest plans were revised to include guidance necessary to conserve lynx. The assessment was revised in 2013 (Interagency Lynx Biology Team 2013).

Lynx analysis units were delineated across the Bridger-Teton National Forest under direction of the original Lynx Conservation and Assessment Strategy (Ruediger et al. 2000). The project area overlaps 6 analysis units (Big Twin-Middle Beaver, Big Twin East, Big Twin West, Fish Creek South, Roaring Fork West, and Upper Gros Ventre South LAU). By design, the analysis units provided the appropriate scale to evaluate and monitor effects of forest management actions on lynx habitat.

An understanding of the condition of lynx habitat in the units overlapped by the project area is relevant to understanding the effects of grazing within the project area at a broad spatial scale. Timber stands are reduced to stand initiation stages (ages 0–30 years; also called early succession or forests "unsuitable" for foraging) through timber sales, fuel reduction projects, wildlife (ungulate) habitat improvement projects, and natural disturbances (e.g., wildfire). In Western Wyoming, many such stands (but see Berg et al. 2012) may be of less value to snowshoe hares and lynx than mature and old-growth forests.

The Northern Rockies Lynx Management Direction Record of Decision (USFS 2007) provided management direction to national forest units to conserve and promote the recovery of lynx in the Northern Rockies Ecosystem. This document was based upon science and recommendations in the “Ecology and Conservation of Lynx in the United States (Ruggerio et al. 2000), the Canada Lynx Conservation Assessment and Strategy (as above), and other publications. Plans and projects that incorporate the standards and guidelines in the direction are not expected to have adverse effects on lynx and contribute to the conservation of the species. The direction was incorporated into the Bridger-Teton Forest Plan as amendment # 13. Several standards (S1, S2, S5, and S6) in the direction seek to limit the anthropogenic conversion of lynx habitat to stand initiation stages through vegetation management, but do not apply specifically to grazing (USFS 2007). For example, the desired long-term coverage of stand initiation stages under S1 is < 30 percent. The coverage of stand initiation stages among the lynx analysis units that overlap the project area is 7 percent overall. The coverage for only one unit (Big Twin East LAU) approaches 30 percent while the other five lynx analysis units’ area of stand initiation are less than 7 percent.

Of the 101,061 acres of mapped lynx habitat within the six allotments that comprise the project area, 12,465 (12 percent) occur on sites that are capable of cattle grazing. No mapped lynx habitat occurs in the livestock driveway and the Wagon Creek Allotment.

Livestock management's greatest potential effects on lynx and snowshoe hares are through its impacts on the coverage, physical structure, and successional stage of vegetation, with focus on shrubs and deciduous trees such as aspen. With respect to the effects of livestock management, the direction provides one objective and four guidelines concerning the effects of livestock on lynx habitat, and one guideline concerning its effects on linkage (connectivity) of habitats. There are no standards that apply to grazing. The grazing objective is to maintain or improve lynx habitat. The grazing guidelines call for the management of livestock grazing (1) so as to provide for the shrub and tree regeneration in fire and harvest-created (timber) openings; (2) to facilitate aspen health and sustainability; and (3 & 4) to maintain late mid or late seral riparian and shrub-steppe communities, similarly to conditions that would have occurred under historic disturbance regimes. The intent of the linkage guideline is to maintain a preponderance of mid- or late-seral stages in shrub-steppe habitats. In context with grazing, the direction defines mid-seral stages as the midpoint of succession for the plant community as it moves from bare ground to climax. For the definition that concerns riparian areas, willows

or other shrubs have become established at mid-succession. For shrub-steppe habitats, shrubs associated with climax are present and increasing in density.

In February 2009, the U.S. Fish and Wildlife Service designated revised critical habitat for the contiguous United States distinct population segment of Canada lynx (USFWS 2009). In 2014, the Service revised the distribution of critical habitat (USFWS 2014), but the revision did not affect the distribution of mapped critical habitat identified in 2009 for the Upper Green River watershed. The project area occurs within the 9,500-mi^2 Greater Yellowstone Unit # 5. For purposes of Section 7 (Endangered Species Act) consultation with the U.S. Fish and Wildlife Service, lynx critical habitat is considered separately from lynx habitat mapped and managed in accordance with the Canada lynx Conservation and Assessment Strategy (Ruediger et al. 2000) and the Northern Rockies Lynx Management Direction Record of Decision (USFS 2007).

The primary constituent elements of lynx critical habitat as defined by the U.S. Fish and Wildlife Service (2009, 2014b) include (1) the presence of snowshoe hares and their preferred habitat (boreal and similar forests in a mosaic of successional stages); (2) winter snow conditions that are generally deep and fluffy for extended periods of time; (3) sites for denning that have abundant coarse woody debris, such as downed trees and root wads; and (4) matrix habitat (e.g., hardwood forest, dry forest, non-forest, or other habitat types that do not support snowshoe hares) that occurs between patches of boreal forest and that support lynx travel. Federal actions such as grazing adversely affect lynx critical habitat if they reduce the quality or quantity of the primary constituent elements.

In 2011, the Forest Service completed Section 7 (Endangered Species Act) consultation concerning the effects of the livestock management in the project area, and nearby allotments, on lynx and lynx habitat (USFS 2010, USFWS 2011). The Service concurred with the "**may affect, not likely to adversely affect**" determination by the Forest Service for grazing in the project area under current management. The finding was based primarily on the rarity of lynx in the project area (lack of disturbance effects), and limited foraging and trailing by livestock in typical snowshoe hare and lynx habitat in forests that are unsuited to cattle grazing. In the same biological assessment, the Forest Service also determined that current management of livestock grazing in the project area "**may affect, but is not likely to adversely affect lynx critical habitat**".

Biological Assessment

In 2010, the Forest Service initiated Section 7 (Endangered Species Act) consultation with the U.S. Fish and Wildlife Service concerning the effects of livestock management in the project area, and nearby allotments, on lynx and critical lynx habitat (biological assessment: U.S. Forest Service 2010). The U.S. Fish and Wildlife Service concurred with the Forest Service's "**may affect, not likely to adversely affect**" determinations for lynx and lynx critical habitat (concurrence letters: U.S. Fish and Wildlife Service 2011b, 2011c). The finding was based primarily on the rarity of lynx in the project area (lack of disturbance effects), and limited foraging and trailing by livestock in typical snowshoe hare and lynx habitat in forests that are unsuited to cattle grazing. The consultation and concurrence remain in effect for current management.

Environmental Consequences

Effects Indicator, Management Objective, and Threshold of Concern

The effects indicator was the number of grazing guidelines met by the alternative, with the objective that consistency with all four guidelines was achieved. The threshold of concern was the overall consistency with the Northern Rockies Lynx Management Direction, based on the aggregate of effects for the alternative. Alternatives that were consistent with the Direction were also consistent with the Bridger-Teton Forest Plan because the Direction is a Forest Plan amendment. The effects indicator for lynx critical habitat was whether

or not the alternative caused negative effects on a primary constituent element of critical habitat. The threshold of concern was whether or not there were adverse effects on any of the elements.

Alternative 1 – No Livestock Grazing (No Action Alternative)

Direct and Indirect Effects

Grazing guidelines and adverse effects on lynx critical habitat: This alternative meets the objective and four grazing guidelines identified in the Northern Rockies Lynx Management Direction. The existing effects of herbivory on herbaceous vegetation carried by livestock grazing and trailing in the project area would be eliminated. Similarly, the threshold of lynx critical habitat would not be reached because there would be no adverse effects on the primary constituent elements.

There would be few, if any, direct and indirect effects of livestock grazing on lynx in this alternative. Any existing disturbance-related effects on lynx due to livestock management operations such as herding; range improvement work; and use of support vehicles, rider cabins, and facilities would be eliminated as term grazing ceases two years after cancellation. The limited use of motorized vehicles such as trucks and four-wheelers to access and remove approximately 62 miles of fence over 10 years could disrupt vital activities and displace lynx from their habitat. However, lynx seldom occur in the project area (see Affected Environment for Canada lynx), fencing tends not to occur in dense forests favored by the species, and fence removal activities would be localized (along fences) and very short-term (hours to a few days). Removal of fences would be managed by the Pinedale Ranger District so as not to damage vegetation and lynx habitat. Removal of water developments, water crossing structures, and support cabins would improve riparian habitats and reduce disturbance effects over the long-term.

Cumulative Effects

The indicator and threshold of concern for the cumulative effects was whether or not they collectively met the requirements, or at least the intent, of all the applicable objectives, standards, and guidelines in the Northern Rockies Lynx Management Direction. For example, the compliance of past and present timber sales was evaluated with the Direction's vegetation management section. Some cumulative actions were not addressed by the Direction, so their compliance was not evaluated. In these cases the action's favorable or unfavorable contribution toward lynx or lynx habitat was evaluated. To define the temporal scope of the analysis, 30 years before present to the end of the proposed grazing permit (about 2025) was used. Silvicultural treatments convert forests to stand initiation stage for approximately 30 years, with effects on woody browse and cover available extending to the present and future. The cumulative effects analysis area was limited to the collective lynx analysis units that overlapped the project area (Big Twin-Middle Beaver, Big Twin East, Big Twin West, Fish Creek South, Roaring Fork West, and Upper Gros Ventre South lynx analysis units). These units are the standard units of analysis identified in the direction for evaluating typical forest management activities that affect lynx habitat (USFS 2007). They only occur on federal lands.

The effect of the cumulative actions on the principal constituent elements of lynx critical habitat was also evaluated. Critical habitat is continuous across the eastern portion of the Forest, including all of the cumulative effects analysis area. The indicator, objective, and threshold of concern for critical habitat in this analysis was the same as for the direct and indirect effects, that is, the presence of an adverse effect on any of the primary constituent elements.

The cumulative actions carried a mix of compensating positive and negative effects on mapped lynx habitat and lynx critical habitat. Thirty-four total timber sales, thinning projects, and fuel reduction treatments (1,603 total acres within the lynx analysis units) reduced the coverage of mature multi-storied forests that provide winter food for snowshoe hares, lynx denning habitat, and horizontal cover. These projects negatively affected the coverage of multi-story, boreal forests and denning habitat, two of four primary constituent

elements. However, inspection of aerial photos indicated good regeneration in these areas, apparently due to seedling planting, a benefit to snowshoe hares and lynx. Overall, the collective timber sales and fuels reduction projects were neutral for lynx habitat because of the favorable existing condition of the lynx analysis units and because of the small coverage (1,603 acres) of treatment activity relative to all (186,658 acres) mapped lynx habitat.

The benefits of fire suppression to lynx and snowshoe hares at the landscape scale also varied. Fire suppression was detrimental to seral aspen stands that are regenerated and maintained by fire and other disturbance. Long-term, fire suppression (ongoing) maintained snowshoe hare and lynx habitat components across the lynx analysis unit by reducing the extent of high intensity wildfires that consume mature, multi-story conifer forests and (occasionally) willow stands. However, fire suppression was not always successful and some were allowed to burn in support of Forest Plan objectives. Since 1985, wildfires consumed 11,073 acres, with some areas burned at high intensity (aerial photos). In this analysis, aerial photos indicated poor regeneration of burned areas. In some cases, intense stand-replacing fires also triggered development of dense conifer regeneration that supports high densities of snowshoes, a benefit to lynx (Berg et al. 2012). Based on these considerations, wildfire suppression was regarded as neutral in its effect on lynx habitat.

Cattle grazing in 9 allotments inside the lynx analysis units, but outside the project area, covered 86,268 acres. These ongoing actions had effects similar to those associated with the existing conditions in the project area, were collectively consistent with the Northern Rockies Lynx Management Direction, and carried no adverse effects on the primary constituent elements. Domestic sheep grazing in the allotments next to the project area carried little negative effect on mapped lynx habitat (met the grazing guidelines) and the primary constituent elements because sheep forage primarily on herbaceous vegetation in meadows, aspen, and willow communities; and with little effect on woody vegetation that extends above snowpack. Woody vegetation provides the principal source of food and cover for snowshoe hares during the winter (Interagency Lynx Biology Team 2013). Herbaceous vegetation was less important because it was typically covered by snow (2–6 feet deep) in this region. Domestic sheep also make little use of dense conifer forests in the project area, habitat favored by snowshoe hares and lynx. In general, grazing or browsing by domestic livestock on federal lands is unlikely (under moderate or light grazing intensity) to reduce the snowshoe hare prey base or have a substantial effect on lynx (Interagency Lynx Biology Team 2013). Thus, livestock grazing was treated outside the project area as a neutral in its effects.

Elk herbivory on willows and other shrubs reduced willows and other shrubs available as food to snowshoe hares near the Green River Lake feedground. This area supported riparian zones that were functioning at risk (see Riparian Areas section in this DEIS and Robertson 2016) and that did not meet the riparian guideline for grazing, a clear negative effect at the local scale.

Recreational activities, suppression of actively burning fires, and road maintenance activities (proposed gravel pit and road work) eliminate habitat, disturb lynx if present, and reduce habitat effectiveness. These effects were minor, however, because the activities were local scale and because lynx were rare in the area. Climate change during the permit planning period (through 2025) would contribute to a reduction in the coverage of deep, fluffy snow (primary constituent element) needed by lynx during the winter.

In sum, the cumulative actions were neutral overall with regard to compliance with the Northern Rockies Lynx Management Direction, and with regard to their effect on the primary constituent elements. Alternative 1 would not result in adverse cumulative effects on lynx habitat identified in the direction or lynx critical habitat because it contributes no important negative direct and indirect effects to the analysis, and because the effects of the cumulative actions were neutral.

Determination and Rationale

Alternative 1 is consistent with the Northern Rockies Lynx Management Direction (U.S. Forest Service 2007) and carries no adverse effects on the primary constituent elements of lynx critical habitat. Thus, the effects of Alternative 1 do not cross the threshold of concern. This determination is based on the absence of human-caused lynx disturbance and herbivory-related effects of livestock on lynx habitat identified in the management direction, and the absence of effects on the primary constituent elements of lynx critical habitat. Among the four alternatives, this alternative contributes most favorably toward desired habitat conditions for snowshoe hares and lynx in the project area. With respect to a determination of effects made during Section 7 (Endangered Species Act) consultation with the U.S. Fish and Wildlife Service, Alternative 1 "**may affect but is not likely to adversely affect**" the Canada lynx and its critical habitat.

Alternative 2 - Grazing as Currently Permitted and Current Management

Direct and Indirect Effects

Grazing guidelines and adverse effects on lynx critical habitat: Although grazing or browsing by domestic livestock on federal lands would be unlikely to have a substantial effect on lynx, grazing could have an indirect impact on lynx by reducing prey such as the snowshoe hare, a cover-dependent species (Ruediger et al. 2000, Interagency Lynx Biology Team 2013). This effect occurs primarily through livestock herbivory and trailing in willow and aspen communities, habitats also used by snowshoe hares for browsing during the winter. Cattle use of herbaceous forage in riparian zones at maximum permitted use (typically 65 percent) would cause cattle to increasingly use current annual growth of willows as a food alternative, reducing forage (stems) and cover available to snowshoe hares. Cattle begin using willows for food when herbaceous use reaches 45 percent (Kovalchik and Elmore 1992) or a 3-inch stubble (Hall and Bryant 1995). This effect would increase when poor precipitation during spring, summer, and early fall leads to reduced production of herbaceous forage. At 65 percent herbaceous use, similar effects on aspen are expected as well, as this species is preferred forage for livestock (DeByle 1985).

That only 44 percent (170,643 acres) of the project area is capable and suitable for cattle grazing helps compensate for this negative effect. None-the-less, two out of four grazing guidelines in the Northern Rockies Lynx Management Direction would not be met because grazing on cattle-capable project lands would still occur over a substantial area—8,470 acres of aspen and aspen-conifer mix, and 5,699 acres of willow within 100 yards of mapped lynx habitat.

Based on the discussion above, high levels of riparian use in this alternative would cause adverse effects on winter snowshoe hare foraging habitat (willows and aspen, particularly near dense conifers), a primary constituent element of lynx critical habitat. It would not affect denning habitat for lynx; sites capable and suitable for cattle use typically do not include dense forests with heavy woody material favored by lynx denning. Matrix (travel) habitat would not be affected because no impediments to lynx travel would occur. Fences in the allotments would be wildlife friendly (highly permeable), and range improvements and facilities (e.g., herder cabins) would be too small to impede lynx travel. Wildlife-friendly fences were not identified in the Lynx Conservation and Assessment Strategy (Interagency Lynx Biology Team 2013) as risk factors that impede lynx movement. Thus, this alternative does not affect lynx matrix habitat. It would have no effect on the availability of deep snow because livestock grazing would not be present during the winter.

Under existing conditions (current actual use), cattle use of herbaceous forage in nearly all the allotments is sufficiently light (consistently ≤ 37 percent; see Chapter 2, DEIS; Booth and Hayward 2015, and Riparian Conditions in Murphy 2016) that grazing effects on willow and aspen communities would be minor (Kovalchik and Elmore 1992, Hall and Bryant 1995). At this grazing intensity, the alternative is consistent with the management direction and would have no adverse effects on critical habitat.

Several design features, range improvements, and focus area prescriptions (Waterdog Lakes, Wagon Creek) that would occur in Alternative 2 would improve riparian and upland function, a benefit to lynx and lynx prey. In contrast, season-long grazing in several allotments would not be as supportive of riparian and upland function as rotation systems used elsewhere and/or in the other grazing alternatives.

This alternative could carry disturbance effects on lynx that travel through the area, and that encounter livestock management operations such as herding, range improvement work, and support vehicles. Seventy-six miles of livestock fence that requires occasional maintenance (about 10 miles per year) would be accessed primarily using horses, with little chance of disturbance to lynx by motorized vehicles. Lynx occasionally use the project area as a travel corridor between favorable habitats in the Wyoming Range and more northerly habitats in the Yellowstone Ecosystem, including the project area (Squires and Oakleaf 2005). However, any of the potential disturbance-related effects discussed above would be both unlikely to occur due to lynx rarity, and insignificant because the intensity of disturbance (motorized vehicles mostly along roads, and associated with herders travelling on horseback) would be low and unlikely to occur in dense forests typically used by lynx.

Cumulative Effects

For the analysis of cumulative effects for Alternatives 2, 3, and 4, the same indicators were used, thresholds of concern, spatial bounds, and temporal bounds that were used for Alternative 1, following the same reasoning.

The cumulative effects of this alternative under maximum use exceed the threshold of concern—consistency with the Northern Rockies Lynx Management Direction—because (1) the direct and indirect effects themselves exceed the threshold (two out of four grazing guidelines are not met in the project area), and (2) the cumulative actions are neutral in the aggregate, that is, do not compensate for the direct and indirect effects. In addition, implementation of the alternative would have adverse cumulative effects on the primary constituent elements of lynx critical habitat in the project area.

Determination and Rationale

Because two out of four grazing guidelines (U.S. Forest Service 2007) would not be met under conditions of maximum permitted use (65 percent forage utilization in riparian/meadow areas), this alternative exceeds the thresholds of concern — consistency with the Northern Rockies Lynx Management Direction (U.S. Forest Service 2007) and adverse effects on the primary constituent elements of lynx critical habitat. Thus, implementation of Alternative 2 does not provides for the recovery of lynx and does not maintain or improve lynx critical habitat. Alternative 2 is the least desireable among the four alternatives with regard to its ability to conserve lynx habitat. With respect to a determination of effects made during Section 7 (Endangered Species Act) consultation with the U.S. Fish and Wildlife Service, Alternative 2 "**may affect, and is likely to adversely affect the Canada lynx**". Alternative 2 "**may affect but is unlikely to adversely affect lynx critical habitat**". This determination was appropriate because the spatial extent of the project area (170,643 acres) is limited in comparison to that of 9,500-square mile Greater Yellowstone Unit # 5, essentially the entire Yellowstone Ecosystem.

Alternative 3 - Modified Grazing Management

Direct and Indirect Effects

Grazing guidelines and adverse effects on lynx critical habitat: The grazing objective and all four grazing guidelines for lynx management in the Northern Rockies Lynx Management Direction would be met, and no adverse effects on lynx critical habitat would occur. Alternative 3 reduces allowable use of key herbaceous forage to 50 percent (typical) in both upland and riparian areas, a level more favorable than Alternative 2

which allows 60 percent and 65 percent use, respectively. Here, the application of adaptive management features and the requirement for 4-inch or 6-inch minimum stubble heights at the greenline would limit herbaceous use and negative effects on riparian function. However, the coverage, recruitment, and age structure of willow and aspen communities would be negatively affected where and when use reaches the maximum allowable, as cattle begin using willows when 45 percent of herbaceous forage is consumed (Kovalchik and Elmore 1992, Hall and Bryant 1995).

Alternative 3 also modifies the existing grazing management to improve resource conditions in focus areas, sites that are currently not meeting desired conditions. Improvements would be attained through reductions in allowable use of key herbaceous forage, stubble height minimums, limits on stream bank alteration, range improvements, and other conservation measures. At a landscape scale, all the above changes would maintain or improve conditions for habitat identified in the Northern Rockies Lynx Management Direction. Because only 44 percent of mapped lynx habitat in the project area is capable of supporting cattle grazing, the effects of cattle herbivory on lynx habitat would be limited.

Livestock management in this alternative may carry negative effects on one primary constituent element of lynx critical habitat—snowshoe hare habitat provided by aspen and willow communities—when use of key herbaceous forage nears the 50 percent maximum. However, the limited acreage of cattle-capable grazing area and the measures that limit livestock use of herbaceous forage (see above) reduces adverse effects. Thus, the negative effects of livestock grazing in willow and aspen communities would not rise to the level of an adverse effect on the primary constituent elements.

This alternative carries numerous adaptive management features, changes in management systems in some allotments (to rotational grazing), and range improvements, that protect or benefit ecological function in riparian and upland areas, and thus improve habitat for lynx and lynx prey over existing conditions.

Disturbance effects on lynx are essentially the same here as in Alternative 2—insignificant due to low severity, and highly unlikely to occur because lynx are rare in the project area and typically would not occur in open rangelands where livestock grazing and management operations are most likely to occur.

Cumulative Effects

No adverse cumulative effects result from this alternative because compliance with the objective and guidelines for grazing in the Northern Rockies Lynx Management Direction is achieved and the net effect of the cumulative actions is neutral (see analysis of the cumulative actions in Alternative 1).

Determination and Rationale

Because the objective (Graz O1) and all four grazing guidelines for lynx management in the Northern Rockies Lynx Management Direction (U.S. Forest Service 2007) would be met, and due to the absence of adverse effects on lynx critical habitat, the threshold of concern would not be reached if this alternative were implemented. These calls are consistent with the conclusion in the Lynx Conservation and Assessment Strategy (Interagency Lynx Biology Team 2013) that grazing or browsing by domestic livestock on federal lands is unlikely to reduce the snowshoe hare prey base or have a substantial effect on lynx. Implementation of Alternative 3 provides for the recovery of lynx and maintains or improves lynx critical habitat. Thus, the effects of the alternative do not exceed the threshold of concern, that is, they are consistent with the intent of the management direction and do not carry adverse effects on lynx critical habitat. With respect to a determination of effects made during Section 7 (Endangered Species Act) consultation with the U.S. Fish and Wildlife Service, Alternative 3 "**may affect, but is not likely to adversely affect"** the Canada lynx and its critical habitat.

Alternative 4 - Modified Grazing Management with Riparian Emphasis

Direct and Indirect Effects

Grazing guidelines and adverse effects on lynx critical habitat: This alternative meets the objective and four grazing guidelines in the management direction and carries no adverse effects on the primary constituent elements of lynx critical habitat. Among the three grazing alternatives, implementation of Alternative 4 would most maintain or improve lynx habitat because key forage use by cattle is reduced to 35 percent (typical) in riparian areas. This level would not result in browsing of willows (Kovalchik and Elmore 1992, Hall and Bryant 1995), aspen, and other shrubs and trees in early seral communities that provide foraging habitat and cover for snowshoe hares. Similarly to Alternative 3, this alternative also carries beneficial adaptive management features such as stubble height minimums (4-inch or 6-inch), adaptive management features, tailored prescriptions for focus areas, reductions in permitted numbers of cattle (270 head in one allotment), and other measures that help insure proper use of herbaceous forage and reduce cattle browsing riparian areas and uplands.

This alternative carries nearly the same adaptive management features, changes in management systems and range improvements as Alternative 3, measures that improve habitat for lynx and lynx prey by protecting or benefiting ecological function in riparian and upland areas. Similar to the other grazing alternatives, disturbance effects on lynx would be minor.

Cumulative Effects

No adverse cumulative effects would result from implementation of this alternative. Owing to light grazing in riparian zones, this alternative's direct and indirect effects are consistent with the objective and guidelines for grazing in the Northern Rockies Lynx Management Direction and carry no adverse effects on lynx critical habitat. This positive effect combines with cumulative actions that are neutral in the aggregate (see analysis of the cumulative actions in Alternative 1).

Determination and Rationale

Alternative 4 does not reach the threshold of concern because it meets the objective (Graz O1, U.S. Forest Service 2007) and four grazing guidelines in the management direction, and carries no adverse effects on the primary constituent elements of lynx critical habitat. Thus, implementation of Alternative 4 provides for the recovery of lynx and maintains or improves lynx critical habitat. Owing to light use of herbaceous forage in riparian zones, this alternative best protects woody cover and forage available to snowshoes hares during the winter. With respect to a determination of effects made during Section 7 (Endangered Species Act) consultation with the U.S. Fish and Wildlife Service, Alternative 4 "**may affect but is not likely to adversely affect**" the Canada lynx and its critical habitat.

North American Wolverine (*Gulo gulo*) - Sensitive

This section presents the indicators addressed in this analysis, the existing condition and the environmental effects of each alternative on wolverines. Information provided in this section was summarized from the Supplemental Wildlife Report (Roberts 2016).

Indicator Used for Comparison of Alternatives

- Potential for grazing-related management actions to directly cause death or injury to wolverines

Affected Environment

Wolverines occur at low densities within a wide variety of alpine, boreal, and arctic habitats, including boreal forest, tundra, and montane forests. They do not appear to specialize on specific vegetation or geological

habitat aspects, but instead select areas that are cold and receive enough winter precipitation to reliably maintain deep persistent snow late into the warm season (Copeland et al. 2010). Based on current knowledge of occupied habitat and animal densities, wolverines in the contiguous United States number approximately 250–300 individuals. The bulk of the current population occurs in the northern Rocky Mountains. Subalpine forest and alpine habitat in this area is naturally fragmented, producing wolverine populations that are small and isolated (Aubry et al. 2007, Ruggierio et al. 2007). Risks to wolverines include loss of habitat connectivity, mortality due to trapping or poisoning and change or loss of habitat due to climate warming. The wolverine is *proposed* for listing under the Endanger Species list. Please see the Supplemental Specialist Report (Roberts 2016) for more detail on wolverine status, natural history, and threats to the species.

Wolverine sightings have been reported recently in the Upper Green River project area (unpublished data, Inman, April 2015). The Upper Green may serve as a key landscape connection for wolverine movements between the Absaroka, Gros Ventre, and Wind River Ranges. The project area is also a functional part of the Greater Yellowstone region predicted to retain relatively large contiguous blocks of snow cover under multiple climate change scenarios, thereby providing one of the more important parcels of wolverine habitat in the Lower 48 (McKelvey 2011). Given the relative importance of individuals and especially breeding females to the overall wolverine population in the region, a single breeding individual on the Forest or in the Greater Yellowstone Area could contribute significantly to genetic exchange and positive population trends in adjacent regions.

Environmental Consequences

Alternative 1 – No Livestock Grazing (No Action Alternative)

Direct and Indirect Effects and Determination

Because no wolverine losses are expected to occur due to management actions in this alternative, there would be no negative effects on the local population or at the scale of the Greater Yellowstone Ecosystem. The determination for wolverines under Alternative 1 is "**no effect**."

Action Alternatives - Alternatives 2, 3 and 4

Direct and Indirect Effects

All of the action alternatives involve similar levels of management activities related to grazing, with similar minor potential for disturbance to individual wolverines, and carry similar potential risks to wolverines regarding incidental harm or death due to management removal trapping of other species. Due to the low density of wolverines in the watershed and surrounding areas, such occurrences might be rare, but could result in loss of a wolverine, possibly a denning female, and possibly the only one in the watershed. Because there are very few wolverines on the Forest, the loss of a single individual would be substantial for the planning unit because the loss would account for a large fraction of individuals. The only known locations of wolverines on the Forest are the Upper Green River watershed/Bridger Wilderness, Togwotee Pass area, and Teton Wilderness.

Cumulative Effects for Action Alternatives

The Upper Green River watershed is the spatial scale appropriate to define the boundaries of the cumulative effects area for wolverines. The principal human-related actions that potentially negatively affect wolverines in the Upper Green River watershed are effects on snowpack and summer temperatures related to climate change, incidental trapping during predator control trapping in response to livestock/canine conflicts, the potential for being shot or trapped during other legal hunting efforts, and human-caused disturbance associated with snowmobile-based recreation or management activities during winter (USFWS 2010).

Climate change effects wolverines by reducing snowpack needed for denning during winter and early spring, by increasing summer temperatures beyond the species' physiological tolerance, or reducing the long-term acreage of high-elevation ecosystems upon which wolverines depend (U.S. Fish and Wildlife Service 2012). Climate change likely operates to degrade wolverine habitat in the Greater Yellowstone Ecosystem, including the Upper Green River watershed, but little is known about its effects on denning, foraging, and sheltering of individuals or populations (U.S. Fish and Wildlife Service 2010).

Snowmobile traffic (recreational and administrative) commonly occurs from December to March along the main Upper Green River Road, with trips extending from the Forest boundary to Green River Lakes, and to Union Pass, Gunsight Pass, and the Upper Gros Ventre watershed. Snowmobile trails are restricted to designated routes where they cross ungulate winter range at low elevations and along the main road, but off-trail activity is permitted, particularly at high elevations. Snowmobile activity is not permitted in the Wilderness areas.

Snowmobile recreation and backcountry skiing potentially carries a negative effect on wolverine fitness, foraging, and denning, but little is known about how the species responds to machine noise and human presence.

Determination for Action Alternatives (Alternative 2, 3, and 4)

All of the action alternatives carry similar risk of incidental trapping resulting in harm or death of one or more wolverines as a result of livestock-related conflict-response management actions. The status of wolverine populations on the Bridger-Teton National Forest is largely unknown, so it is difficult to evaluate the effect of the loss of a wolverine or denning female in this area on Forest population viability. However, because there likely are so few wolverines on the Forest, the loss of even a single individual, especially a breeding adult or female, could be substantial. With such a low density of individuals, however, there is also a low probability of incidental trapping due to management actions, given the limited extent and timing of such activities, and if agency protocols are followed, to minimize incidental capture of non-offending animals. Loss of a single wolverine in the project area would not necessarily compromise viability on the Forest scale. Thus, the determination for the action alternatives (2-4) is "**not likely to jeopardize continued existence**" of wolverines on the forest (critical habitat has not been proposed).

Amphibians: Boreal Toad, Columbia Spotted Frog, and Boreal Chorus Frog

The amphibian section presents the indicators addressed in this analysis, the existing condition and the environmental effects of each alternative on northern boreal toads, Columbia spotted frogs and boreal chorus frogs. Information provided in this section was summarized from the Supplemental Wildlife Specialist Report (Murphy 2016).

Indicators Used for Comparison of Alternatives

- Riparian function (properly functioning condition)
- Retention of herbaceous vegetation

Methodology and Data Sources

Methods for evaluating riparian function were presented in the Riparian Areas section, Fisheries section, and Rangeland Vegetation section.

Methods and results for estimating herbaceous retention were provided in detail in U.S. Forest Service (2015) and summarized here. In 2013 and 2014, herbaceous retention studies were conducted at sites that were readily accessible to cattle (subjectively chosen), within riparian zones and within amphibian breeding

areas (Figure 72). Four sites in 2014 were chosen at random within amphibian breeding zones. These studies supplemented utilization data provided in the Rangeland Resources Specialist Report (Booth and Hayward 2015) which provided utilization data that were collected throughout several different allotments and at sites not specific to amphibian breeding areas. The 2013 and 2014 studies were important because they enabled estimates of herbaceous retention to be made, using linear regression (Figure 73), at the different levels of maximum key forage utilization permitted in the grazing alternatives. The estimated levels of herbaceous retention were compared across the alternatives and to the 70 percent herbaceous retention indicator.

Forage utilization (use) is the percentage of the annual forage production that has been removed by animals throughout a grazing period or season (Stoddard et al. 1975). Total herbaceous retention is the current year's production of all herbaceous vegetation on a given site that is not consumed or trampled by grazing animals. For this project, herbaceous retention is measured as a percentage of weight and is calculated as 100 percent vegetation production minus total vegetation used. In this case, the measurement of utilization was made after the grazing season. This is differentiated from key forage utilization (use) which is the percentage of key forage removed by herbivores. "Key" forage identified for this project was site-specific, and typically consisted of sedges (various), Idaho fescue and tufted hair grass. Key forage use is of interest to managers because it affects rangeland condition. Total herbaceous retention is of particular interest to wildlife managers because it indicates cover and food at ground level available to species such as amphibians, mammals, and birds. Sites with a history of heavy grazing that reduces the availability of key forage are expected to have retention values that are about 100 percent minus the percent key forage use because little key forage is available for livestock (Smith et al. 2007). In contrast, sites with an abundance of key forage plants are expected to show retention values that are disproportionately higher.

The average key forage use for the 11 measurements at mesic meadows (with sparse willow) was highly variable, averaging 33 percent. Average total herbaceous retention was 62 percent. These values included two measures of key forage use in meadows that were negative (no apparent grazing) and one measure of retention that exceeded 100 percent (no herbaceous offtake). As expected, retention was negatively related to use of key forage (Figure 73). Key forage accounted for much (R^2 = 71 percent) of the variation in total herbaceous retention in linear regression. The regression suggested that total herbaceous retention could be reasonably estimated simply as 100 percent minus key forage use, as moist meadows typically included little biomass of highly palatable key forage and supported primarily coarse sedges.

Average key forage use for seven measurements in shrubby cinquefoil and silver sage was also highly variable, averaging 37 percent. Average total herbaceous retention was 53 percent. There was no relationship found between key forage use and retention in silver sage and shrubby cinquefoil communities, as indicated by a flat regression line and a low R^2 (< 1 percent) value.

Assumption

The assumption was made that achieving 70 percent total herbaceous retention in moist meadow-sparse willow riparian areas would provide for a similar or greater level of retention in dry riparian (silver sage and shrubby cinquefoil), dense willow, and upland habitats dominated by herbaceous vegetation. Given the opportunity, cattle spend a disproportionate amount of time (up to 30 times higher) in riparian habitats as compared to adjacent, dry uplands (Clary and Webster 1989). This assumption would require verification if herbaceous retention was monitored to gauge amphibian habitat conditions during implementation of a grazing alternative.

Incomplete and Unavailable Information

Surveys were not completed for all species to determine the status of populations or habitat in the project area. Sample sizes supporting some population and habitat analyses were limited due to constraints on manpower and resources.

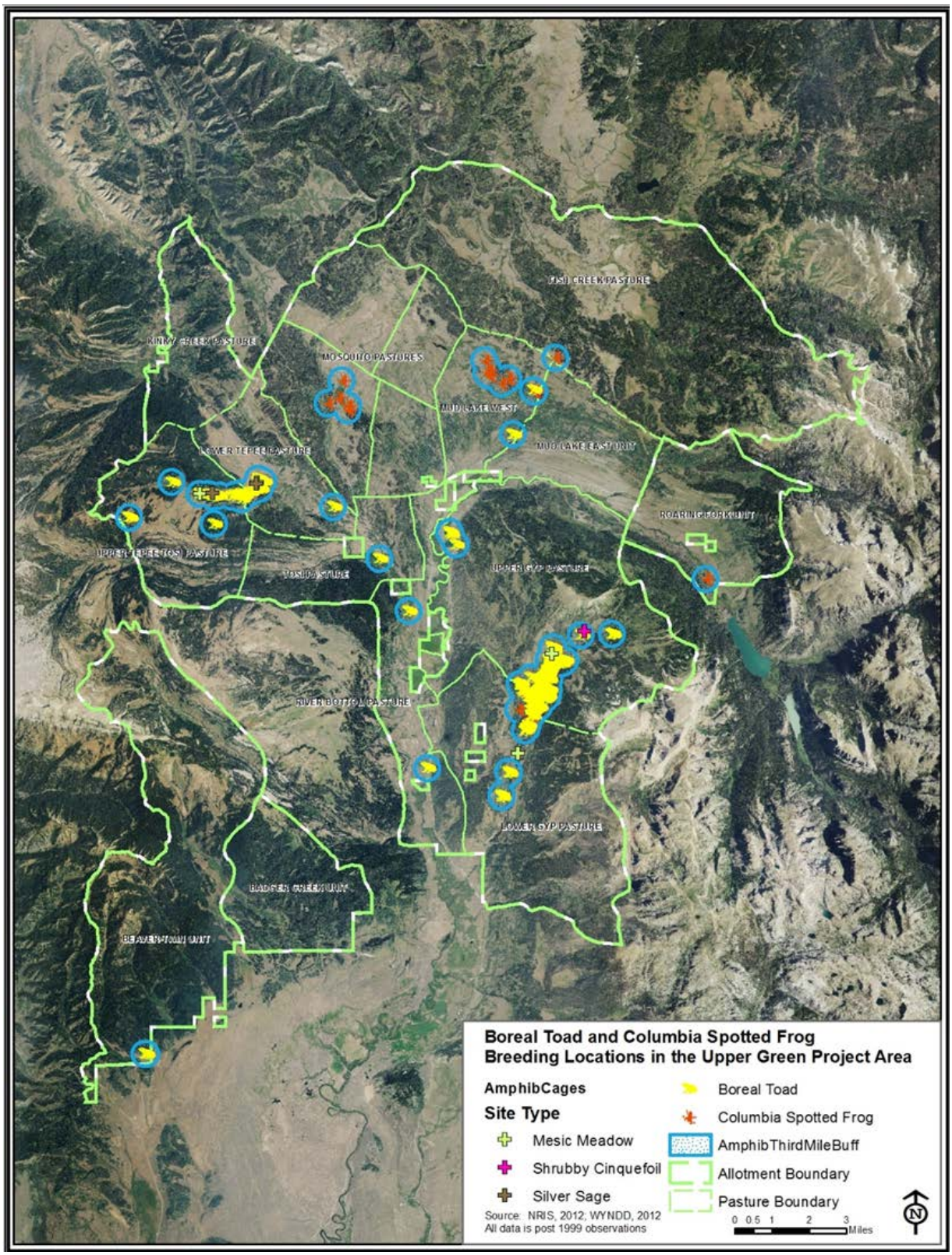

Figure 72. Breeding sites, breeding zones buffered by ⅓ mile buffer, and grazing utilization (cage) monitoring sites in the Upper Green River project area

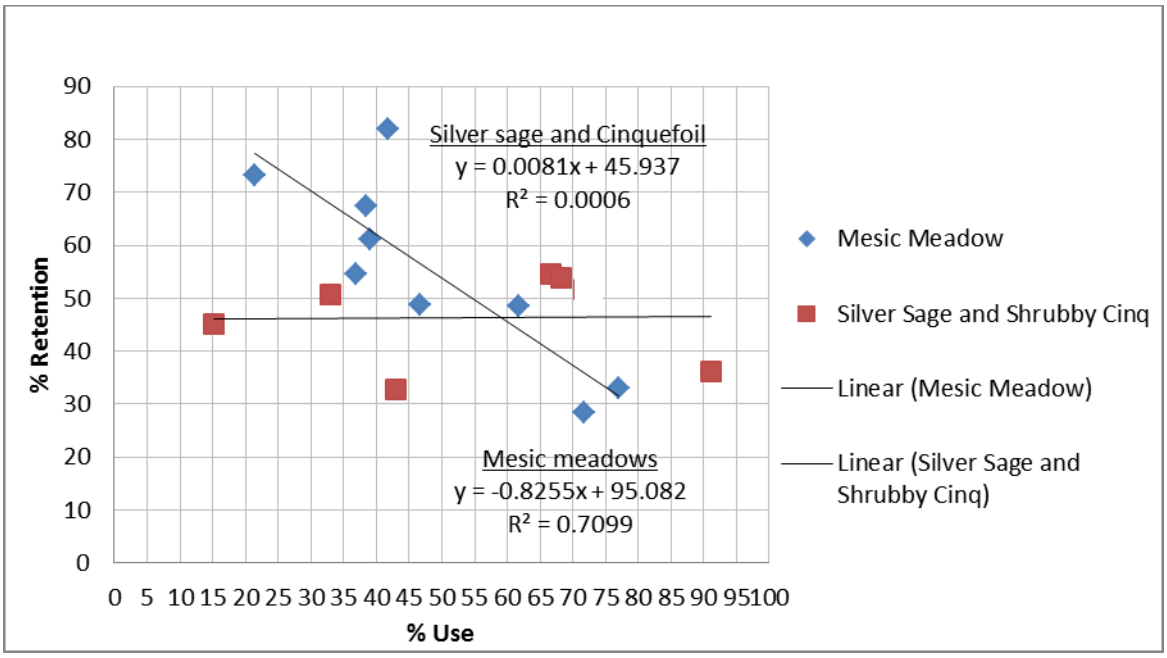

Figure 73. Regression of total herbaceous retention on key forage use in mesic meadow-willow and shrubby cinquefoil-silver sage communities

Boreal Toad (*Anaxyrus boreas*) - Sensitive and Management Indicator Species

Affected Environment

Habitat

Habitat of boreal toads and other amphibians are typically "wetlands" and "riparian" areas that have non-flowing surface water and vegetative cover. Wetlands are habitats where saturation of soils with water is the dominant factor determining the types of plant and animal communities. To be suitable for breeding amphibians, wetlands must have standing water during the breeding season, and include wetland types such as lakes, small pools, and wet meadows with little visible open water. Surface water many times is seasonal in wetlands used by frogs and toads. After the breeding season, wetland habitats used by amphibians are more encompassing, including those with no surface water but with saturated soils. Riparian areas are lands directly adjacent to creeks, rivers, streams, ponds, or lakes where surface water influences the surrounding vegetation. Thus, riparian zones are the transition between uplands where there is seldom standing water and the stream, river, or lake where free flowing or standing water is common. Rivers and lakes function by facilitating amphibian movement (Gould et al 2012).

Breeding

Breeding occurs in ponds, lakes, slow streams, river backwater channels and oxbow ponds, beaver ponds, flooded meadows, ephemeral pools, and manmade impoundments (Hammerson 1982, Keinath and McGee 2005). Pierce (2006) added that these sites are normally associated with lodgepole pine and spruce-fir forests. In the Greater Yellowstone ecosystem, breeding sites include shallow-water edges of ponds and lakes (typically in water depths of 4-8 inches), stream and river edges where water is pooled or very slow moving, oxbow ponds, thermal pools and streams, flooded meadows, ephemeral pools, abandoned and active beaver-impounded ponds, and man-made impoundments including reservoirs and quarries (Patla 2001). Sedges and

other emergent vegetation appear to be an important component of breeding habitat, and there is a propensity for toads to lay their eggs in or near the marshy parts of wetlands (Keinath and McGee 2005).

Breeding typically begins when snow melts or ice thaws at breeding sites and, therefore, the timing of breeding is variable from year to year and is dependent on elevation (Keinath and McGee 2005). Most breeding takes place between mid-May to late June in the Greater Yellowstone Ecosystem, although thermally influenced areas may host earlier breeding (late April) and stream backwater pools may attract late-summer breeding efforts (mid-July or even later). Toad tadpoles have been observed in mid-September on the upper Snake River (Patla 2001). Breeding activity at a single site may extend over several weeks with several peaks of activity. At the large toad breeding site near the Blackrock Ranger District, Bridger-Teton National Forest, fresh egg strings have been observed between May 17 and June 12 (Patla 2001). Hatching occurs 10-14 days after eggs are laid. Metamorphosis typically happens from late July to late September, but the amount of time from egg laying to metamorphosis is highly variable and depends on water temperature and site conditions. In some cases, metamorphosis may not be completed by winter.

Dispersal and Movements

After the breeding season, male boreal toads tend to remain close to breeding sites (within about 330 yards), while females may range as far as 1.5-2.4 miles (Muths 2003, Bartelt et al. 2004, Pierce 2006, Goates et al. 2007).

Summer Habitat

After metamorphosing, young toads move away from aquatic habitat and use moist terrestrial habitats where part of their time is spent under the shelter of moist woody debris and underground cavities (Keinath and McGee 2005). They also spend time basking in the sunlight to thermo-regulate. Found near water during the day, the boreal toads travel quite some distance from water at night to forage (Wyoming Game and Fish Department 2005, p. 438). Most toads do not venture far from water and typically spend more time in willow and sedge areas where the soil is wet or moist (Hammerson 1982, Keinath and McGee 2005). Adult toads move into high grasses and surrounding forests after breeding (Pierce 2006). When they inhabit drier habitats, they spend a disproportionate amount of time in relatively moist microsites such as under shrubs, woody debris, and in underground burrows. Moist microsites in drier habitats provide protection from evaporative water loss and are used to thermo-regulate.

Food Habits

Boreal toads forage primarily during the day although they are also active at night when traveling overland (Bartelt 2000 as cited in Patla 2001). Their diet is dominated by beetles and includes a wide variety of invertebrates such as sawflies, bees, ants, spiders, mosquitoes, grasshoppers, mites, snails, water striders, and backswimmers (Keinath and McGee 2005). Tadpoles are omnivorous, with a large portion of their diet coming from decaying vegetation. They feed on green algae, planktonic material, detritus, dead tadpoles, and possibly bacteria and dissolved nutrients (Warkentin 199, Keinath and McGee 2005, Schmutzer et al. 2008).

Population Status

Region

Boreal toads occur from northern New Mexico to Alaska, including the Rocky Mountains and west to the Pacific Coast. Boreal toads were formerly widespread and common, but have declined dramatically in the last three decades in many portions of its range in western North America (Carey 1993, Corn 1994). In Wyoming, their range is restricted to wet locations in mountains, foothills, and subalpine habitats (Baxter and Stone 1985), ranging in elevation from about 6,500 to 12,000 feet (Wyoming Game and Fish Department 2005, p. 438).

The boreal toad is thought to have two population segments in Wyoming, a Northern Rocky Mountain population (clade) that occurs in the northern portion of the state, (Bridger-Teton—generally north of Highway 191) and an Eastern population that includes southwestern Wyoming, southeastern Idaho, northeastern Nevada, and Utah. The Northwest Clade (Northern Rockies) extends from western Wyoming and northwestern Utah to west-central California and up to southeastern Alaska (U.S. Fish and Wildlife Service 2012b). The range of the Eastern population also encompasses a Southern Rocky Mountain population that includes southeastern Wyoming, and extends to the mountainous region of central and west-central Colorado and into extreme north-central New Mexico (U.S. Fish and Wildlife Service 2012b).

In 1995, the U.S. Fish and Wildlife Service announced a 12–month finding that listing the Southern Rocky Mountain population of the boreal toad as an endangered distinct population segment was warranted but precluded (candidate status) by other higher priority actions (U.S. Fish and Wildlife Service 1995). In a subsequent 2012 affirmative 90-day finding, the U.S. Fish and Wildlife Service concluded that a petition they considered presented substantial scientific information indicating that the Eastern population of the boreal toad may be warranted for listing as a distinct population segment, but that listing the Southern Rocky Mountain population as a distinct population segment was not warranted (U.S. Fish and Wildlife Service 2012b). The Colorado boreal toad population has declined dramatically in number and distribution, likely related to chytrid fungus (*Batrachochytrium dendrobatidis*) disease (U.S. Fish and Wildlife Service 2012b, also see Boreal Toad Recovery Team and Technical Advisory Group (2001) for disease considerations). In general, lack of suitable habitat does not appear to be a significant limiting factor for boreal toads in the Southern Rocky Mountains (Boreal Toad Recovery Team and Technical Advisory Group 2001). Declines in the southeastern Wyoming population were documented from 1986 through 1988 as well, and the species is now rare in this region (references in U.S. Fish and Wildlife Service 2012b). The population status and distribution of the species in southwest Wyoming as a whole is unknown (U.S. Fish and Wildlife Service 2012b). The Boreal Toad Recovery Team and Technical Advisory Group (2001) stated that although Southern Rocky Mountain toads occupied a broad range historically, the species' distribution has been greatly reduced. Based on a separate literature review, Keinath and McGee (2005) also opined that boreal toads have declined, with some local extinctions in Colorado, Utah, southeastern Wyoming, and New Mexico. Further, they suggested that the northern Rocky Mountain population was declining, but not as rapidly as toads in the southern Rocky Mountains.

Recently, Hossack et al. (2015) studied population trends of amphibians in the Glacier, Yellowstone, Grand Teton, and Rocky Mountain National Parks. Their studies supported earlier work (Corn et al. 2005) documenting a decrease in amphibian abundance from north to south along the continental divide (Rocky Mountains) due to population declines over recent decades. They found that boreal toads declined between 2002 and 2011 in Yellowstone and Grand Teton National Park, but found no change in Glacier National Park.

A watershed-based assessment of amphibian status in the Yellowstone Ecosystem found that, although common historically, the boreal toad was the second most uncommon amphibian species (Van Kirk et al 2000 cited in Patla 2001). Boreal toad declines occurred in the southwest portion of the ecosystem (southeast Idaho) based on comparison of historical and current records.

Bridger-Teton National Forest

Based on compilation of data prior to 1999 and field surveys in 1999, Patla (2000) concluded that boreal toads were rare on the Forest and that this species' status warranted concern. A recent collaborative effort (2012–present) between Wyoming Natural Diversity Database, the Wyoming Game and Fish Department, and Bridger-Teton National Forest personnel was initiated to (1) strategically sample amphibian habitats on the Forest where no prior surveys occurred; (2) to summarize historical information on species' presence and breeding locations; and (3) to systematically sample amphibian populations to estimate occupancy rates and occupancy trend (Estes-Zumpf et al. 2014). This effort has already improved understanding of the

distribution of amphibian populations across the Forest. Because only one year (2014) of systematic data were collected, the authors could not reach conclusions about Forest-wide population trends for boreal toads or the other two amphibian populations (Columbia spotted frogs, boreal chorus frogs) of interest. At least three years of data collection (from 2014) will be required to estimate occupancy rates and trends.

Surveys for boreal toads (and all other amphibians) at subjectively chosen (ideal) sites were conducted on the forest from 1905 to present to document the presence of individuals and breeding activity. In addition, data summarizing individual and breeding locations have not been fully compiled by the forest and its partners. Despite these limitations, the species' general distribution across the forest and location of several core (breeding) populations were evident from the historical data and the new systematic surveys, as described below.

Historical records indicated boreal toad presence within all six ranger districts on the Forest (Estes-Zumpf et al. 2014; Figure 74). Based on data collected during 2014 and 2015 using methods described in Estes-Zumpf (2014), boreal toads were found on the Forest at least once in 8 of 38 (21 percent) survey areas (Amphibian Occupancy Summary, 2014-2015, project record). Breeding activity was detected in seven (18 percent) survey areas. In general, recent surveys (from 2012) have detected few boreal toads outside of their previous distributional extent, despite extensive effort in the western portion of the Wyoming Range and the Wind River Range (see Estes-Zumpf et al. 2014).

Breeding centers for boreal toads on the Forest are currently limited to the Hams Fork watershed, the Wyoming Range (La Barge Creek north to Beaver Creek extending in an arc to the area south of Highway 191 at the Rim, to portions of the project area, and a few sites on Blackrock Ranger District) (Figure 75). A new breeding site was detected along the North Fork of Spread Creek on the Blackrock Ranger District in 2014. An adult boreal toad was detected in 2015 near Upper Slide Lake by a Wyoming Game and Fish Department biologist incidental to other work (Wyoming Game and Fish Department, 8/2015, personal communication). Boreal toad breeding activity apparently does not occur on the Greys River District

Estes-Zumpf et al. (2014) also sampled Forest amphibians (280 samples skin swabs) for the presence of chytrid fungus, a pathogen now widely distributed on the Forest (Figure 76). The fungus was detected in boreal toads, Columbia spotted frogs, and boreal chorus frogs. Chytrid fungus was documented at many boreal toad breeding sites and was particularly prevalent among amphibians within the Wind River Range.

Populations of boreal toads may be declining due to chytridiomycosis, the disease caused by the chytrid fungus. The disease has population-level effects that range from rapid extirpations or declines to minimal population effects and persistence (Ryan et al. 2008, Briggs et al. 2005). The fungus is common in the Rocky Mountains. Muths et al. (2008) detected the fungus at 64 percent of 97 study sites and in 23 percent of 1,151 boreal toads sampled. Murphy et al. (2009) found the fungus at all of 10 boreal toad breeding sites sampled in Jackson Hole area (40 miles west of the project area), with a mean prevalence of 64.5 percent. Muths et al. (2011) compared the mortality and recruitment of uninfected adult male boreal toads at a study site in Colorado to infected toads on the site on the Buffalo Ranger District, and 29 miles northwest of the project area. Survival of uninfected toads was greater, but recruitment lower in Colorado, suggesting compensation between the two vital rates, and that amphibian populations challenged with the disease were not necessarily doomed to extinction.

Project Area

Boreal toads were documented on several grazing allotments in the project area, both historically and currently (Figure 77). Based on both historical and recent amphibian surveys, the project area appears to be one of three important breeding concentration areas for boreal toads on the Bridger-Teton National Forest. Historical and recent observations indicate known or suspected breeding activity at Gypsum (Wright and Zafft 2004), Upper Tepee, and Lower Tosi Creeks of the Upper Green River Allotment, Miner Creek in the

Beaver-Twin Allotment, and along the Green River between Noble Pastures and the mouth of Wagon Creek (Figure 72). No breeding zones occurred in the Wagon Creek, Noble Pasture, Roaring Fork and Badger allotments.

In 2013, 17 subjectively chosen sites in the project area were surveyed for amphibians by Estes-Zumpf et al. (2014), including Gypsum, Teepee, Tosi, Big Twin, Little Twin, Packer, and Klondike Creeks, and Dollar and Mosquito Lakes. Boreal toads were present at 13 sites, and breeding was confirmed at 3 sties (Packer, Little Twin, and Tosi Creeks). Conditions for breeding were near normal.

During the 2014 season, amphibians were surveyed at 26 sites (some chosen subjectively and others chosen using methods associated with new long-term occupancy monitoring described in Estes-Zumpf et al. 2014), including Miner Creek, Green River, Dollar Lake, Mosquito Lake, Bacon Ridge, Strawberry Creek, Roaring Fork, and Gypsum Creek. Two historical and one new boreal toad breeding site were found. Snow water equivalence and spring precipitation were above average, leading to wet spring and high water conditions in amphibian habitats.

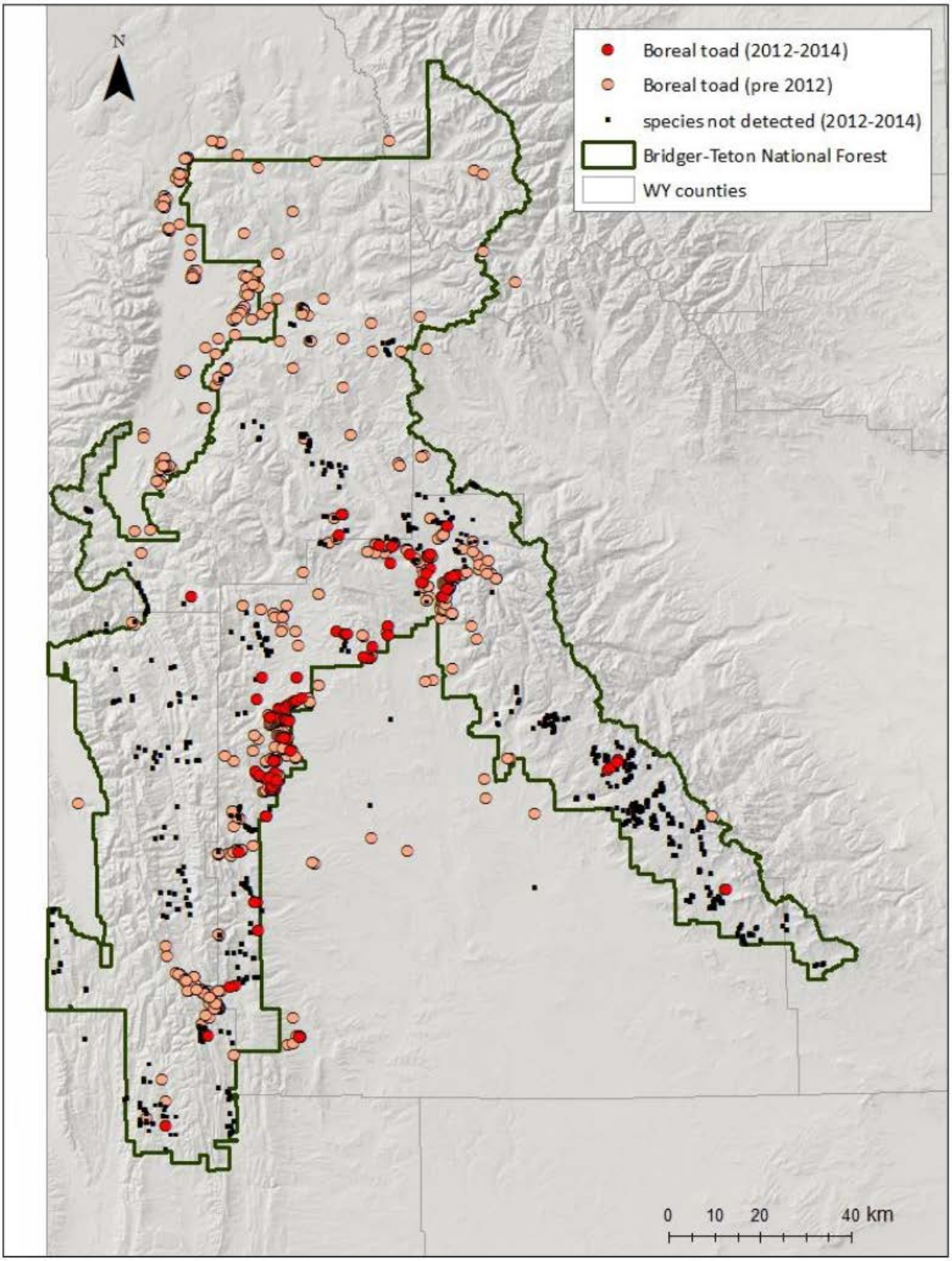

Figure 74. Distribution of boreal toads on the Bridger-Teton National Forest based on data collected prior to and post 2012 (Estes-Zumpf et al. 2014)

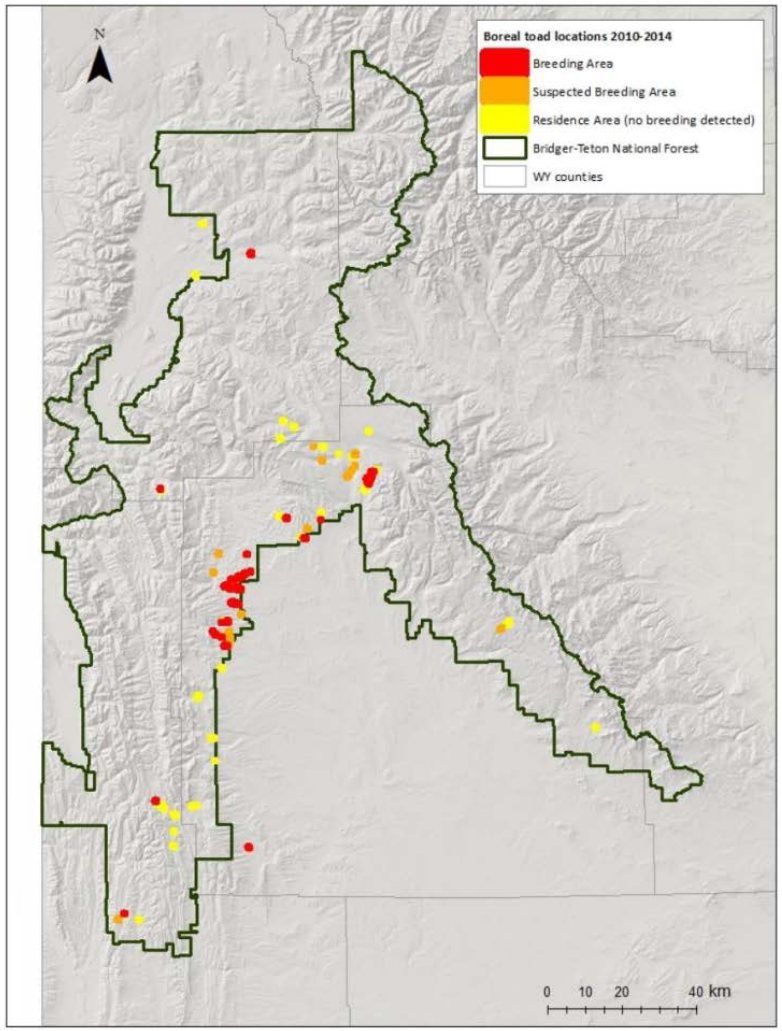

Figure 75. Locations of important breeding areas for boreal toads in the Bridger-Teton National Forest based on 2010–2014 data (Estes-Zumpf et al. 2014)

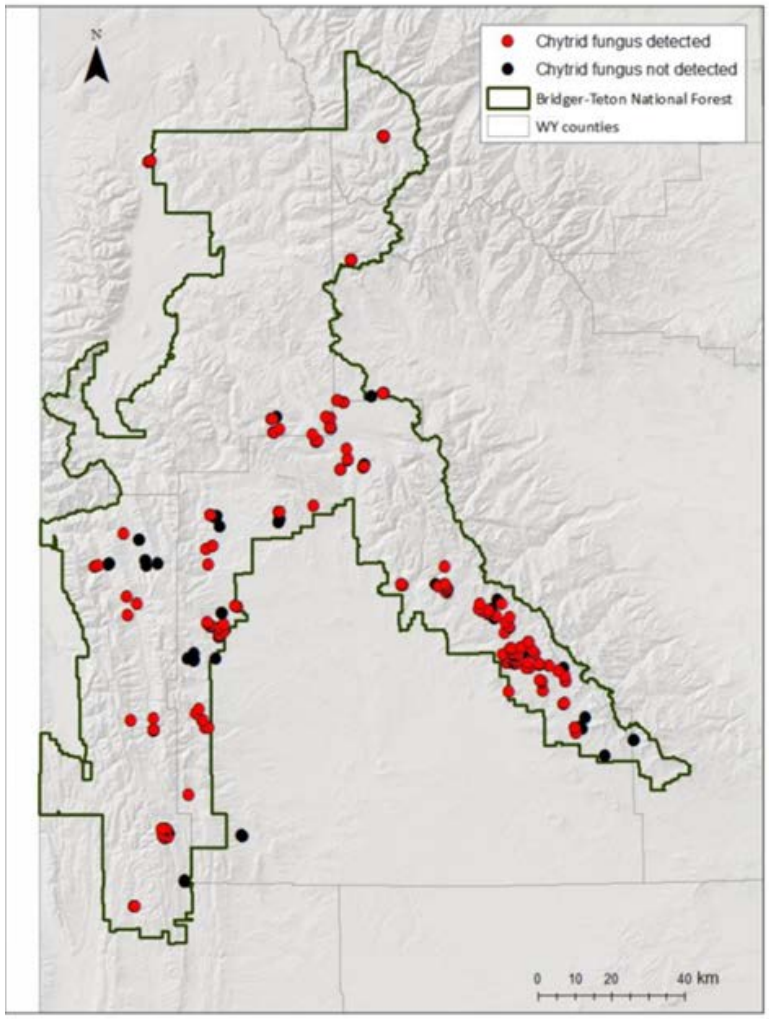

Figure 76. Distribution of amphibian chytrid fungus that tested positive (red circles) or negative (black circles) for the disease

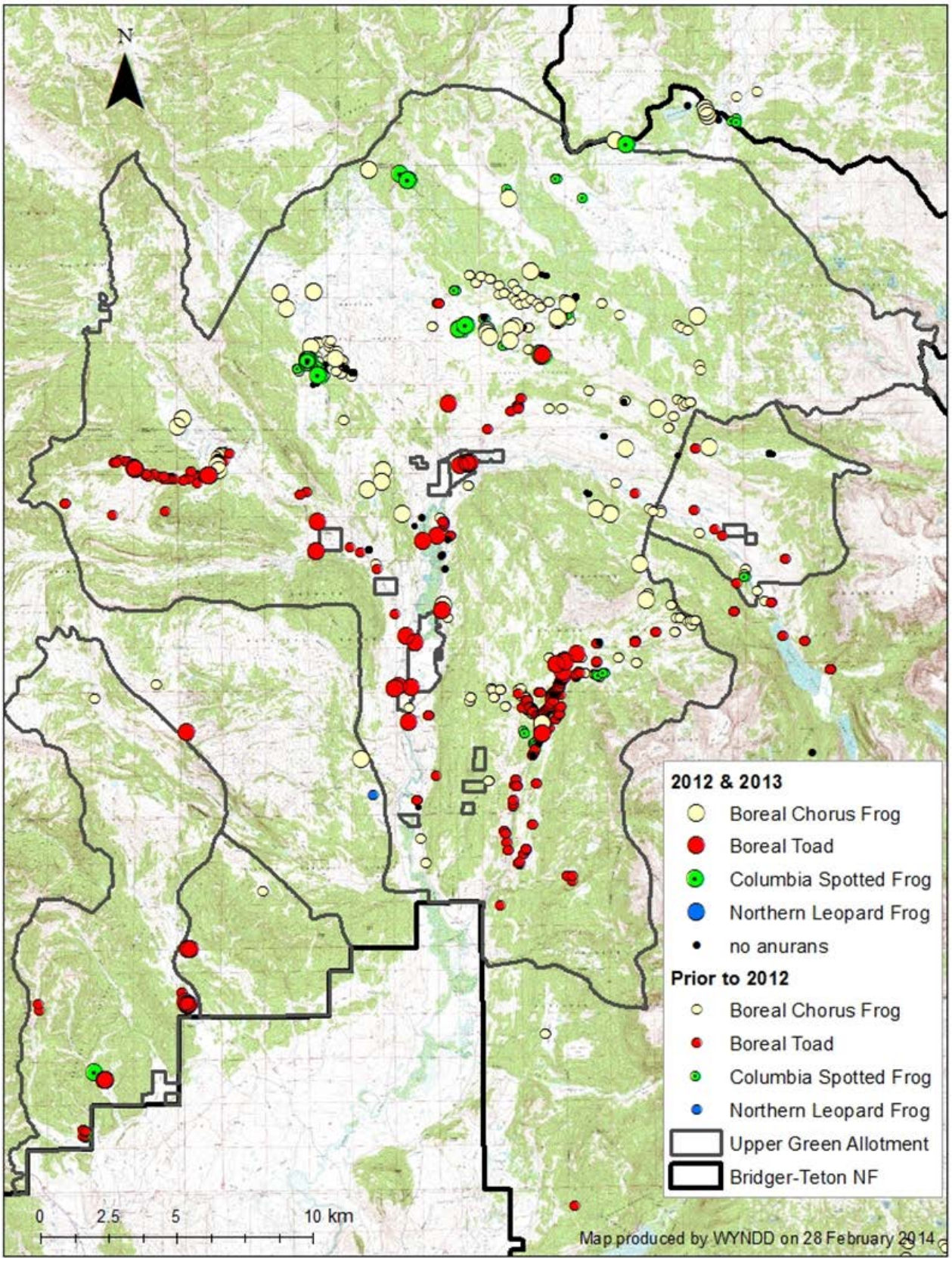

Figure 77. Historical to 2013 amphibian detections in the Upper Green River project area

Columbia Spotted Frog (*Rana luteiuentris*) - Sensitive

Affected Environment

Habitat

Yearlong, Columbia spotted frogs are more tied to wetlands and standing water habitats than that the more terrestrial boreal toad. The frogs are associated with high levels of emergent vegetation cover (Pilliod et al. 2002, Munger et al. 1998).

Breeding

Spotted frogs breed in shallow waters of ponds, marshes, slow streams, river backwater channels, and along lake edges (Hammerson 1982, Patla 2000, Patla and Keinath 2005). Breeding sites typically contain emergent vegetation, such as sedges.

Spotted frogs typically lay eggs just after snowmelt (Patla and Keinath 2005), which varies considerably from low to high elevations. In general, the breeding season typically spans late April or early May (low elevations) to late June (high elevations). Metamorphosis occurs between mid-July and late September, depending on elevation and other factors. Tadpoles require about a month to mature, although this is dependent on habitat parameters such as temperature and food supply (Wyoming Game and Fish Department 2005). Beavers help create, maintain and enhance habitats used by amphibians (Patla and Keinath 2005).

Dispersal and Movements

While some spotted frogs typically do no venture far from water after breeding, individuals in some populations travel as far as 450–675 yards (Turner 1960, Hollenbeck 1974, Bull and Hayes 2001, Pilliod et al. 2002). Females travel up to ⅔ miles or more between breeding sites and summer foraging habitat; males as far as 1¼ miles (Pilliod et al. 2002). However, such long distances appear to be uncommon. Movements by juvenile spotted frogs are considerably shorter than adults (Pilliod et al. 2002). Because some of the breeding sites used by spotted frogs go dry, juveniles must move to permanent wetlands and streams which can be as far as ¼ to ⅓ mile away, or greater, an effort that necessitates overland travel. Spotted frogs may leave summer habitat and move to winter habitat between mid-July to October depending on conditions of summer habitat (Pilliod et al. 2002, Patla and Keinath 2005). When breeding pools dry shortly after metamorphosis, survival depends on overland movement to more permanent water. Migrations from summer to wintering sites were completed in 1–2 days in central Idaho.

Migrations across dry land pose particular problems for frogs. Frog bodies have limited ability to regulate the loss of water through their skin and, therefore, their skin must remain moist. They regulate skin moisture by selecting micro-sites in which to inhabit. Dumas (1964, as cited in Patla and Keinath 2005) reported that relative humidity of 65 percent at about 80 °F is lethal to adult spotted frogs in approximately two hours. For spotted frogs that migrate from their breeding site when humidity is low and/or temperatures are high, survival may depend on migration habitat that retains high moisture and humidity at ground level, and protection from the sun and predators (e.g., herbaceous or shrub cover). This may be particularly important for adults that migrate during late June and July, and juveniles that migrate away from the temporary waters, when temperatures are highest, relative humidity is lowest, and rain events may be widely spaced. Pilliod et al. (2002) found that frogs at 8,000–8,500 feet elevation in Idaho migrated through subalpine fir and lodgepole pine (easterly aspects) with sparse whortleberry and bear grass where seeps, springs, and other water sources were available along the way.

Summer Habitat

As surface water evaporates from breeding sites, frogs move to more permanently wet areas. Adult spotted frogs spend summer and fall in seasonally moist meadows, ephemeral and permanent pools in meadows and forests, beaver ponds, riparian zones, streams, lakes (shallows), and marshes (Pilliod et al. 2002, Patla and Keinath 2005). Wetland habitat is preferred as summer habitat (Pilliod et al. 2002). When dispersing from breeding sites, many follow riparian zones when available, but others make linear movements across meadows and upland habitats such as big sagebrush communities and forestland (Pilliod 2002).

Food Habits

Columbia spotted frogs are opportunistic and flexible predators, eating a variety of prey (Patla and Keinath 2005). Variation in prey availability and ecological conditions account for differences in diet. In Yellowstone National Park, 70-90 percent of food items collected from stomach of 178 spotted frogs were spiders and representatives of four orders of insects: Hemiptera (bugs), Coleoptera (beetles), Diptera (flies), and Hymenoptera (ants, wasps, and bees) (Turner 1960 in Patla and Keinath 2005). Spotted frogs have also been observed to feed on earthworms, mollusks, and crustaceans, other frogs, and possibly even small mammal young (Patla and Keinath 2005, Wyoming Game and Fish Department 2010).

Foraging sites include ephemeral pools in forests and meadows, permanent and intermittent streams, river edges, riparian zones, temporary and permanent ponds, lake margins, and marshes (Patla and Keinath 2005). Summer foraging may occur at the same water body used for breeding and overwintering, but frogs may also move to other sites in summer to avoid predators and foraging competitors, and find abundant food (Bull and Hayes 2001 in Patla and Keinath 2005).

Legal and Population Status

Region

The range of the spotted frog extends from southern Alaska south through British Columbia, Washington, Oregon, Idaho, Montana, Wyoming, Utah, and Nevada (Patla and Keinath 2005). Columbia spotted frogs are considered “rare” in Wyoming (Wyoming Game and Fish Department 2010). This species is known to occur within Wyoming’s northwest mountain ranges in the Yellowstone Ecosystem and in the Bighorn Mountains. The Bridger-Teton National Forest is near the south-eastern extent of the species continental distribution (Patla 2000).

Columbia spotted frogs are classified by Forest Service Regions 4 and 2 as a sensitive species (U.S. Forest Service 2013b, Keinath and McGee 2005). Sensitive species are defined by the Regional Forester as those plant and animal species for which population viability is a concern, as evidenced by a (1) significant current, or predicted, downward trend in population numbers or density; or (2) significant current or predicted, downward trend in habitat capability that would reduce a species’ existing distribution (FSM 2670.5). The Forest Service objective (FSM 2670.22) for sensitive species management is to develop and implement management practices to ensure that species do not become threatened or endangered because of Forest Service actions.

Wyoming Game and Fish Department classified the Columbia spotted frogs as a Species of Special Conservation Concern, but also indicated that declining populations and/or habitat losses are not suspected (Wyoming Game and Fish Department 2010). Columbia spotted frogs are also on the sensitive species list of the Wyoming Natural Heritage Program, and the statewide population is ranked as vulnerable (NatureServe 2002). Vulnerable is defined as “At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors. Such species are often rare or found locally in a restricted range.” (NatureServe 2002).

Gould (2012) documented trends in occupancy of Columbia spotted frog in Grand Teton and Yellowstone National Parks over a 4-year period (2006–2009). Occupied catchments (about 40 percent) were fairly widespread throughout the parks, although occupancy declined non-significantly during the study. Similarly, Klaver et al. (2013) estimated Columbia spotted frog occupancy at 35 percent, based on 235 wetland sites in the Yellowstone and Grand Teton National Parks, the National Elk Refuge, and the Bridger-Teton National Forest. Hossack et al. (2015) documented a 50 percent decrease in occupancy for this species from 2002 to 2011 in Yellowstone and Grand Teton National Parks, a finding similar to previous work on the species in which a 12 percent decline was documented in from 1991 to 2011 in central Idaho, Montana, and Wyoming.

Bridger-Teton National Forest

Historic and recent field surveys indicated that Columbia spotted frogs were and remain common on the northern and southwestern ranger districts (Jackson, Buffalo, and Greys River) of the Bridger-Teton National Forest (Figure 78, Patla 2000). The species was absent from the Wind River Range and the southerly portion of the Wyoming Range both historically and recently. A possible decline in this species' occupancy from 1999 to 2014 in the Forest's northeastern Wyoming Range was suggested by survey data (Estes-Zumpf et al. 2014).

Based on data collected during 2014 and 2015 using methods described in Estes-Zumpf (2014), Columbia spotted frogs were found on the Forest at least once in 11 of 38 (29 percent) survey areas (Amphibian Occupancy Summary, 2014-2015, project record). Breeding activity was detected in 9 (24 percent) survey areas.

On the Upper Green River project area, Columbia spotted frogs have been detected less frequently than boreal toads and chorus frogs. Historic and recent detections were principally in the Gypsum, Mosquito, and Mud Lake-Fish Creek rotations of the Upper Green River Allotment and in the Beaver-Twin Allotment (Wright and Zafft 2004). A possible decline in this species' occupancy from 1999 to 2014 at Gypsum Creek was suggested by survey data (Estes-Zumpf et al. 2014). Breeding sites are displayed in Figure 72.

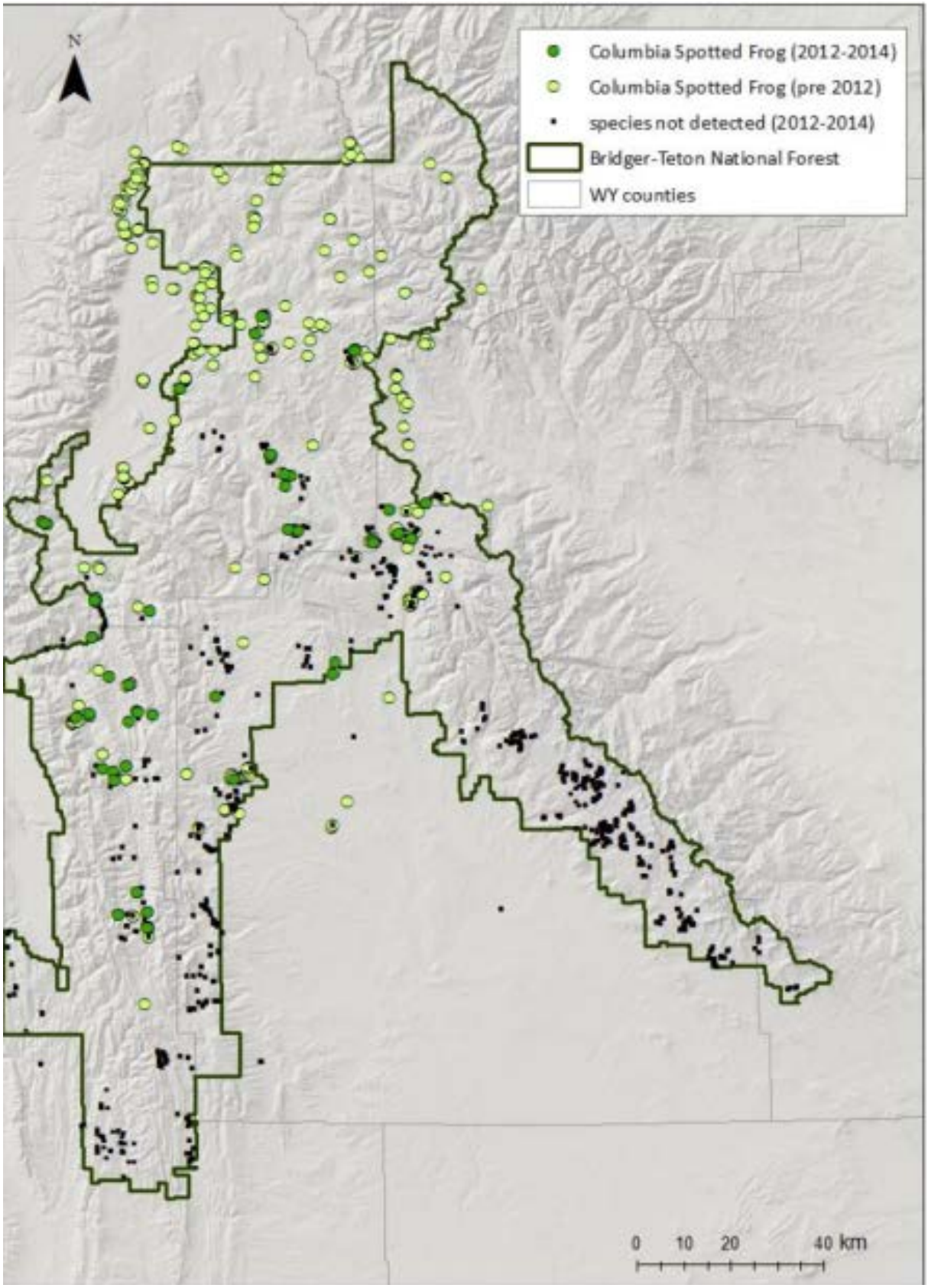

Figure 78. Distribution of Columbia spotted frogs on the Bridger-Teton National Forest (Estes-Zumpf et al. 2014)

Boreal Chorus Frog (*Pseudacris triseriata*) - Management Indicator Species

Affected Environment

Habitat

Breeding

This species inhabits wetlands and riparian areas, and is often associated with temporary water bodies. In the spring and early summer, male frogs call to attract females to breeding sites; typically shallow, ephemeral pools, marshes, bog ponds, and shallow ephemeral water bodies (Koch and Peterson 1995, Orabona et al. 2012). Tadpoles metamorphose in approximately 60 days. They typically do not breed in pools kept cool by large influxes of water (Hammerson 1982). Eggs are deposited on submerged portions of plants. Young metamorphose during July and August (Hammerson 1982). At higher elevations in Colorado (e.g., above 9,000 feet), breeding begins immediately after the spring thaw in late May or early June, and breeding extends into June, a period similar to that observed on the Forest. Water sources sometimes dry up before tadpoles have metamorphosed (Hammerson 1982).

Sites in northern Yellowstone National Park that supported adult chorus frogs had a significantly higher percentage of emergent vegetation than sites without frogs (Hill and Moore 1994, cited in Koch and Peterson 1993). Chorus frog habitats anecdotally identified by Koch and Peterson (1995) in southern Yellowstone Park supported tall vegetation (1.5 feet), moist ground, and high humidity. Newly metamorphosed frogs were abundant in shallow waters with emergent vegetation, isolated by gravel bars from a large, cold water body (Yellowstone Lake).

Dispersal and Movements

After emergence in the spring, chorus frogs move to breeding sites as early as late March or April. Post breeding, adult chorus frogs disperse away from the breeding sites to moist habitats including riparian habitats, grasslands, and forests (Roberts and Lewin 1979 cited in Dodd 2013). Dispersers hide under ground, leaves, and woody debris. Chorus frogs hibernate in the winter beneath logs, rocks, and leaf litter or in loose soil, and in animal burrows (Koch and Peterson 1995).

Summer Habitat

When not breeding, chorus frogs are generally found in terrestrial habitats such as damp grassy and marshy areas, or damp forests near (< 0.3 mile) water (Hammerson 1982, Nussbaum et al. 1983). In the mountains of Colorado, chorus frogs spend most of the summer in wet meadows, up to ⅓ mile from breeding pools, although some remain in or near pools of water (Hammerson 1982). Because they have limited ability to regulate loss of water through their skin, chorus frogs must remain moist and use wet microsites to reduce water loss. Dead herbaceous vegetation, a dense woody canopy cover and a high water table help sustain higher soil-surface moisture levels and protection from the sun. Areas with these characteristics include riparian areas, springs and seeps, moist meadows, aspen, and moist forestlands close to breeding sites.

Food Habits

Adults feed primarily on insects and invertebrates, both semi-aquatic and terrestrial, which they catch using a sit-and-wait strategy. They prefer ants and spiders, but also consume flies, beetles, aphids, and snails (Koch and Petersen 1993, Nussbaum et al. 1983). Tadpoles are herbivores, feeding on algae.

Legal and Population Status

Region

This tree frog occurs in the Rocky Mountains and the northern plains of North America, with the exception of Arizona and New Mexico (Baxter and Stone 1985, Koch and Petersen 1995). The chorus frog is a common resident in Wyoming (Baxter and Stone 1985, Stebbins 2003), including the Yellowstone Ecosystem (Koch and Peterson 1995) and southern Idaho (Nussbaum et al. 1983). They are ubiquitous in the Yellowstone Ecosystem, common anywhere there is standing water in the springtime. They are not a Wyoming Species of Greatest Conservation Need (Orabona et al. 2012). Chorus frogs range upward in elevation to sites at 12,000 feet (Stebbins 2003).

Average occupancy of chorus frogs in Grand Teton and Yellowstone National Parks over a 4-year period (2006–2009) in high and medium quality catchments ranged from 66 to 81 percent (Gould et al. 2012). Occupied catchments were fairly well dispersed throughout the parks. Klaver et al. (2013) found that this species was the most common amphibian in the Yellowstone Ecosystem (collectively Yellowstone and Grand Teton National Parks, the National Elk Refuge, and Bridger-Teton National Forest), documenting 48 percent occupancy among 235 sites. Hossack et al. (2015) found little change (< 3 percent) in occupancy of this species in Yellowstone and Grand Teton National Park from 2002 to 2011.

Bridger-Teton National Forest

The boreal chorus frog is the most common amphibian on the Forest (Patla 2000). It has been documented on all six ranger districts and is widely distributed, with the possible exception of the Teton Wilderness where surveys are limited (Estes-Zumpf et al. 2014). The chorus frog has been observed up to 9,400 feet at Togwotee Pass.

Based on data collected during 2014 and 2015 using methods described in Estes-Zumpf (2014), Columbia spotted frogs were found on the Forest at least once in 21 of 38 (55 percent) survey areas (Amphibian Occupancy Summary, 2014-2015, project record). Breeding activity was detected in 17 (45 percent) survey areas.

In the Upper Green River project area, chorus frogs are widely distributed with the possible exception of the Beaver-Twin and Badger Creek allotments where few surveys have occurred (Figure 77). Individuals and their breeding sites were identified at many sites in the project area by Wyoming Game and Fish Department and Forest surveys crews. Three breeding sites (adults and tadpoles) occur at Mosquito Lake, and one near the Whisky Grove campground. The latter site was created as a result of water pooling around an improperly designed culvert (personal communication, U.S. Forest Service Fisheries Biologist, 2009). Many metamorphs, juveniles, and adults occur in the Gypsum Creek drainage (Wright and Zafft 2004).

Indicators Used for Comparison of Alternatives

- Riparian function
- Herbaceous retention

For riparian areas, the level of livestock utilization occurring on a site is the most important consideration in livestock management (Clary and Webster 1989). This factor varied across the four proposed alternatives and has differential effects on riparian function and herbaceous retention. Table 30 presents the two indicators used in the amphibian analysis (riparian function and herbaceous retention), the associated risk factors, and rationale for using these two indictors for assessing amphibians and their habitats.

Table 30. Indicators and risk factors for amphibians and their habitats and the rationale for indicator selection

Indicator	Potential risk factor	Rationale for indicator selection	Reference
Riparian function	**Loss of Stream Bank Stability:** affects vegetative cover, soil stability, and water table. **Loss of Water Quality:** cattle wading and activity on stream banks increase sedimentation and degrade water quality through urination or defecation. **Loss of Beaver Pond Habitat:** browsing by cattle may affect the availability of willow and aspen, seasonal foods for beaver; heavy grazing leads to extensive browsing on willow and aspen, with negative effects on the cover and structure of these species; soils, and water tables.	Riparian and wetland communities provide critical breeding, foraging, and over-wintering habitats; and are used as dispersal corridors for juveniles. Long-term riparian health correlates with the presence of amphibians, including breeding, egg-laying, offspring rearing, and dispersal. Poor riparian and wetland management leads to lowered water tables and conversion to xeric vegetation communities along waterways that are unfavorable for amphibians. Beavers supported by healthy riparian communities create ponds with open-canopies that facilitate amphibian breeding and other requirements.	Belsky et al. 1999, Keinath and McGee (2005), The Boreal Toad Recovery and Technical Advisory Group (2001), Pilliod 2002, Warren and Buttner 2008, Roche et al. 2012, Beschta et al. 2013, Clary and Webster 1989, Hossack et al. 2015
Retention of herbaceous cover in riparian zones	**Insufficient cover and related components of habitat:** heavy grazing reduces cover and humidity; and increases air temperature, excessive sun, and exposure to predation. **Amphibian Crushing Mortality:** cattle may crush amphibians at the edges of wetland, in riparian zones, and in adjacent uplands. **Loss of Beaver Pond Habitat:** high levels of herbaceous forage utilization leads to browsing on willow, with negative long-term effects on riparian function.	The availability of herbaceous cover, expressed by retention, is positively related to amphibian occupancy and is directly related to livestock use. Through shading, herbaceous cover helps retain humidity, moderates temperature, provides protection from excessive sun; and reduces predation losses. Also a measure of “time spent” by livestock in breeding zones and adjacent uplands, it indirectly gauges relative levels of amphibian trampling mortality.	Engel 2001, Rittenhouse et al. 2008, Keinath and McGee 2005, Long and Pepras 2012, Gould et al. 2012. Kovalchik and Elmore (1992), Hall and Bryant (1995).

It was assumed that by meeting the riparian function and herbaceous retention objects in riparian and wetland areas, the desired conditions in terms of adequate amounts of suitable habitat for amphibians would be met, particularly in vegetation communities dominated by herbaceous vegetation. Given the opportunity, cattle spend a disproportionate amount of time in riparian areas, 5–30 fold more than expected based on the spatial extent of this vegetation type (Clary and Webster 1989). Riparian areas provide higher forage volume (versus uplands), shorter distances to water, flat terrain, and favorable (cool) microclimates (Skovlin 1984). Thus, the greatest foraging pressure, least ecological function, and least herbaceous retention would likely occur in the accessible portions of riparian zones, such as cattle-accessible meadows dominated by sedges and sparse stands of willow, and adjacent silver sage and shrubby cinquefoil communities.

Desired and Existing Conditions

Riparian Function

Riparian function addressed several of the most important risk factors for amphibians and their habitats that stem from grazing (Table 30). Riparian function (health) is related to amphibian habitat quality, as riparian (and shoreline communities with emergent vegetation) support vital amphibian activities such as breeding,

egg-laying, offspring rearing, and dispersal. Poor riparian and wetland management leads to lowered water tables and conversion to xeric vegetation communities along waterways that are unfavorable for amphibians.

About 50 percent of the project area is comprised of terrain and vegetation that are capable of supporting cattle grazing. Included in this area capable of supporting livestock grazing are extensive riparian communities that occur along the Green River and along the lower potions of its lower tributaries. The Upper Green River Allotment supports many lakes and ponds, often with well-developed riparian zones and emergent aquatic vegetation. Riparian communities on the project area are comprised of dense willow, sparse willow interspersed with sedge communities, silver sagebrush, and shrubby cinquefoil.

Vegetation cover types within a ⅓ mile buffer around amphibian breeding sites (**Figure 72**) were estimated using the 2007 Vegetation GIS layer. Breeding areas within most allotments were dominated by conifer, mixes of aspen and conifer, sagebrush, and silver sage-shrubby cinquefoil cover types. Willow and riparian herblands (moist sedge meadows interspersed with willows) accounted for 6 to 15 percent of the area within the ⅓ mile buffer surrounding breeding sites.

The riparian function objective is a riparian system that captures sediment, maintains a high water table, and supports hydric vegetation that is capable of slowing high flows and protecting and stabilizing the stream banks or “properly function condition”. Measures of riparian condition and function often indirectly indicate the current and future condition of cover, food, shelter, and other important components of amphibian habitat. For example, indices of stream bank stability or the age-structure of willows may indicate trends in the amount sediments carried by streams, a factor relevant to the survival of amphibian eggs. Measures of forage use by livestock may also indirectly gauge losses of amphibians due to trampling or indirect effects such as disturbance. Riparian and wetland areas that meet the riparian function objective or are properly functioning are generally expected to provide the quality and quantity of habitat resources needed by amphibians.

The existing habitat conditions in riparian areas and wetlands in the project area were evaluated by several resource specialists (Robertson 2016, Anderson 2015, Booth and Hayward 2015), discussed in the Riparian Areas, Fisheries and Rangeland Vegetation sections of this DEIS, and are summarized in Table 31.

Table 31 Summary of riparian conditions in the project area, assessed using various field methods.

Assessment method	Riparian function parameters	Narrative and/or results summary	Section in DEIS
Wyoming Habitat Assessment Methodology	Stream condition class assignments (Classes I–III) Scale: project area creeks.	Summary: Of surveys covering 148 miles of widely-distributed allotment streams, 84% in Class I (most desirable) condition, 12% were in Class II, and 4% in Class III (least desireable). Stream condition class assignments (Classes I–III) were based on riparian function; presence of hydric soils; recruitment of riparian vegetation; and bank erosion.	Fisheries
Water Quality	Scale: Green River (2 sample sites) and Gypsum Creek (1 site)	Summary: All water quality parameters (pH, total suspended solids, turbidity, Nitrate and Nitrite, water temperature) measured in 2009 and 2012 at the 3 sites met Wyoming water quality criteria.	Riparian Areas
Wetlands	Scale: Green River & north pastures of Upper Green R. Allotment	Summary: Based on visual observations, most wetlands have robust vegetation reflective of healthy conditions. At some sites, sedge-grass communities measure over 18 inches in height and support willows.	Riparian Areas
Hydrologist field observations of riparian habitats along waterways, Multiple Indicator Monitoring (MIM), and Properly Functioning Condition (PFC) Assessments.	Standard measures of riparian function: bank stability, vegetative cover, browse utilization; willow age structure and recruitment; identification of non-livestock effects (beavers, recreation). Scale: project area creeks.	Upper Green River: Good willow and herbaceous coverage in most areas. Four out of five sites rated as Properly Functioning (but the elk feedground functioning at risk.). Light effects of cattle grazing and recreation at PFC sites. Effects of elk were very evident around the Green River Lakes feedground. Assessment of vegetation seral stage (Missouri River MIM method) at 1 site along Green River 1 mile north of Noble Pasture: Ecological Status Rating—100 (at Potential Natural Community, both transects); Site Wetland Status— 85–99 (good–very good); Winward Greenline Stability—7.4–8.4 (high rating, both transects); Average key species (mostly un-grazed) stubble heights: 14.5 (greenline) and 16.9 inches (interior). Big and Little Twin: Stable banks and productive riparian vegetation. Expansive willows and thick understory grasses. Trailing along fence lines (ATV, cattle). Miner: Stream in excellent condition with stable banks due to excellent cover. Well established willow community. Recreation effect at 1 site. North Beaver: Excellent condition with stable banks due to extensive coverage of mature willow, grasses, and sedges. Positive beaver and negative recreation effects. Packer: Excellent condition with stable banks due to extensive coverage of mature willow, grasses, and sedges. Beaver and recreation effects. Tepee: Historical overgrazing complicated up much upstream beaver activity (sediment deposition). Channel generally recovering from past impacts but well below bank stability standards. Strong decline in vegetation cover from 2009 to 2012. Tosi I: Abundant vegetation coverage, but down-cutting, shear banks, sloughing in several sections (bank stability below standard) due to historic and current heavy use. Beaver pond effects. Tosi II: Excellent bank cover provided by willows. Some cattle trailing effects. Beaver activity.	Riparian Areas

Assessment method	Riparian function parameters	Narrative and/or results summary	Section in DEIS
		Wagon I: Excellent condition, very good coverage of vegetation (mostly non-willow) and stable banks within standard. Impacts (hummocks and loss of riparian vegetation) from horses evident around the herder cabin. Wagon II: Photos and MIM data indicate extensive coverage of willows and herbaceous vegetation. High bank stability (within standard). Crow: Concerns (cattle) for riparian vegetation and bank stability at numerous sites. Fish (I): Good overall stream condition but low bank stability and cover at MIM site (below standard) due a mix of cattle and recreationists. Fish (II): Improving bank stability and cover at a MIM site (within standard). Hummocks. Negative recreation effects. Raspberry: Sedge species maintain the stability (below standard) and high cover. Strawberry: A well-developed trail contributed to reduced vegetation (herbivory) along the stream banks. Photos suggest excellent cover. MIM site indicated that bank stability was below forest standard. Kinky: 1 site near Darwin Ranch showed compaction and hummocks due to horse grazing. Roaring Fork: Stream in excellent condition, high bank stability within standard, and high cover. Lower Klondike: Streambank sloughing, declining cover and bank stability (below standard) along the reach grazed by cattle after an enclosure fence was removed. Assessment of vegetation seral stage using 1 MIM transect at greenline along creek: Ecological Status Rating—32 (early succession); Site Wetland Status— 68 (good); Winward Greenline Stability—3.8 (low); Average key species stubble height at greenline: 2.9 inches. Gypsum: Stream is stable, functioning well, in good condition, excellent cover. Beaver effects. South Gypsum: Stream stable but bank stability slightly below standard, well vegetated banks, excellent cover, little trailing and current-year alteration; fire effect—sediment deposition on point bars.	
Stubble heights of herbaceous vegetation.	Stubble heights of key species in riparian zones. Scale: Upper Green River Allotment	Upper Green River Allotment (entire): The minimum stubble height at the greenline measured by the Upper Green River Cattle Association from approximately 2002 to 2013 was 4.4-inches. Tosi-Tepee Rotation: Average stubble height measurements at greenline for 19 sites ranged from 5.7 (min.) to 16.5 (max.) inches for the period of 1998 to 2013. Mosquito Lake Pasture: The minimum and maximum stubble height measurement at greenline among 10 sites for the period 1996 to 2013 was 4.4 and 15.7 inches, respectively. South Fork Gypsum: Average stubble height on the greenline (1 transect) was 6 inches in 1999. In 2012, average stubble height was 8.7 and 11.2 inches, respectively.	Rangeland Vegetation

Herbaceous Retention

Retention of total herbaceous vegetation in riparian zones, measured at the end of the grazing season, was used as the second indicator describing the desired conditions for amphibians and to analyze the effects of the alternatives on amphibians. This indicator directly or indirectly accounted for differences in other habitat variables that were important to amphibians, including cover (predation risk), humidity, drying effects of the sun, ambient temperature, soil moisture and porosity, disturbance and trampling mortality of amphibians (Table 30). Retention of total herbaceous vegetation in riparian zones was also strongly affected by the varying levels of key forage utilization associated with the grazing alternatives.

Total herbaceous retention is the current year's production of all herbaceous vegetation on a given site that is not consumed or trampled by grazing animals. For this project, herbaceous retention is measured as a percentage of weight. Similarly, key forage use is the percentage of key forage removed by herbivores. Key forage species identified for this project area are primarily Idaho fescue (Festuca idahoensis) in the uplands and sedges (Carex species) or tufted hairgrass (Deschampsia) in riparian/meadow areas. Other key species may be identified on a site specific basis. Key forage use is of interest to range managers because it affects rangeland condition. Total herbaceous retention is of particular interest to wildlife managers because it indicates cover and food at ground level available to wildlife species such as amphibians, mammals and birds.

The herbaceous retention objective is 70 to 100 percent of herbaceous vegetation in riparian areas. This objective was established based on the recommendation of the Boreal Toad Recovery Team and Technical Advisory Group (2001) to limit herbaceous utilization to no more than 30 percent of current season's growth. A minimum of 70 percent retention of herbaceous vegetation in and around breeding wetlands, summering wetlands, and in other summer and migration habitat would provide sufficient habitat for Columbia spotted frogs and boreal toads. The use of 70 percent as the minimum retention was supported in email correspondence dated Jan. 20, 2014 (project record) between Forest staff and Dr. Wendy Estes-Zumpf, a zoologist and amphibian expert with the Wyoming Natural Diversity Database at the University of Wyoming. Bridger-Teton National Forest Supervisor, Clinton Kyhl, affirmed 70 percent minimum as an appropriate threshold after it was used in the 2013 Sherman cattle allotment appeal resolution (Big Piney Ranger District) with the Western Watersheds Project (Kyle email dated July 2, 2014, project record).

In addition in the boreal toad conservation assessments, both Keinath and McGee (2005) and the Boreal Toad Recovery Team and Technical Advisory Group (2001) recommended that minimum sedge (Carex sp.) heights of 4–6 inches be maintained in summer-fall riparian pastures grazed by livestock. A 6-inch stubble height in riparian zones roughly corresponds to 24–32 percent utilization and a 4-inch stubble to 37–44 percent utilization, acknowledging that this relationship for riparian zones varies with species composition, plant vigor, precipitation, and site potential (Clary and Webster 1989). These stubble height recommendations were aimed primarily at maintaining healthy riparian areas (proper function). However, levels of cover associated with 70 percent minimum herbaceous retention would also insure that ambient temperature, humidity, soil porosity (burrow habitat), cover for avoiding predation, and other cover benefits are adequate for amphibians.

Data concerning total herbaceous retention and utilization of key forage species in several riparian and upland community types in the Upper Green River Allotment were collected by Forest wildlife and range management staff in 2013 and 2014. These data represented existing conditions and current management under Alternative 2-Current Management. Methods and results were provided in detail in U.S. Forest Service (2015). The 2013 and 2014 studies were conducted at sites that were readily accessible to cattle (subjectively chosen), within riparian zones, and within amphibian breeding areas, and represent high use areas by livestock (Figure 72). In addition, 4 sites in 2014 were chosen at random within amphibian breeding zones. These studies supplemented utilization data provided in the Rangeland Resources Specialist Report (Booth

and Hayward 2015) which provided utilization data that were collected throughout several different allotments and at sites not specific to amphibian breeding areas. The average retention of herbaceous cover in moist meadows was estimated at 62 percent and ranged from 33 to112 percent. These values included two measures of key forage use in meadows that were negative (no apparent grazing) and one measure of retention that exceeded 100 percent (no herbaceous offtake). Importantly, these studies established a relationship between herbaceous retention and utilization of key forage species. This enabled us to estimate herbaceous retention at different levels of maximum key forage utilization proposed under the grazing alternatives.

Environmental Consequences

This section describes the direct, indirect and cumulative effects of implementing Alternatives 1, 2, 3, and 4 on amphibians and their habitats.

Effects Indicator, Management Objective, and Threshold of Concern

The indicators used for amphibians were riparian function and herbaceous retention. The threshold of concern for the sensitive amphibians was a “will impact” determination for a sensitive species. In other words, whether or not implementation of the alternative will impact individuals with the consequence of a trend toward federal listing or cause a loss of population or species viability. The threshold of concern for the management indicator amphibian species was whether or not the alternative contributed positively toward population growth or stability.

Alternative 1 – No Livestock Grazing (No Action Alternative)

Direct and Indirect Effects

Indicator 1 – Riparian function: Existing conditions and the effects of this and the other alternatives on the indicators are contrasted in Table 32 . In Alternative 1, fully-functioning riparian communities would be maintained at the project scale. Conditions would improve from the existing (mostly healthy) condition due to the absence of livestock-related effects on vegetation coverage and structure, bank stability, water quality, and other metrics of riparian function. Some localized areas of heavy willow browsing by moose and elk would occur where these species concentrate during late fall and winter. Riparian function in focus areas would rapidly improve from their current, at-risk state due to the absence of cattle grazing, save for localized effects of recreational stock. An exception would be the Tepee Creek focus area where logs previously placed in the stream would not be removed, and thus would continue to degrade the aquatic and riparian system.

Indicator 2 – Herbaceous retention: Estimated retention of herbaceous cover in riparian zones, project-wide, would approach 100 percent, save for herbaceous losses associated with wild herbivores. Cover-related components of amphibian habitat such as humidity retention, water quality, and relief from trampling losses would generally improve from existing conditions (average 62 percent herbaceous retention in moist meadows, but highly variable), particularly as compared to sites in less than desired condition. Some herbivory by wild ungulates (especially near the Green River Lakes feedground), recreational stock, rodents, and insect herbivores (up to 65 percent allowable key forage utilization) would still reduce cover, however.

Other effects – The effects of management actions (e.g., grazing system) on riparian function and herbaceous retention are summarized in Table 32.

Alternative 1 carries negative effects on amphibians at small spatial scales that stem from excessive cover and lack of anthropogenic and natural disturbance. Some micro-sites that are currently maintained without tall herbaceous, shrub, and tree canopies by cattle grazing and trailing under this alternative may be lost due to vegetation development and natural succession. Bartelt (2000) observed that willows and breaks in shrub

or tree canopies allowed sunlight to the ground layer of sites frequently used by boreal toads. Amphibians in heavily shaded (forest) wetlands experience lower growth and survival rates, possibly related to lower water temperatures and less food (Skelly et al. 2005, Semlitsch and Skelly 2007, Earl et al. 2011). Openings near the water's edge are desirable habitat components for amphibians because they provide microsites for thermoregulation (sun basking) (Bull 2005, Keinath and McGee 2005, Burton et al. 2007), sites less common in the absence of grazing. Boreal toad larvae require warm waters (> 10 °C) for development (Carey et al. 2005), and egg masses benefit from summer sun (Boreal Toad Recovery Team and Technical Advisory Group 2001). Direct sunlight may also help abate adverse effects of chytrid fungus (Wyoming Natural Diversity Database, personal communication, 3/12/2015). However, the absence of these benefits in Alternative 1 are minor in comparison to the important short-term and long term negative effects on riparian function and herbaceous cover that potentially result from heavy livestock grazing (Alternative 2). In the absence of livestock effects, herbivory and trailing by wild ungulates such as moose would preserve some openings for amphibian thermoregulation and other benefits.

Table 32. Summary comparison of existing condition of amphibian habitat and effects of alternatives

Indicator	Existing condition & current management	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Riparian function	Riparian areas typically function properly based on assessments of bank stability, stubble heights, willow structure and recruitment, water quality, and other metrics. Cattle grazing is not contributing to establishment of invasive plants (currently at roadsides and developed sites). Generally meets desired condition for riparian function. **Focus areas:** Not in desired condition (at risk). Does not meet desired condition for riparian function. Riparian communities near Green River feedground—functioning at risk primarily due to elk herbivory.	Riparian areas would be properly functioning due to the lack of cattle grazing. Riparian health would improve relative to existing conditions. Meets desired condition for riparian function. **Focus areas**: rapid improvement toward desired condition. Meets desired condition for riparian function.	High (maximum) key forage use (55% or 65%) puts riparian function at risk, especially in areas currently in less than desired condition. Low expected stubble heights (< 3" at greenline due to high forage use) would trigger fall season browsing on willows by cattle that is detrimental. Does not meet desired condition for riparian function. Fully-functioning riparian communities (currently most areas) would typically be retained at desired condition if current levels of cattle use (less than maximum permitted) continued to occur. **Focus areas**: Not in desired condition (at risk) due to lack of adjustments to grazing management. Does not meet desired condition for riparian function.	Riparian areas that are currently in desired condition remain so, but with less certainty than in Alternative 4. Application of a 4-inch minimum for stubble height (greenline) prescription and adaptive management provides for community stability. Some fall browsing on willows is expected at sites grazed at maximum key forage use. Application of adaptive management, design features, and other adjustments in livestock management improve riparian function where needed in other areas. Meets desired condition for riparian function. **Focus areas:** Trend toward desired condition due to site-specific prescriptions designed to address concerns about riparian function, such as application of a minimum 6" (greenline) stubble height, limits on bank alteration, use of design features, or other adjustments. Meets desired condition for riparian function.	Riparian areas that are currently in desired condition remain so with high certainty. Application of a 4-inch minimum for stubble height (greenline) prescription, and moderate grazing pressure (35% maximum use) sustains riparian function. Fall browsing on willows is not expected. Application of adaptive management, design criteria, and other adjustments in livestock management improve riparian health in areas that are currently in less-than-desired condition. Meets desired condition for riparian function. **Focus areas**: Trend toward desired condition due to site-specific prescriptions designed to address concerns about riparian function, such as application of a minimum 6" (greenline) stubble height, limits on bank alteration, use of design features, or other adjustments. Meets desired condition for riparian function.

Indicator	Existing condition & current management	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Retention of herbaceous cover in riparian areas (objective —70%.	Average retention of total herbaceous cover in mesic (sedge and sparse willow) meadows was estimated at 62%. During 2011, use of key forage in the combined Roaring Fork and Beaver Twin allotments, and Upper Green River Mud Lake East pasture averaged 8%; 34% in Noble Pastures; and 65% in the Wagon Creek allotment Calculated as 100% minus the key forage use, retention of all herbaceous vegetation was then estimated as 92%, 66%, and 35%, respectively. Meets desired condition for retention except in Wagon Allotment with high uncertainty.	Estimated retention of herbaceous cover in key mesic meadows approaches 100% due to the absence of cattle grazing. Meets desired condition for retention.	Estimated herbaceous retention was 50% and 42% for key forage utilization levels of 55% and 65%, respectively, in mesic meadows, based on the utilization-retention regression (Figure 73). Does not meet desired condition for herbaceous retention.	Estimated herbaceous retention was 54% for key forage utilization level of 50% in mesic meadows based on the utilization-retention regression (Figure 73). Does not meet desired condition for herbaceous retention.	Estimated herbaceous retention was 66% for key forage utilization level of 35% based on the utilization-retention regression (Figure 73). Meets or nearly meets desired condition for herbaceous retention, except in Noble Pastures and Wagon Creek allotments.

Table 33. Effect of livestock management actions on amphibians by grazing unit and alternative7u6y

Management Actions	Allotments or unit	Effect on Greater Sage-grouse habitat	Relevant alternative			
			1	2	3	4
Design features						
Delay in livestock entry for range readiness	All allotments	Improves or maintains riparian and/or upland health relative to existing conditions.		X	X	X
Early onset (1 week maximum; ≤ 2 years out of 10) for cattle season of use	Various	Reduces current-year cover available to breeding amphibians in riparian and upland areas. May improve residual cover for following year.		X	X	X
Exception to early onset for cattle season of use to protect Greater Sage-grouse nesting habitat.	Upper Green River (except Gypsum rotation), & Wagon Creek allotments	Maintains current-year cover available to breeding amphibians in riparian and upland areas.			X	X
Improved herding and salt placement ≥ ¼ mile from streams	All allotments & pastures	Improves or maintains riparian and/or upland function relative to existing conditions.		X	X	X
Improved herding, and restriction on salt placement and cattle presence at the Green River Lakes feedground	Roaring Fork allotment & focus area, Green River Lakes' feedground.	Improves or maintains riparian and/or upland health relative to existing conditions. Improves condition of amphibian habitat (e.g., humidity at ground level) and reduces trampling mortality.		X	X	X
Restriction on grazing at sites with < 60% ground cover	All allotments	Improves or maintains rangeland health in general and helps insure adequate cover and the cover-related components of amphibian habitat.		X	X	X
Use of certified weed-free hay	All allotments	Maintains native plant composition and reduces the presence of invasive weeds.		X	X	X
Enclosure fence at Kendall Warm Springs	Upper Green River Allotment, River Bottom Pasture or Livestock Driveway	Protects a riparian habitat and local amphibians from cattle-related effects.		X	X	X
Timing restriction for range improvement work in occupied habitat during amphibian breeding season.	All allotments	Reduces human-caused disturbance and mortality effects on breeding amphibians.		X	X	X
Management system						
Season-long grazing	Badger Creek; Beaver-Twin; Roaring Fork; Wagon Creek	Repeated grazing on plants within a season reduces forage plant vigor and may impede seed set, and thus is less supportive of riparian and upland function than other grazing systems Season-long grazing reduces shade and humidity that benefits amphibians throughout the allotment during late summer.		X		
Deferred, deferred rotation or rest-rotation	All allotments	Deferred, deferred rotation and rest rotation grazing systems reduce repetitive grazing on forage plants and provide for seed set and/or complete rest from grazing during the course of a rotation, and thus better support upland and			X	X

		riparian function. Improves cover and humidity for pastures not exposed to late summer grazing.				
Focus area prescriptions						
Limits on grazing use — 20% for cattle, no outfitter stock use.	Waterdog Lake focus area	Locally improves riparian function and improves cattle distribution. Improves cover for amphibians.		X	X	X
Limits on streamside presence and grazing use by livestock—20% bank alteration and 6" minimum stubble height. Optional electric fence.	Tosi Creek focus area	Locally improves riparian function and improves cattle distribution. Improves cover for amphibians.			X	X
Limits on livestock presence in riparian habitat- construct grazing enclosure, willow plantings, hardened crossings, and maximum ≤ 0.5 AUMs per acre cattle density.	Klondike Creek focus area	Locally improves riparian function and reduces adverse effects of sedimentation on amphibian reproduction. Improves condition of amphibian habitat (e.g., humidity at ground level) and reduces trampling mortality. Culvert may impede amphibian movement			X	X
Limits on livestock use ≤ 50% forage use by cattle & elk, salting prohibited.	Roaring Fork West focus area	Locally improves species composition. Improves cover for amphibians.			X	X
Limits on livestock presence—actively herding cattle out of the feedground area; salting prohibited.	Upper Green River feedground	Locally improves riparian and nearby upland function. Improves cover for amphibians.			X	X
Limits on streamside presence and grazing use by livestock—≤20% bank alteration and minimum 6" greenline stubble height.	Fish Creek focus area	Locally improves riparian function. Improves cover for amphibians.			X	X
Limits on streamside presence and grazing use by livestock—electric fence enclosure and minimum outside 6" greenline stubble height.	Wagon Creek focus area	Locally improves riparian function. Improves cover for amphibians.			X	X
Exclude livestock grazing from streamside, construct fence enclosure, and remove cabled logs.	Tepee Creek focus area	Locally improves riparian function. Improves cover for amphibians.			X	X
Range improvements and riparian protection						
Selective removal of 4 water developments, 4 rider cabins/facilities, and 9 water crossings (culverts and bridges).	All allotments	Restoration of native riparian and upland habitat benefits amphibians over the long-term.	X			
Installation of culvert, hardened crossings, improved cattle holding facility, willow plantings.	Noble Pasture	Installation of these facilities carries disturbance effects to amphibians, temporarily increases sedimentation and soil compaction (heavy equipment), and eliminates riparian habitat at a small scale. Planting and management for willow establishment improves riparian function and cover for amphibians.			X	X

Removal of about 62 miles of interior fencing.	All allotments	Minor negative effect on amphibian habitat and individuals related to overland travel of motor vehicles (ATVs) that are used to access fences.	X			
Maintain or reconstruct 76 miles of existing fence, all cattle guards and water developments as needed.	All allotments	Minor negative effect on amphibian habitat and individuals related due overland travel of motor vehicles (ATVs) that are used to access fences.		X	X	X
Cattle exclusion from the Green River Lakes Campground, Whisky Grove Campground, Kendall Guard Station, and Fish Creek Guard Station using fences	Upper Green River and Roaring Fork allotments	Cattle exclusion promotes rangeland (upland) function and cover available to amphibians.		X	X	X
Travel System						
Occasional motorized travel on roads or overland to remove, maintain, or install fences and other improvements.	All allotments	Occasional (minor) disturbance or crushing mortality for amphibians. Negative effects of vehicle tires on riparian vegetation and upland soils, and sedimentation.	X	X	X	X
Unauthorized route decommission—removal (rip and seed) of spur off of forest road 370691	Upper Green River Allotment, Fish Creek pasture	Restoration of upland habitat near riparian areas is beneficial to amphibians over the long-term.			X	X

Cumulative Effects for All Action Alternatives

The project area was used as the cumulative effects analysis area for amphibians because it is large enough to encompass local populations and the habitat components that support their breeding, nesting, post-natal development, and wintering activities. The duration of the proposed term grazing permit (date of decision + 10 years, approximately 2025) was the temporal boundary chosen for the analysis. Although not a cumulative action itself, term grazing on the project area was the dominant factor affecting amphibians in the cumulative effects analysis and thus provided ideal temporal bounds on the analysis. The temporal extent of the other cumulative actions were not used to define the temporal boundary because their effects on amphibians were ongoing (e.g., road maintenance, fire suppression) and/or were of uncertain duration (timber sales and fuel reduction).

From the set of all cumulative actions described for the project area and vicinity (DEIS, Appendix A and Appendix 1 in Murphy 2016), a subset (Table 34) was selected as relevant to amphibians. Fire suppression carries a mix of positive and negative effects on amphibians due to suppression activities (negative, but temporary direct effects). It also impacts essential amphibian habitat components (e.g., temperature of ponds, availability of refugia, humidity, food sources) in a variety of ways. Other cumulative actions such as timber sales and fuel reduction projects carry a mix of positive and negative effects, albeit at a local scale. Winter elk herbivory at and near the Green River Lakes feedground continues to occur, and has left the Roaring Fork focus area as functioning at-risk (Robertson 2016). Reduced snowfall and increased summer evaporation associated with climate change could carry sustained negative effects on the duration or occurrence of seasonal wetlands, primary habitats for amphibians (Corn 2005), and exacerbate negative effects of excessive grazing (e.g., several focus areas) on hydrologic processes and riparian function (Beschta et al 2013).

As compared to the cumulative actions, the effects of grazing and livestock management (i.e., the direct and indirect effects) were the dominant factor in the cumulative effects analysis because of their broad extent (capable and suitable grazing lands) in the project-area, and because of their strong potential to directly influence important variables of amphibian habitat—riparian function and herbaceous cover. Thus, the

absence of grazing in Alternative 1 is a dominant, positive influence among the collective factors that comprise the cumulative effects. The cumulative actions that carry negative effects are limited in spatial extent and severity (except climate change) and are thus not strong, immediate counter-weights to the positive effects of grazing relief.

Table 34. Cumulative actions relevant to the cumulative effects analyses for amphibians, Upper Green River Rangeland Project

Cumulative action	Riparian function	Retention of cover	Reference
Broad-scale habitat modifications			
Long-term fire suppression, project wide	Loss of (deciduous shrub) beaver habitat through conifer increases (-) Reduced natural disturbance cycles (-, +) Reduced sedimentation following severe fires (+). Promotes forest (shaded) tree canopies that decrease water temperatures (-)	Reduces direct mortality associated with wildfire (+) Promotes woody debris at ground level that are used as refugia (+) Reduces open habitats that retain ground cover and humidity (-)	Vogle 1973, Maxell 2000, Bartelt 2000, Keinath and McGee 2005, Hossack and Corn 2007, Guscio et al. 2007.
Fire suppression activities, local scale	Increases in sediments (vehicles) (-)	Vehicle-strike mortality (-) Human disturbance (-)	Columbia Spotted Frog Technical Team 2015
Climate change (planning period)	Reduced snowfall and increased summer evaporation reduce the duration or occurrence of seasonal wetlands (-).	Droughty conditions reduce herbaceous production that provides cover for humidity and moderation of temperature and sunlight (-).	Corn 2005
Local-scale habitat modifications			
Six timber sale or fuels reduction projects, local scale	Riparian loss at road crossings (-) Sedimentation (vehicles and landform changes, road modifications) (-)	Vehicle-strike mortality (-) Human disturbance (-) Open forest canopies (+) Residual slash piles and woody debris as refugia (+), or loss (-) Mixed effects on shrub understories (-, +) Interruption of dispersal (-) Soil compaction effects on burrows (-)	Bartelt 2000, Boreal toad recovery and technical advisory group 2001, Columbia Spotted Frog Technical Team 2015

(+): minor positive effect; (+++): major positive effect; (-): minor negative effect

Determination and Management Indicator Analysis for Alternative 1

Livestock-amphibian habitat overlap: To evaluate spatial overlap between habitats of the amphibian management indicators and suitable and capable range for cattle, a habitat model was developed in 2015 by Bridger-Teton National Forest wildlife biologists. The model estimated the distribution of boreal toad and Columbia spotted frog breeding habitat throughout the Forest. The model included aquatic habitats (National Wetland Inventory for the Bridger-Teton National Forest; creeks ≤2 percent gradient and shorelines) and 3 riparian vegetation types—willow, cottonwood, and riparian herbland below 9,000 feet, as identified from the 2007 Forest vegetation layer. The riparian communities often contained ephemeral aquatic habitats of small size that were unmapped in the Wetland Inventory. This zone also encompassed breeding and summer

habitat for chorus frogs. Overlap between boreal toad summer and migratory habitats (also modelled by the forest) and suitable and capable rangeland were not evaluated because the amphibian presence of these would be infrequent. Modelled breeding habitat in the project area, mapped as above, totaled 11,891 acres, and overlapped suitable and capable rangeland for cattle by 10,922 acres. The acreage and coverage of all cattle suitable and capable rangeland in the project area (74,263 acres) was discussed in the Rangeland Vegetation section.

Because livestock grazing would be rapidly phased out under this alternative, livestock would not occur in breeding habitat used by the two amphibian management indicators. Thus, no sites unsuitable for livestock grazing in capable and suitable rangeland for cattle (or other portions of the project area) would occur. There would be no negative effects on the condition of the Forest's estimated total acreage of breeding habitats (107,979 acres). Amphibian habitat overlapped by suitable and capable rangelands for cattle in the project area represented about 10 percent of breeding acres on the entire Forest.

Population effects: Due its positive effect on riparian health and the retention of herbaceous cover, this alternative contributes positively to stability (or even improvement) in Columbia spotted frog (sensitive species), western boreal toad (sensitive and management indicator), and boreal chorus frog (management indicator) populations in the project area. Overall, desired conditions for amphibian populations and habitats would be met with implementation of this alternative. Because Alternative 1 outperforms the grazing alternatives with respect to the indicators above, it best meets the habitat needs of amphibians.

Because historic and recent surveys also indicate that the project area supports an important population of boreal toads and boreal chorus frogs on the Bridger-Teton National Forest (Estes-Zumpf et al. 2014; and see occurrence data presented in the Affected Environment), this alternative also positively influences populations of these two amphibians at this spatial scale as well. Thus, for the sensitive amphibians, Alternative 1 "**may impact individuals but is not likely to cause a trend to federal listing or loss of viability**". A beneficial determination was not made for the sensitive species because the absence of grazing carries some negative effects on amphibians, as described above. In this case, the positive effects of this alternative on riparian function and cover contribute to maintaining amphibian populations that are stable, or at least not declining (Forest-wide trends for these amphibians are discussed in the determination section for Alternative 2). Due to its positive influence on the ecological management indicators, implementation of this alternative will likewise improve wetland habitat conditions at the scale of the project area and the National Forest.

Alternative 2 - Grazing as Currently Permitted and Current Management

Direct and Indirect Effects

Existing conditions and the effects of this and the other alternatives on the indicators are contrasted in Table 32.

Indicator 1 – Riparian function: In this alternative, cattle grazing at the maximum allowable use of key herbaceous forage (55 percent or 65 percent) would cause riparian areas, especially those currently in less than desired condition, to decline dramatically in function. In particular, riparian function in focus areas would decline further due to high forage utilization levels. However, cattle appear to under-utilize some riparian zones in the project area (e.g., lower Tosi, Upper Gypsum, and upper Tepee Creeks) because dense willows provide heavy cover for bears (Wyoming Game and Fish Department, personal communication). To maintain riparian function, streamside use of herbaceous vegetation should not exceed 40–50 percent (about 3–4-inch stubble), a level not achieved in this alternative under maximum allowable use of key forage (Clary and Webster 1989). Low expected stubble heights (< 3 inches; as estimated from this alternative's maximum allowable use and Clary and Webster 1989) would also trigger fall season browsing by cattle that would,

over the long-term, reduce willow coverage, produce unbalanced shrub age structures, and cause downward range trends.

Most riparian communities would be retained at desired condition (properly functioning) if current levels of cattle grazing (approximately 30 percent) continued to occur. Riparian communities in the project area are typically healthy. However, riparian function in focus areas would remain at risk—the current condition—due to lack of adjustments to forage utilization and the absence of numerous allotment-specific design features characteristic of the other grazing alternatives. Overall, Alternative 2 under current management is worse than Alternative 1 with regard to riparian function because, although desirable conditions for riparian health and herbaceous retention would be met for a majority of sites, some ill effects on riparian habitats (e.g. focus areas, soil compaction, amphibian trampling) would still occur due to cattle grazing.

Indicator 2 – Herbaceous retention: Under maximum allowable use of key forage (55 percent or 65 percent, depending on the allotment), the estimated retention of total herbaceous vegetation in mesic meadows was 50 and 42 percent, respectively, far below the 70 percent objective. Alternative 2's expected late-season stubble height (< 3 inches) would be the lowest among the grazing alternatives, that is, would produce the least vertical cover and cover benefits to amphibians. No stubble height requirement of 4-inch or 6-inch would be in effect in this alternative to help limit cattle use of herbaceous forage. Because this alternative provides for the longest time spent by cattle in riparian zones (by virtue of the highest utilization level permitted), it is also responsible for the highest (relative) level of trampling mortality and disturbance to amphibian foraging, resting, and dispersal, and other negative effects that are related to reductions in the amount of herbaceous cover (Table 30).

Overall, desired conditions for amphibian populations and habitats would be not be met with implementation of maximum allowable use of key forage by cattle in Alternative 2-Grazing as Currently Permitted, primarily due to strong negative effects on riparian function, and due to effects stemming from high levels of key forage utilization. Compared with the other grazing alternatives, grazing at maximum allowable use proposed in Alternative 2 is the least desirable with regard to its effects on riparian function and herbaceous retention indictors (Table 32).

Under current management, Alternative 2 would not meet desired conditions for herbaceous retention on many sites because our grazing utilization and retention studies (Murphy 2016 Table 21 and U.S. Forest Service 2015) suggested that total herbaceous retention was commonly (16 of 21 sites) less than the 70 percent objective, with the caveat that our study sites were biased toward low retention because they were located on favorable (flat) terrain and provided cattle ready access to water.

Other effects – Alterative 2 carries some positive effects (local scale) on riparian function and cover available to amphibians that stem from design features (Table 33), and a mix of effects associated with range improvements and permittee travel. However, the five allotments or pastures that would retain season-long grazing would not benefit (improved vigor and seed set; Rangeland Vegetation Resources Specialist Report) from adjustments to grazing systems characteristic of the other two grazing alternatives.

The trend of upland habitats grazed at 50–60 percent maximum allowable use of key forage would decline relative to existing condition (< 35 percent use, Booth and Hayward 2015). Upland habitats support a variety of habitat requirements and population processes for amphibians, particularly toads (Todd and Rothermal 2006). This level of key forage use would reduce humidity and other cover-related components in upland communities as compared to existing use, particularly at sites where the cover available to amphibians is provided predominantly by herbaceous (versus willow) vegetation. In communities capable and suitable for cattle grazing that do not support abundant herbaceous vegetation (e.g., in dense sagebrush or some conifer forests), the negative effect of 50–60 percent use of key forage by cattle on amphibians would not be as great.

Cumulative Effects

In bounding the cumulative effects analysis, the same spatial and temporal boundaries and past, present and reasonably foreseeable future activities (Table 34) were used as identified for Alternative 1.

As in Alternative 1, the direct and indirect effects of this alternative were the dominant factor in the cumulative effects analysis for amphibians because of their broad spatial extent (capable and suitable grazing lands) in the project-area, and because of their strong influence on important variables of amphibian habitat. The cumulative actions themselves were a mix of positive and negative effects on amphibians that occurred at a variety of scales. Here, the strong negative direct and indirect effects of Alternative 2 under maximum allowable use, and the additive negative cumulative actions (e.g., active fire suppression activities, climate change), were not strongly counterbalanced by several positive effects of other cumulative actions identified in Table 34. Thus, the cumulative effects were strongly negative for amphibians.

Determination and Management Indicator Analysis for Alternative 2

Livestock-amphibian habitat overlap: Identification of breeding and summer habitats of the management indicator amphibians, and their overlap with cattle-capable and suitable range in the project area, was the same as described in the corresponding amphibian management indicator analysis for Alternative 1. Lands capable and suitable for cattle grazing, described in the Rangeland Vegetation Resources Report, did not differ among the alternatives.

For Alternative 2, many sites that are currently identified as suitable and capable for livestock grazing, particularly in several focus areas and the allotments that are grazed season-long, may be rendered unsuitable for livestock grazing due to the severe effects of grazing on riparian function and herbaceous retention (see analysis for the effects indicators provided above). The identification of such sites as unsuitable for livestock grazing would be necessary to protect breeding and summer habitat of the management indicator amphibians. Overlap between lands suitable and capable for cattle grazing and modeled amphibian breeding habitat in the project area (16 percent; 10,922 acres) was extensive.

Amphibian habitat overlapped by suitable and capable rangelands for cattle in the project area represented about 10 percent (107,979 acres) of breeding habitats on the entire Forest. Owing to its severe effects on riparian function and herbaceous retention, Alternative 2 contributes to the decline in the condition of the amphibian management indicator habitat and populations at the forest scale.

Population effects: Due its negative effect on riparian function and herbaceous retention, this alternative contributes strongly to declines in boreal toad (Sensitive and Management Indicator), Columbia spotted frog (Sensitive), and boreal chorus frog (Management Indicator) populations in the project area. Because historic and recent surveys also indicate that the project area supports an important reservoir (source) population for boreal toads and boreal chorus frogs on the Bridger-Teton National Forest (see occurrence data for both species presented in Affected Environment), this alternative negatively influences these two species at this broader spatial scale as well.

With respect to Alternative 2, the central question for the two sensitive species is whether or not the alternative's negative effects on riparian function and herbaceous cover (the effects indicators) and the cumulative effects contribute to a trend toward federal listing, or the loss of population viability for the populations or the species' at the Forest scale. The effects of management decisions on population viability and/or trends in federal endangered species listing are pivotal considerations in sensitive species determinations. The effects of Alternative 2 on both population viability at the planning unit scale, and the alternative's effects on federal listing at the scale of the species geographic range and/or distinct population segment were considered. The analysis pivoted on the extent maximum key forage utilization in Alternative 2 and other risk factors such as chytrid fungus and climate change (1) were a threat to amphibian habitats and

individuals in the project area, and (2) ultimately caused a loss of population viability or contributed to federal listing of the species or the distinct population segment. This latter question required an assessment of the threats to amphibians at the project scale, and a look at population trends at the project area, Forest, and regional scales using the existing survey data and scientific literature.

Boreal Toad

Alternative 2 as a threat to boreal toads in the project area: As discussed above in the analysis of the direct and indirect effects, implementation of Alternative 2 at maximum use of key forage species carries substantial negative effects on amphibians owing to its ill effects on both riparian function (health) and herbaceous cover. In particular, Alternative 2's negative effects on the hydrologic processes that fundamentally support riparian and aquatic function (references in Table 22) in the project area undermine the ability of these habitats to support breeding and other critical activities of boreal toads. There was wide agreement among the resource specialists which prepared reports (e.g., fisheries, rangeland resources, riparian areas, and trumpeter swans) for this project that Alternative 2 would carry strong negative effects to riparian function. It is acknowledged that management activities such as timber harvest, grazing, and recreation are not believed to be the causal agents of toad population declines (Boreal Toad Recovery Team and Technical Advisory Group 2001, U.S. Fish and Wildlife Service 2012, Roche et al. 2012a, Allen-Diaz et al. 2010, and Lind et al. 2011 cited in Roche et al. 2012a). Under current levels of grazing (average 33 percent key forage use in mesic meadows, but highly variable), this is also likely true for the project area, which currently supports both healthy riparian zones overall and a persistent boreal toad population. However, Alternative 2's proposed level of grazing utilization (60-65 percent) is likely much greater than the current levels that predominate in most project riparian areas. Thus, implementation of Alternative 2 under maximum key forage use, with its concomitant negative effects on riparian function and herbaceous cover, is a substantial threat to boreal toads and their habitat in the project area, especially in view of potential interactions of heavy grazing with important stressors such as chytrid fungus—an important regional mortality factor (Pilliod et al. 2009, Figure 18)—and climate change (Beschta et al. 2013, Columbia Spotted Frog Technical Team 2015).

Amphibian population trends on the project-area and Bridger-Teton National Forest: The trends in occupancy and population size of amphibians, and their breeding distribution on both the project area and the Bridger-Teton National Forest are not well understood despite an abundance of historical information. This problem stems, in part, from the long time period (> 3 years of annual surveys) required to reliably document these parameters, and the Forest's previous lack of statically-valid survey procedures. In 2014, Forest staff began collaborative work with Wyoming Natural Diversity Database and Wyoming Game and Fish Department staffs to collect objective, systematic information about the Forest's amphibian populations (see Estes-Zumpf et al. 2014). Detailed estimates of population trend, occupancy, and breeding distribution will not be available for several more years.

Boreal toads were not extirpated on the project area despite a history of grazing that dates to the 1800s, and historically occurred at higher stocking levels than present (Rangeland Vegetation Resources Report). Thus, the species' persistence in the project area suggests that grazing has not had consistent, severe negative effects on boreal toad numbers. However, the species current persistence does not preclude a scenario that boreal toads (and the other amphibians) have steadily declined to present levels, and yet may be declining, especially under the added influence of recent stressors such as chytrid fungus and climate change.

Systematically-collected data, historical surveys, and anecdotal observations yield some important information about Forest amphibians. The current distribution of breeding boreal toads on the Forest is summarized in the Affected Environment section. The species' breeding is spatially limited, and the project area supports an important portion of the breeding population. Although a substantial portion of the Forest has now been surveyed for boreal toads, with the exception of the Teton and Gros Ventre Wilderness area,

additional boreal toad occurrences and new breeding sites are expected to be documented as surveys continue and anecdotal information accumulates.

Apparent trends of boreal toads and other amphibians based on the literature: Global, regional, and the limited information available from the Forest was used to understand local population trends and the breeding distribution of amphibians. Collectively, these sources provide the best available information on these questions.

Amphibian populations are declining globally, including in the United States (Wake 1991; Stuart et al. 2004, Boyer and Grue 1995). Occupancy of amphibians in ponds and comparable habitats in the United States declined 3.7 percent annually from 2002 to 2011, suggesting amphibian declines in the U.S. are widespread and severe (Adams et al. 2013). Based on studies of historically-occupied sites, Wente et al. 2005 concluded that boreal toads and Columbia-spotted frogs showed moderate declines in the northern Great Basin (central and eastern Oregon and northern Nevada) from 1939 to 2003. They failed to detect either species at any of the historical sites known to be occupied within the last 10 years leading up to their 2000–2003 surveys.

Patla and Peterson (1999) documented a decline in boreal toads, Columbia spotted frogs, and boreal chorus frogs at a wetland in interior Yellowstone National Park. This site was degraded (from 1952) by construction of a new road and buildings, and conifer growth. Gould et al. (2011) documented slight increases in boreal chorus frog occupancy for catchments in Yellowstone and Grand Teton National Park. However, they verified slight negative, but inconclusive trends for Columbia spotted frogs. Trends in numbers of boreal toads were not studied.

Hossack et al. (2015) recently documented a slight decline in site occupancy of boreal toads from 2002 to 2011, and a large decline in Columbia spotted frogs in Yellowstone (including the Patla and Peterson 1999 site) and Grand Teton National Parks. Their result was consistent with earlier work that identified a decline of 12 percent in egg-mass abundance from 1991 to 2011 for Columbia spotted frogs in its northern population clade (central Idaho, Montana, and Wyoming) (Hossack et al. 2013).

In 1995, the U.S. Fish and Wildlife Service announced a 12–month finding that listing the Southern Rocky Mountain population of the boreal toad as an endangered distinct population segment (DPS) was warranted but was precluded (candidate status) by other higher priority actions under the *Endangered Species Act* (U.S. Fish and Wildlife Service 1995). In 2012, the U.S. Fish and Wildlife Service concluded that listing of the Eastern Major Clade (population) of the boreal toad as a DPS warranted further consideration (U.S. Fish and Wildlife Service 2012b). The listing decision for the DPS is currently pending. The agency did not find that the southern Rocky Mountain population warranted DPS status separate from the Eastern Major Clade. The range of the Eastern Clade encompasses the southern Rocky Mountain population and includes southwestern Wyoming, southeastern Idaho, northeastern Nevada, and Utah. The Bridger-Teton National Forest apparently supports populations of both the Eastern Clade and Northwest Major Clade of the boreal toad, with overlap in the northern portion of the Wyoming Range (boundary not yet identified). Project-area boreal toads apparently occur in the Northwest Clade. The southern Rocky Mountain population (as part of the Eastern Clade) of the boreal toad has declined in Colorado, New Mexico, and southeastern Wyoming, and is stable in Utah (U.S. Fish and Wildlife Service 2012). Trends are unknown in southeastern Idaho and northeastern Nevada.

Based on a review of studies comparing current occupancy to that at historic sites, Keinath and McGee (2005) concluded that boreal toads in the northern Rocky Mountain population were likely more abundant historically than currently, but were not declining as rapidly as the southern Rocky Mountain population.

Pilliod et al. 2009 studied boreal toad survival and population growth over six years at three study sites in the Rocky Mountains, including one in the Blackrock Ranger District, Bridger-Teton National Forest, 38 miles

northwest of the project area. Two of the study sites, including Blackrock Ranger District, supported some individuals that were infected with chytridiomycosis (chyrid fungus). The fungus reduced toad survival 31–42 percent. The two infected populations declined 5–7 percent annually, but the uninfected population (Colorado) was stable. They concluded that the fungus was not causing rapid population declines, but rather functioned as a low-level pathogen that carried negative population effects. The authors suggested that some amphibian populations may successfully coexist with the disease (also see Corn 2007 regarding boreal toad coexistence with chytridiomycosis).

Patla (2000) compiled existing information on amphibians on the Bridger-Teton National Forest and expanded her database by soliciting observation reports and by conducting amphibian surveys. She found that boreal toads were rare on the Forest, and that breeding sites were limited. She found no observation records (breeding or otherwise) for the Greys River, Kemmerer, and southern Pinedale districts. She concluded that the status of the boreal toad on the Forest warranted management concern.

Based on the indirect evidence presented above, the conclusion was drawn that boreal toads are slowly but consistently declining, or have previously declined, in both the Yellowstone Ecosystem and on the Bridger-Teton National Forest. This conclusion stems primarily from findings of Pilliod et al. (2009), Hossack et al. (2015), Patla (2000), and the U.S. Fish and Wildlife Service (2012) finding that the Eastern Clade of boreal toads has exhibited well-documented declines in Colorado. The U.S. Fish and Wildlife Service finding was considered as an expert opinion on boreal toad populations. Although these sources do not provide definitive, field-based information on Bridger-Teton National Forest trends, it is reasonable to conclude that regional trends, including some documented in the Yellowstone Ecosystem (Hossack et al. 2015) and on one site on the Bridger-Teton National Forest (Pilliod et al. 2009), characterize the Forest and project-area population as well. The causes of regional population declines are not well understood, but are likely associated with multiple stressors, including chytrid fungus, habitat loss, and other factors (see Pilliod et al. 2009, Keniath and McGee 2005). As stated above, grazing is not considered a primarily cause of boreal population declines in most areas of the western United States; however, few studies have specifically evaluated the effects of heavy grazing (e.g., Alternative 2) on boreal toads in riparian and shoreline zones. The literature clearly indicates that heavy grazing in riparian and wetland communities degrades riparian function, amphibian habitat, and frog species richness (Belsky 1999, Keniath and McGee 2005, Columbia Spotted Frog Technical team 2015, Janson and Robertson 2001, Jansen and Healey 2003).

Conclusion for boreal toads: Maximum allowable use of key forage by livestock under Alternative 2 *"**will likely result in a trend to federal listing or loss of viability**"* on the Forest. This determination was made because (1) heavy grazing in Alternative 2 is a threat to riparian function and health over a large (74,263 acre) project area; (2) the spatial extent of boreal toad occurrence and breeding across the Forest is limited (only 21 percent of survey sites on the forest in 2014 and 2015 supported boreal toads-see Affected Environment for the species), and the project area accounts for an important fraction of the population; and (3) boreal toads have apparently declined regionally, and likely at the forest and project scales (see discussion in the previous sections). Grazing that substantially impedes proper riparian function and heath, and thereby degrades the primary constituent elements of amphibian habitat (e.g., adequate cover, humidity, and surface water) is strongly detrimental to amphibian populations. Implementation of Alternative 2 under maximum forage utilization will degrade riparian function (also see the Rangeland Vegetation Resources, Fisheries, and Hydrologists Reports for concurrence). There is strong evidence that the species is already slowly declining in the region under the influence of chytrid fungus, with climate change likely contributing as an added anthropogenic stressor. Grazing in Alternative 2, *as proposed under maximum allowable use,* will contribute strongly to the species decline on the project area, irrespective of its current population trend. Owing to the project area serving as an important locus of the limited occupancy and breeding activity on the Forest, implementation of Alternative 2 under maximum allowable use will also substantially reduce population viability at the planning unit scale. However, Alternative 2 is not likely to contribute to a trend toward federal listing because a boreal toad decline in the project area following implementation of

Alternative 2 would occur over a relatively small area as compared to the geographic range of the species and/or its distinct population segment(s) (e.g., Eastern Major Clade, or the Northern Clade).

With regard to boreal toads that serve as a management indicator of wetland habitats, implementation of Alternative 2 contributes to the decline in their condition at the forest scale. This determination is based on limited information at the forest level. None-the-less, the balance of the best available information weighs toward this determination and serves to support the conservation of the species.

Columbia Spotted Frog

During the 1990s, Columbia spotted frogs were generally widespread and abundant in the Yellowstone Ecosystem (U.S. Fish and Wildlife Service 1993b, cited as Worthing 1993 cited in Patla and Keinath 2005, Koch and Peterson 1995). As of 2000, this species was common in the northern Ranger Districts of the Bridger-Teton National Forest, but less common in the south (Patla 2000, also see Affected Environment section). This frog species occurred on the Big Piney Ranger District, but was apparently uncommon. There were no records for the Kemmerer Ranger District and the southern two thirds of the Pinedale District.

Currently, this species remains widely distributed on the planning unit, particularly in its northern and western extent, and is widespread in the adjacent Grand Teton National Park (Estes-Zumpf et al. 2014). The species' broad distribution suggests that breeding yet occurs throughout much of the northern portion of the Forest. However, recent observations of Columbia spotted frogs during surveys conducted by Estes-Zumpf et al. (2014) all occurred within the previously mapped distributional extent within their study area, that is, their extensive surveys failed to document occupied areas among previously un-surveyed sites (e.g. Wind River and several portions of the southern Wyoming Range). Their analysis of recent historical and current occupancy data for spotted frogs suggests a possible decline (1999 to 2014) in occupancy in the northeastern portion of the Wyoming Range and Gypsum Creek (project area). A decline on the Bridger-Teton National Forest would be consistent with Hossack et al. (2015) who recently (2002 to 2011) documented a decline in occupancy from 21 percent to 11 percent in nearby Grand Teton and Yellowstone National Parks.

Columbia spotted frogs appear to have declined and/or are still declining in the Yellowstone Ecosystem (Hossack et al. 2013, 2015). However, the species' broad distribution in the northern (Jackson and Blackrock Ranger Districts) and southwestern (Greys River District) portion of Bridger-Teton National Forest suggests the presence of numerous breeding sites. The Jackson and Blackrock Districts collectively support two wilderness areas, one Wilderness Study Area, numerous Wild and Scenic Rivers, and are adjacent to Grand Teton National Park. Thus, this region is relatively secure from important risk factors for amphibians such as the loss of water quality and degradation of riparian and aquatic habitats. Chytrid fungus is also not identified in the scientific literature as an important risk factor for this species.

Because of its strong negative effects on riparian function and cover retention, implementation of Alternative 2 would contribute to declines of Columbia spotted frogs on the project area. This effect, however, would not extend throughout the Forest. Based on (1) the species' broad distribution (and apparent breeding) of Columbia spotted frogs in the northern and southwestern portions of the Forest; and (2) the apparent absence of chytrid fungus as an important additive source of mortality, Alternative 2 "**may impact individuals but is not likely to cause a trend to federal listing or loss of viability**".

Boreal Chorus Frog

As of 2000, boreal chorus frogs occurred on all the Ranger Districts of the Bridger-Teton National Forest, the species was common, and its population status was not of concern (Patla 2000). Currently, boreal chorus frogs remain well distributed. The species' recent distribution is consistent with its apparent, historic distribution (Estes-Zumpf et al. 2014). Numerous first detections of the species recently occurred in portions of the Forest that were historically un-surveyed (Estes-Zumpf et al. 2014). Thus, it appears that this species is

not on a declining trajectory on the planning unit. Hossack et al. (2015) found little change (< 3 percent) in occupancy of this species in Yellowstone and Grand Teton National Park from 2002 to 2011. Thus, although locally detrimental to boreal chorus frog in the project area, Alternative 2 will not substantially reduce boreal chorus frogs at the planning unit scale. However, with regard to boreal chorus frogs that serve as a management indicator, implementation of Alternative 2 contributes (through heavy grazing) to the decline in the overall condition of wetland habitats at the Forest scale.

Alternative 3 - Modified Grazing Management

Existing conditions and the effects of this and the other alternatives on the indicators are contrasted in Table 32.

Direct and Indirect Effects

Indicator 1 – Riparian function: Maximum allowable utilization of key forage species in riparian zones is reduced to 50 percent in mesic meadows and a 4-inch greenline stubble height (typical), as compared to 55–65 percent use in Alternative 2-Grazing as Currently Permitted. Grazing intensities of 40–50 percent (3–4-inch stubble) provide for stability in existing conditions (i.e., maintenance) in riparian communities (Clary and Webster 1989). Thus, the proper function (healthy state) that currently characterizes much of the project area would be narrowly maintained under key forage utilization of 50 percent. Some mid–late season willow browsing would occur under Alternative 3, as cattle use of willows begins when the use of herbaceous riparian forage reaches about 45 percent (Kovalchik and Elmore 1992). However, the application of adaptive management, design criteria, and range improvements in Alternative 3, applied as necessary, would indirectly limit the negative effects of grazing where they occur. Thus, desired conditions for riparian function would be met under the Alternative 3's maximum allowable use of key forage.

In general, the risk of riparian areas loosing function would be higher in Alternative 3 than in Alternative 4 (35 percent use of key forage and about herbaceous 65 percent retention) because the typical maximum allowable key forage use (50 percent) in Alternative 3 is at the upper margin of the Clary and Webster (1989) recommendation for grazing utilization that maintains riparian function. Grazing at 50 percent key forage use would typically not improve or maintain, with certainty, good riparian conditions where they currently occur. Vigorous woody growth and at least 6 inches of residual stubble height (24–32 percent herbaceous utilization) at the end of the growing season is associated with good–excellent or improving conditions (Clary and Webster 1989). Thus, through its potential negative effects on riparian function, Alternative 3 carries higher risks of long-term, detrimental effects on amphibian habitat than Alternative 4 (Table 30).

The design features and range improvements proposed in Alternative 3 would maintain or improve riparian health in focus areas, sites not currently in desired condition (Robertson 2016, Anderson 2015, Booth and Hayward 2015). Fall browsing on willows is not expected at focus sites with a minimum 6″ stubble height (Kovalchik and Elmore 1992, Hall and Bryant 1995), although it is undetermined if greenline stubble measurements (this alternative) are similar to stubble measured nearby in the interior of mesic meadows. In general, cattle use of key forage in mesic meadows would be expected to be equal to, or greater than, levels at the greenline because boggy and rocky conditions at streamside may discourage cattle use.

Indicator 2 – Herbaceous retention: Under maximum allowable use of key forage (50 percent), retention of total herbaceous vegetation in cattle-accessible moist meadows is estimated at 54 percent (Figure 73), a level well below the objective of 70 percent. Fifty percent key forage use in meadows also produces about a 3-inch stubble height (Clary and Webster 1989), a level below that (4–6″) recommended by Keinath and McGee (2005). Thus, Alternative 3 does not meet desired condition for herbaceous retention where actual key forage utilization is 50–55 percent, maximum levels typical for this alternative.

Other effects: Alterative 3 carries numerous positive effects (local scale) on riparian function and cover available to amphibians that stem from its design features (Table 33), and a mix of effects associated with range improvements and permittee travel. Besides its beneficial focus area prescriptions, this alternative favorably modifies the grazing systems for several allotments and provides for the removal a short user-created route.

Through removal of dense herbaceous vegetation, this alternative beneficially warms aquatic (larval and egg development) and fringe terrestrial environments (sun basking) at microsites that otherwise support limited amphibian use because of low ambient temperature (see discussion of the opposite effect for Alternative 1).

As in Alternative 2, the trend of upland habitats grazed at 50 percent maximum allowable use proposed under Alternative 3 would decline relative to the existing condition grazed at typically less than 35 percent forage use (Booth and Hayward 2015). This level of key forage use would also reduce humidity and other cover benefits of boreal toad habitats in upland habitats where herbaceous vegetation provides a primary source of cover at ground level. In upland communities capable and suitable for cattle grazing that do not support abundant herbaceous vegetation (e.g., dense sagebrush), the negative effect of 50 percent use of key forage by cattle on amphibians would be not be as great.

In sum, desired conditions for amphibian populations and habitats would typically not be met under Alternative 3 maximum allowable use of key forage because cover and cover benefits would not be adequate, as gauged by the objective to achieve 70 percent retention of total herbaceous vegetation. Riparian function would be maintained or improved, particularly in focus areas, but with less certainty than in Alternative 4.

Cumulative Effects

In bounding the cumulative effects analysis, the same spatial and temporal boundaries and past, present and reasonably foreseeable future activities (Table 34) were used as identified for Alternative 1.

The direct and indirect effects of Alternative 3 on amphibians were the dominant factor in the cumulative effects analysis due to their broad spatial extent (capable and suitable grazing lands) in the project-area, and because of their strong influence on important variables for amphibian habitat.

In Alternative 3, the negative direct and indirect effects on amphibians were collectively negative, primarily due to adverse effects on cover and cover benefits associated with 50 percent key forage use (54 percent total herbaceous retention). This effect, combined with other negative, local-scale cumulative actions were not strongly counterbalanced by several positive actions all identified in Table 34.

Determination and Management Indicator Analysis for Alternative 3

Livestock-amphibian habitat overlap: Use of the Forest's model for amphibian breeding habitat and its overlap with lands suitable and capable for cattle grazing in the project area was the same as described in the management indicator analysis in Alternative 1. Lands capable and suitable for cattle grazing did not differ among the grazing alternatives.

Overlap between suitable and capable rangeland for cattle and amphibian breeding habitat in the project area was extensive (10,922 acres). Because Alternative 3 would reduce herbaceous cover in amphibian habitat to levels below desired conditions, it is expected that some suitable and capable rangelands for cattle in wetland, riparian, and upland areas would be rendered unsuitable for amphibians if livestock grazing occurs at the maximum allowable use. Amphibian habitat and population monitoring would be required during implementation of Alternative 3 to identify such sites and to mitigate negative effects on amphibians where they occur. However, design features, changes in grazing systems, focus area prescriptions, and range improvements in Alternative 3 would maintain or improve riparian function and cover for amphibians over Alternative 2, and reduce the number of unsuitable sites for amphibians.

Modeled amphibian breeding habitat overlapped by suitable and capable rangelands for cattle in the project area represented an important fraction (10 percent) of this habitat Forest-wide. Due to its negative effects on herbaceous retention, grazing at maximum allowable use under Alternative 3 is likely to reduce amphibian breeding habitat quality and contribute negatively to their population trend at the forest scale.

Population effects: The same factors were considered under Alternative 3 as in Alternative 2 in making a determination—the threat to amphibian populations on the project area, the trend of amphibians on the Bridger-Teton National Forest, the contribution of the project-area to amphibians on the Forest overall, and the extent the alternative reduced population viability on the Forest and/or contributed to federal listing.

Under Alternative 3, desired conditions for riparian function and health are achieved, although without certainty. Riparian function will likely be maintained by the collective application of progressive design features as needed, design criteria, and range improvements. Thus, this alternative will not likely carry the strong negative effects on riparian habitats that typically characterize Alternative 2.

Boreal Toads

Under maximum allowable utilization of key forage, Alternative 3 "**may impact individuals but is not likely to cause a trend to federal listing or loss of viability**". This determination was made because (1) desired conditions for riparian function would likely be achieved, and thus the hydrologic processes that underpin proper riparian function and promote amphibian habitats in riparian and shoreline zones would likely be retained; and (2) although herbaceous retention would typically fall short of the 70 percent objective and likely will contribute negative direct and indirect effects on boreal toads, the severity of this effect on Forest-wide population viability and/or trends toward federal listing is uncertain.

Several factors moderate the concerns about the potential for inadequate herbaceous retention in Alternative 3. First, despite the opportunity for 50–55 percent utilization of herbaceous forage, cattle currently avoid using some riparian areas due to the threat of grizzly bear predation, thus reducing livestock foraging pressure. Cattle appear to under-utilize some riparian zones in the project area (e.g., lower Tosi, Upper Gypsum, and upper Tepee Creeks) because dense willows provide heavy cover for bears (Wyoming Game and Fish Department, personal communication). Second, the amphibian breeding zones in the project area support extensive woody cover in the form of dense willows, mountain sagebrush, silver sage, shrubby cinquefoil, conifer and aspen forests, tree downfall, and woody debris on the ground. These community types and components provide extensive cover and cover-related benefits for amphibians and their habitat, in addition to those provided by herbaceous cover. Under Alternative 3, these communities would persist much as they are. Third, moderate or light grazing carries some benefits to boreal toads by reducing thick herbaceous cover in riparian and shoreline zones (see discussion in Alternative 1). And finally, the application of adaptive management (as needed) and the required design features such a rest rotation in several allotments and stubble height requirements (Table 33) would likely help sustain herbaceous retention above 54 percent (estimated for Alternative 3) in some areas.

Boreal toads were not extirpated on the project area despite a history of grazing that dates to the late 1800s, and that included higher stocking rates (Booth and Hayward 2015). Although some decline in boreal toad numbers from pre-grazing levels may have occurred, the species' persistence in the project area suggests that historic grazing did not have consistent, severe effects on boreal toad numbers, and that Alternative 3 would also not cause dramatic population declines. However, continued slow population declines in boreal toads—especially as compounded by mortality effects of chytrid fungus and a reduction in the seasonal availability of surface water (climate change)—remains a plausible scenario.

Although heavy grazing in riparian and wetland communities degrades riparian function, amphibian habitat, and frog species richness (see discussion in the analysis of Alternative 2), the scientific literature provides no empirical data concerning the effects of 50 percent (moderate) forage use in riparian zones. In general, toads

appear to be more tolerant of anthropogenic effects than frogs. Based on experimental grazing studies in the Sierra Nevada, Roche et al. (2012a, b) concluded that *light–moderate* grazing intensity did not impair amphibian habitat conditions for the Yosemite toad (*Bufo canorus*) and other amphibians. They emphasized the importance of maintaining hydrologic function (see analysis of Alternative 2) and risk factors such as climate change, improper (heavy) grazing management, and forest succession caused by altered fire regimes. Burton et al. (2007) found that grazing effects in Tennessee were species specific—American toads, a species that commonly uses terrestrial (upland and riparian) environments, were less affected by cattle-induced environmental changes (reductions in emergent vegetation (predation),water quality, and desiccation from sun exposure) than green frogs, a species with a strong affinity for aquatic environments. Burton et al. (2007) concluded that toads may benefit from controlled grazing.

In sum, although the loss of herbaceous cover in much of the project area under Alternative 3 would likely carry negative effects on amphibian habitat and the boreal toad population, Murphy (2016) was unable to conclude that low (sub-objective) herbaceous retention would contribute substantially at a broader spatial scale to a loss of population viability across the Forest or to a trend toward federal endangered species listing across its range.

Columbia Spotted Frogs

Alternative 3 "**may impact individuals but is not likely to cause a trend to federal listing or loss of viability**". This determination was based on 1) the desired conditions for riparian function would likely be achieved, and thus the hydrologic processes that underpin proper riparian function and promote amphibian habitats in riparian and shoreline zones would likely be retained; and (2) the species and its breeding sites are well distributed on the planning unit (Blackrock, Jackson, and Greys River Ranger Districts) and in adjacent Grand Teton National Park. Thus, a reduction in breeding in the project area through implementation of Alternative 3, should it occur, would not substantially reduce population viability on the Forest (also see Alternative 2).

In northeast Oregon, Bull and Hayes (2000) found no differences between numbers of egg masses or recently metamorphosed Columbia-spotted frogs in cattle-grazed and ungrazed sites (level of grazing—whether light, moderate, or heavy—was not indicated). In the same region, a study by Adams et al. (2009) showed that light–moderate cattle grazing reduced the height of emergent vegetation, but found no differences in water quality, short-term numbers of egg counts, in larval survival, or metamorphic size of Columbia-spotted frogs among ponds with full, partial, and no exclusion of cattle from ponds.

Boreal Chorus Frogs

Because this species is widely distributed and the project area supports one of numerous apparent breeding populations on the Forest (see information presented in Alternative 2), implementation of Alternative 3 **would not likely result in declining frog populations and wetland habitat conditions on the planning unit**.

Alternative 4 - Modified Grazing Management with Riparian Emphasis

Existing conditions and the effects of this and the other alternatives on the indicators are contrasted in Table 32.

Direct and Indirect Effects

Indicator 1 – Riparian function: Moderate use of herbaceous forage (35 percent maximum key forage utilization) by cattle would broadly sustain the proper riparian function that currently characterizes most of the project area and riparian conditions would move towards the riparian function objective in areas currently not meeting objective. Fall browsing on willows is not widely expected with the levels of key forage use and stubble heights (4–6″ at greenline) that predominate in this alternative. Cattle reportedly begin browsing

willows when use of palatable herbaceous vegetation approaches 45 percent (Kovalchik and Elmore 1992), approximately a 3 to 4-inch stubble (Clary and Webster 1989). However, cattle appear to under-utilize some riparian zones in the project area (e.g., lower Tosi, Upper Gypsum, and upper Tepee Creeks) because dense willows provide heavy cover for bears (Wyoming Game and Fish Department, personal communication). Riparian areas in excellent, good, or rapidly improving condition are characterized by vigorous woody plant growth and greater than or equal to 6 inches of residual herbaceous plant height (Meyers 1989 cited in Clary and Webster 1989). In areas presently in less than desired condition, application of adaptive management, design features, and other adjustments in livestock management would improve riparian function. Similarly, several focus areas would trend toward desired condition due to the application of a minimum 6-inch (greenline) stubble height, use of design features, and other adjustments. This alternative would meet the desired conditions for riparian function.

Indicator 2 – Herbaceous retention: The estimated herbaceous retention at 35 percent use of key herbaceous forage (typical under Alternative 4) was about 66 percent (Figure 73), a level that approaches or would achieve (considering sample error) the 70 percent objective and desired conditions. Moreover, stubble height restrictions and design features in this alternative that are not characteristic of current management may improve the biomass of key forage species in riparian habitats and thereby increase herbaceous retention (without decreasing key forage use) in many areas (Smith et al. 2007). This would be a benefit to amphibians. This positive effect is unique among the grazing alternatives because of low use of key forage. Through its limits on grazing use, Alternative 4 provides for the least amount of time spent by cattle in riparian zones, and so best limits the negative effects of sedimentation, soil compaction, trampling mortality, and amphibian disturbance that accompany cattle presence. This alternative meets or nearly meets desired condition for herbaceous retention, except in Noble Pastures and Wagon Creek allotments. Under Alternative 4, these two allotments would receive a maximum of 50 percent key forage utilization and provide an estimated 54 percent herbaceous retention (Figure 73), a level below the 70 percent objective. However, boreal toads or Columbia spotted frogs breeding sites are not located in these allotments.

Other effects: Alterative 4 carries numerous positive effects (local scale) on riparian function and cover that stem from its design features (Table 33) and a mix of effects associated with range improvements and permittee travel. Similarly to Alterative 3, this alternative includes focus area prescriptions, modifications to grazing systems for several allotments, and removal of a short, unauthorized spur route that benefits habitat function. By allowing cattle grazing, this alternative provides for warming of aquatic (larval and egg development) and fringe terrestrial environments (sun basking) at microsites, a beneficial effect to amphibians where their habitat use is limited by temperature (see discussion of the opposite effect for Alternative 1). Moderate grazing may also help prevent some aquatic habitats from becoming overgrown with emergent vegetation, a positive effect on frogs (Engle 2001, cited in Pilliod and Scherer 2015).

Among all the grazing alternatives, Alternative 4 best provides for population and habitat requirements for amphibians. Alternative 4 meets desired conditions because it maintains or restores riparian health with high certainty, meets (or nearly meets) amphibian requirements for herbaceous cover, and provides other benefits that stem from cover. However, the trend of upland habitats grazed at 50 percent maximum allowable use under this alternative would decline relative to the existing condition (< 35 percent use, Booth and Hayward 2015). Also see the analogous discussion in Alternative 3.

Cumulative Effects

In bounding the cumulative effects analysis, the same spatial and temporal boundaries and past, present and reasonably foreseeable future activities were used as identified for Alternative 1. The past, present, and reasonably foreseeable future activities had a mix of positive and negative effects on amphibians across a variety of scales (Table 34). The direct and indirect effects of Alternative 4 were the dominant factor in the

cumulative effects analysis for boreal toads due to their broad spatial extent (capable and suitable grazing lands) in the project-area, and because of their strong influence on important variables for amphibian habitat.

In Alternative 4 the direct and indirect effects on riparian function and amphibian cover (herbaceous retention) were largely positive. The cumulative actions that acted negatively on amphibian populations and habitats were minor in scope and not strongly counterbalancing.

Determination and Management Indicator Analysis for Alternative 4

Livestock-amphibian habitat overlap: Use of the Forest's model for amphibian habitat and its overlap with lands suitable and capable for cattle grazing in the project area was the same as described in the management indicator analysis in Alternative 1.

Overlap between suitable and capable rangeland for cattle and seasonal amphibian breeding habitats in the project area was extensive (10,922 acres). However, the design features, changes in grazing systems, focus area prescriptions, range improvements, and the reduced maximum key forage use by livestock that characterize Alternative 4 will maintain or improve the condition of amphibian habitats—desired conditions would be achieved, or nearly achieved with implementation of this alternative. With regard to protections needed to protect management indicator habitat, very few or none of the areas of overlap between suitable and capable rangeland and seasonal amphibian habitat would be rendered unsuitable for livestock grazing. At the forest scale, implementation of Alternative 4 would maintain or improve amphibian management indicator habitats and contribute positively to their population trend.

Population effects: For boreal toads and Columbia spotted frogs, livestock grazing at maximum allowable use in Alternative 4 "**may impact individuals but is not likely to cause a trend to federal listing or loss of viability**". This alternative meets desired conditions for riparian function, and meets or nearly meets desired conditions for herbaceous retention. Although the boreal toad is likely declining, several minor, negative effects under Alternative 4 are not sufficient to further contribute toward this species' listing or reduce population viability.

Similarly, Alternative 4 does not contribute sufficient negative effects on boreal chorus frogs to cause a decline in the Forest-wide population. Through its favorable effects on riparian function and by sustaining cover available to the management indicators (boreal toad and boreal chorus frog), implementation of this alternative would help sustain wetland habitats on the Forest.

Greater Sage-grouse (*Centrocercus urophasianus*) - Sensitive

The Greater sage-grouse section presents the indicators addressed in this analysis, the existing condition and the environmental effects of each alternative on Greater Sage-grouse. Information provided in this section was summarized from the Greater Sage-grouse Specialist Report (A. DeLong 2016).

Indicators Used for Comparison of Alternatives

- Herbaceous (grass and forb) canopy cover
- Grass height
- Preferred forb availability
- Riparian function and/or Stream bank stability

Affected Environment

This section highlights and supplements information presented in the Wyoming Greater Sage-grouse Proposed Land Use Plan Amendment and Final Environmental Impact Statement (Bureau of Land Management and Forest Service 2015), the Greater Sage-grouse Record of Decision (U.S. Forest Service

2015) and the Conservation Assessment for Greater Sage-grouse on the Bridger Teton National Forest (Bohne 2015). Desired conditions were identified for the Upper Green River project area based on the Greater Sage-grouse Record of Decision (U.S. Forest Service 2015) and best available science. Desired conditions were compared with data collected in the project area describing existing conditions. Greater Sage-grouse breeding, nesting and summer habitats are present in the Upper Green River project area.

Methodology and Data Sources

Greater sage-grouse habitat on the Upper Green River project area was suitable and occupied Greater Sage-grouse habitat, including areas identified as priority habitat management areas and general habitat management areas (U.S. Bureau of Land Management and Forest Service 2015). In this document, these habitats are also referred to as core, connectivity habitat (both included in priority habitat management areas), and general habitat (general habitat management area). The Upper Green River project area contains Greater Sage-grouse connectivity and general habitats (Figure 79), as well as Greater Sage-grouse habitat surrounding 5.3 miles around a lek and a potential lek (Figure 80).

We conducted summer habitat (July 1 to November 30) monitoring in connectivity and general habitats during September of 2014. Nesting habitat was not monitored in 2014. In 2015, nesting (March 15-June 30) and summer habitat (July 1 to November 30) monitoring was conducted in June and August/September, respectively. Monitoring sites were randomly selected within suitable vegetation communities identified with the 2007 Bridger-Teton National Forest vegetation layer (2007 satellite imagery) and were stratified by allotment and rotation. Monitoring sites are displayed in Figure 79.

Habitat monitoring protocol is outlined in the Greater Sage-grouse Habitat Assessment Framework (Stiver et al. 2010). Sagebrush height and canopy cover were assessed using the line intercept method, herbaceous canopy cover assessed using the Daubenmire frame method, and preferred forb availability using the belt transect method as described by Stiver et al. (2010). The riparian function and stream bank stability indicators were evaluated by the hydrologist (Robertson 2016) and fisheries biologist (Anderson 2015) using multiple indicator monitoring (MIM, Burton et al. 2011). These indicators were adopted for the Greater Sage-grouse assessment of riparian/ meadow habitat because they were comparable to the Properly Functioning Condition (PFC) method (Prichard et al. 2003) recommended by Stiver et al. (2010), data and assessment for riparian function and stream bank stability were readily available, and data using the PFC protocol was limited. In some cases, primarily along the Green River, the PFC protocol was used instead of MIM. Data on grass height was collected along transects at 5-foot intervals in the nesting and brood-rearing habitats as described in the Sage-grouse Habitat Assessment Framework (Stiver et al. 2010).

An aerial survey was conducted on May 30, 2014 and Greater Sage-grouse breeding activity was identified in an area referred to as the potential Big Bend lek. In August 2014, nine Greater Sage-grouse were fitted with GIS radio transmitters in the project area and movement data was collected in 2014 and 2015 for available birds. During the 2015 breeding season, one of two radio-tagged hens monitored repeatedly visited the potential Big Bend lek along with a radio-tagged cock. This hen subsequently nested in the project area in addition to another radio-tagged hen. In April 2016, 22 cocks were documented by Wyoming Game and Fish Department strutting at the Big Bend lek. For this analysis, the potential Big Bend lek and Warren Bridge 2 lek were used to identify potential nesting areas. Nesting habitat was identified as mountain big sagebrush community type within two 5.3 mile radius circles in the Bridger-Teton National Forest (Figure 80).

Incomplete and Unavailable Information

Telemetry data indicates that a portion of the Greater Sage-grouse population that inhabit the Green River project area is a migratory population wintering south of the Bridger-Teton National Forest boundary, in the Pinedale Anticline area, and migrating north into the Forest to breed, nest and raise broods in the Upper Green River project area. Information is currently being collected regarding Greater Sage-grouse movements

and the presence and location of a lek(s) in the project area. Connelly et al. (2000) defined an occupied lek as a traditional display area in or adjacent to sagebrush-dominated habitats that has been attended by two or more male Greater Sage-grouse in at least two of the previous five years. Additional lek surveys are being conducted to verify the presence and location of a lek(s) in the Upper Green River project area.

Regardless of lek location, Greater Sage-grouse hens are nesting in the Upper Green River project area based on observations of strutting males in 2014, presence of hens and males during the breeding/nesting season in 2014 and 2015 (April-June), strutting males in 2016, and observations of hens with broods in July and August of 2014, 2015 and 2016 in the project area. In addition two radio-marked hens nested in the project area in 2015, one of which was seen with chicks, and another radio-marked hen nested in the project area in 1998 and 1999. Radio marked hens also nested in the project area in 2016.

Nesting habitat data was collected in June of 2015 and preliminary analysis was included in this analysis. Sagebrush height and canopy cover information collected in the late summer of 2014 can also be used to describe nesting habitat because these values were not expected to change over the summer, however the effects on these indicators do not differ measurably by alternative. Grass height is an important component of nesting habitat; however grass height data is unavailable for 2014 and limited for 2015. The effects of the alternatives on grass height are primarily described in relative rather than qualitative terms.

Habitat monitoring for the summer – late brood rearing season was conducted in 2014 and 2015. Habitat assessments were based on small sample sizes collected in two seasons during summers with above average precipitation. Additional Greater Sage-grouse nesting and brood rearing habitat monitoring is needed over multiple years to draw more comprehensive conclusions regarding existing vegetation conditions within livestock allotments.

Status and Trend

Distribution

The Greater Sage-grouse is resident of central Washington, southern Idaho, Montana, Wyoming, southeastern Alberta, southwestern Saskatchewan, southwestern North Dakota, and western South Dakota south to east-central California, south-central Nevada, southern Utah, and northwestern Colorado. It has been extirpated from historical range in southern British Columbia, western Nebraska, and possibly northern Arizona. The range extent of the Greater Sage-grouse is about 80,000-1,000,000 square miles. Current distribution is estimated at 56 percent of the potential pre-settlement distribution. The Greater Sage-grouse species as a whole is represented by many distinct occurrences (subpopulations) (USFWS 2010).

Trend

Based on data from 2002-2008, total range-wide population size was estimated at approximately 536,000 (USFWS 2010). This estimate, though not precise and based on certain assumptions that may be incorrect, but likely is of the correct order of magnitude. Early accounts suggest that this species was once widespread and abundant in many areas of the West, and there are reports of Greater Sage-grouse being shot by the wagon-load (Braun 1998). However, neither pre-settlement nor current numbers of Greater Sage-grouse are accurately known, so the actual rate and magnitude of decline since pre-settlement times are uncertain (USFWS 2010). Short-term trend varies with populations that are relatively stable or may have declined by more than 30 percent. Estimated decline for minimum number of breeding males in 11 states is reported to be 56 percent from 109,990 in 2007 to 48,641 in 2013 (Garton et al. 2015). The number of breeding males is thought to be a relatively accurate index of trends in the total population. Overall population likely is slowly declining with an annual decline of 1.4 percent which would result in a decline of 13.2 percent over 10 years. The long term decline is 30 to 50 percent (Bohne 2015).

Wyoming supports the largest and most widespread populations of Greater Sage-grouse, about 1/3 to 1/2 of the range-wide population (Bohne 2015). Greater Sage-grouse populations have declined in Wyoming and across the West over the last half-century. There have been long-term declines but in more recent years the average number of males at leks has increased in Wyoming, indicating an increasing statewide Greater Sage-grouse population. Over 44,500 Greater Sage-grouse cocks were observed on leks in Wyoming in 2006. Trends are more varied at the local scale. Local sub-populations are heavily influenced by anthropogenic impacts (sub-divisions, intensive energy development, large-scale conversion of habitat from sagebrush to grassland or agriculture, and interstate highways) and have experienced declining populations or extirpation.

In Wyoming the overall annual rate of Greater Sage-grouse population decline was 5.2 percent for the time period from 1968-2003 but the average annual rate of decline from 1968-1986 was 9.7 percent compared to an average decline 0.33 percent per year from 1987-2003 (Bohne 2015). The number of males per lek declined 49 percent from 1968-2003 in Wyoming. Lows in Wyoming populations were reached in the mid-1990s with some recovery in the subsequent 10 years (USRBSGWG 2008). The average lek size in 2013 remained slightly higher than that recorded during the mid-1990s when Greater Sage-grouse populations were at their lowest level but rebounded in 2015 to over 30 males per active lek. Number of males in 2015 were twice that observed in 2013 (Christiansen 2015 as cited by Bohne 2015).

The Greater Sage-grouse population that uses the Bridger-Teton National Forest can be evaluated using lek counts at two leks in the Gros Ventre Complex, eight leks on the Jackson Hole Complex, and a lek in the Hoback area. The number of males per lek provides a reasonable index of Greater Sage-grouse abundance over time. The long term trend in the lek count data suggests a declining Greater Sage-grouse population reaching a low point in 1996 and again in 2009 with some recovery in the intervening years (Bohne 2015). Greater Sage-grouse trends in the Upper Green River project area are unknown. Hens that attend leks in the Upper Green River Valley to the south of the project area likely move to the project area to nest and/or raise their broods. The Warren Bridge 2 lek is located to the south of the Bridger-Teton National Forest within 5 miles of the project area. The Warren Bridge 2 lek counts began in 1995 in which 10 males were observed on the lek. The highest count was observed in 2007 with 154 males and most recent Warren Bridge 2 lek count was conducted in 2013 with 62 males observed (Wyoming Game and Fish Department lek data). Data from the Warren Bridge 2 lek was not used to determine a trend.

Federal Status

In March 2010 the U.S. Fish and Wildlife Service published their findings in the Federal Register on petitions to list Greater Sage-grouse as threatened or endangered under the Endangered Species Act (75 Federal Register 13910, March 23, 2010). They found that listing the Greater Sage-grouse (range-wide) was warranted, but precluded by higher priority listing actions. Inadequacy of regulatory mechanisms to conserve Greater Sage-grouse and its habitat was identified as one of the major factors in the U.S. Fish and Wildlife Service's finding on Greater Sage-grouse. The U.S. Fish and Wildlife Service identified threats to Greater Sage-grouse habitat including and threats related to this project are impacts from grazing, invasive species, fences and water developments.

On September 22, 2015, the U.S. Fish and Wildlife Service reversed its finding to list the Greater Sage-grouse to a "not warranted" finding. They found that the Greater Sage-grouse remains relatively abundant and well-distributed across the species' 173-million acre range and does not face the risk of extinction now or in the foreseeable future. The Fish and Wildlife Service's decision followed an unprecedented conservation partnership across the western United States that significantly reduced threats to the Greater Sage-grouse across 90 percent of the species' breeding habitat. The Bureau of Land Management and the Forest Service were partners in this Greater Sage-grouse conservation effort. These agencies released amendments to their land management plans to conserve Greater Sage-grouse. The U.S. Fish and Wildlife Service determined that

protection for the Greater Sage-grouse under the *Endangered Species Act* was no longer warranted and withdrew the species from the candidate species list.

Forest Service Status and Direction

In September 2015, the Forest Service signed the record of decision implementing the Greater Sage-grouse Wyoming Management Plan (U.S. Forest Service 2015). The goal of incorporating these specific conservation measures into Forest Service land management plans is to protect, enhance, and restore Greater Sage-grouse and its habitat and to provide sufficient regulatory certainty such that the need for listing the species under the *Endangered Species Act* could be avoided.

The Greater Sage-grouse Wyoming Plan Amendment (U.S. Forest Service 2015 Attachment B) provides the Forest Service direction for Greater Sage-grouse management on the Bridger-Teton National Forest. This amendment provides conservation measures to protect, restore, and enhance Greater Sage-grouse and its habitat by reducing, eliminating, or minimizing threats to Greater Sage-grouse and its habitat. The direction is expressed as desired conditions, objectives, standards and guidelines. The Forest Service made reasonable attempts to be consistent with the State of Wyoming Core Area Strategy and the Governor's Executive Order (2015-4), but in a few instances differences exist as a result of other laws or regulations that govern Forest Service activities.

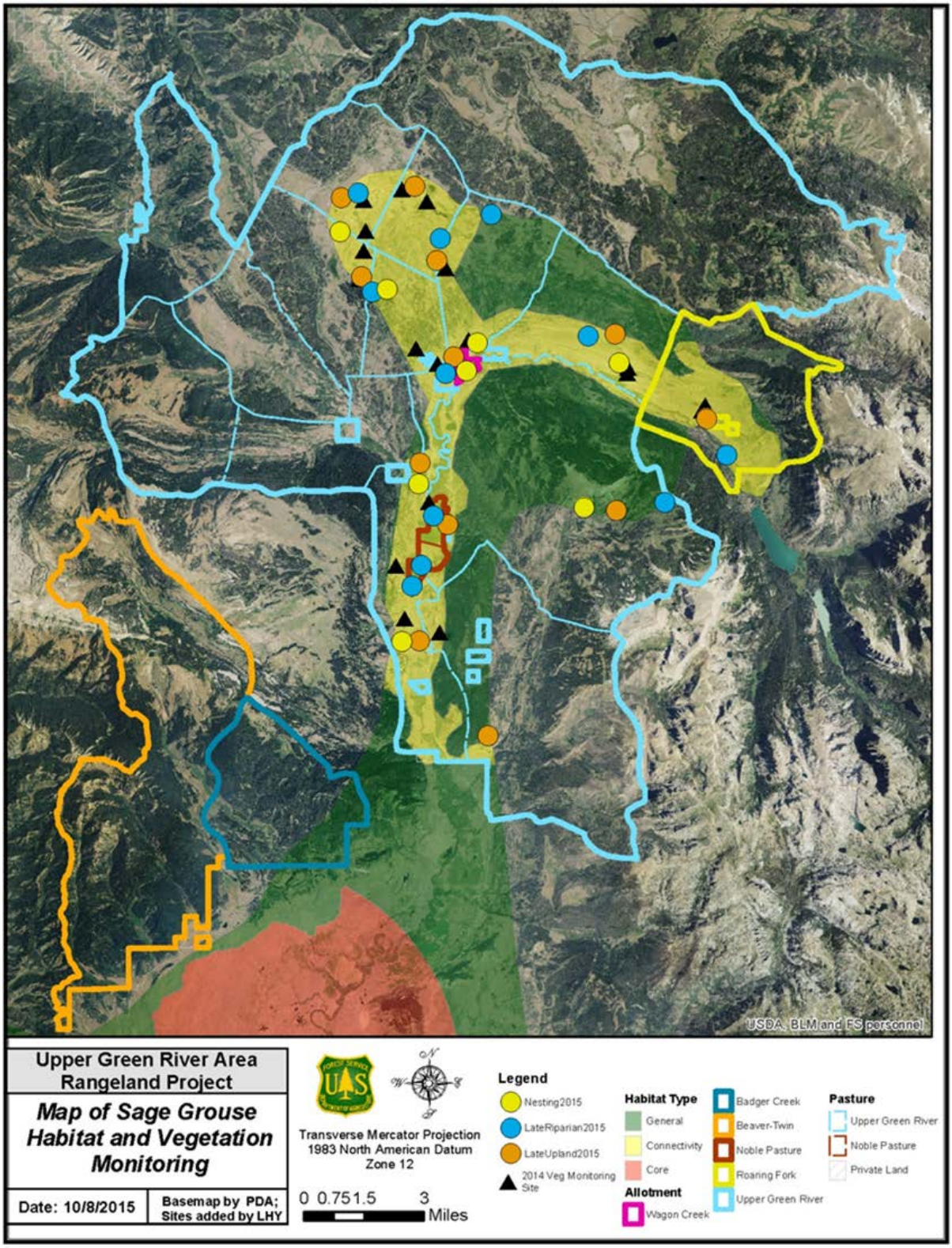

Figure 79. Greater Sage-grouse connectivity and general habitats with habitat monitoring locations in the Upper Green River project area

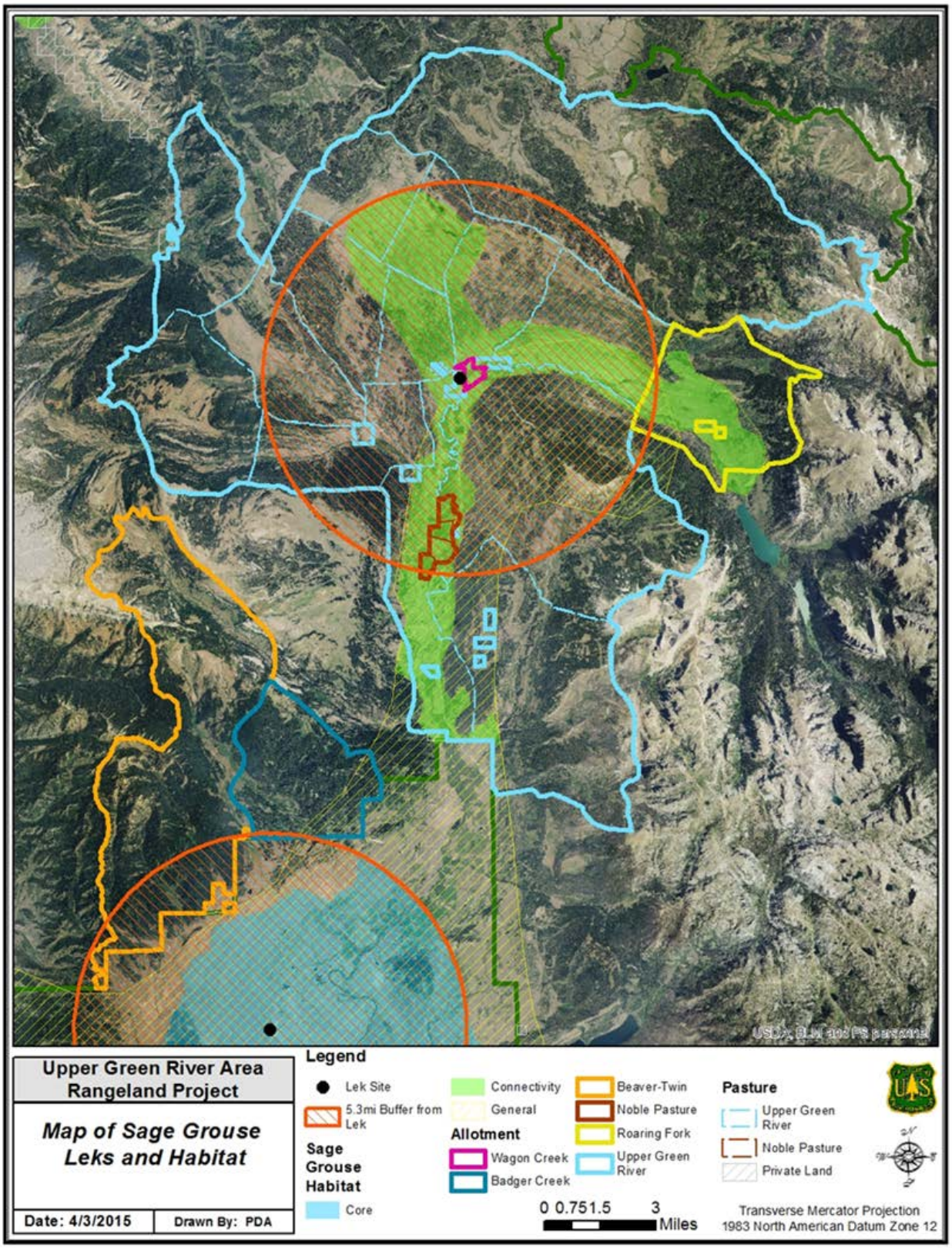

Figure 80. Greater Sage-grouse nesting area in the Upper Green River project area

The Greater Sage-grouse is a sensitive species on the Bridger-Teton National Forest as identified by the Intermountain Regional Forester. Sensitive species are defined as those plant and animal species for which population viability is a concern, as evidenced by a:

- Significant current, or predicted, downward trend in population numbers or density; or
- Significant current or predicted, downward trend in habitat capability that would reduce a species' existing distribution (FSM 2670.5).

The Forest Service objective (FSM 2670.22) for sensitive species management is to "develop and implement management practices to ensure that species do not become threatened or endangered because of Forest Service actions".

Desired Conditions for Greater Sage-grouse Seasonal Habitats

Greater Sage-grouse are large upland game birds that inhabit large contiguous areas of sagebrush with meadow and riparian areas to provide for their seasonal life history requirements including food and cover (Patterson 1952, Connelly et al. 2000, Braun et al. 1977). Both the quantity and quality of the sagebrush environment determines suitability for and productivity of Greater Sage-grouse (Wyoming Game and Fish Department 2003). Understories of sagebrush communities should be diverse with an abundance of forbs (flowering herbaceous plants), grasses, and insects (Upper Green River Basin Greater Sage-grouse Working Group 2007). Habitat for Greater Sage-grouse varies strongly by life-history stage.

The Greater Sage-grouse Wyoming Plan Amendment (U.S. Forest Service 2015) defines the desired conditions for Greater Sage-grouse seasonal habitats on Forest Service lands. In Greater Sage-grouse habitat management areas, including all seasonal habitat, 70 percent or more of lands capable of producing sagebrush have from 10 to 30 percent sagebrush canopy cover and less than 10 percent conifer cover. In addition, within breeding and nesting habitat, sufficient herbaceous vegetation structure and height provides overhead and lateral concealment for nesting and early brood rearing life stages. Within brood rearing habitat, wet meadows and riparian areas sustain a rich diversity of perennial grass and forb species relative to site potential.

Specific desired conditions for the Greater Sage-grouse based on seasonal habitat requirements are in Table 35 (U.S. Forest Service 2015 - Greater Sage-grouse Wyoming Plan Amendment, GRSG-GRSGH-DC-002). In priority and general habitat management areas, sagebrush focal areas, and within lek buffers, livestock grazing is managed to maintain or move towards desired habitat conditions in Table 35 (GRSG-LG-DC-036-Desired Condition). Desired conditions were established by seasonal life history requirements: breeding and nesting habitats (March 15th to June 30th) and summer habitats (July 1st to November 30th). Desired and existing conditions are described by seasonal habitat using indicators and objectives displayed in Table 35.

The desired conditions in the project area is also defined by the Sage-grouse Wyoming Plan Amendment livestock grazing guidelines (GRSG-LG-GL-037-Guideline, U.S. Forest Service 2015) summarized in Table 36. This establishes the desired condition for perennial grass height and herbaceous stubble height in Greater Sage-grouse nesting habitat (7 and 4-inches, respectively) and herbaceous riparian/mesic meadow vegetation stubble height in brood rearing and summer habitat (4-inches).

Table 35. Summary of desired conditions for Greater Sage-grouse nesting and summer habitats

Habitat	General Use Period	Life Requisite	Indicator	Objective
Breeding & Nesting	March 15 to June 30	Cover and food	Seasonal habitat extent	>80% of the breeding and nesting habitat meets the pertinent objectives
Nesting	May 15 to June 30	Cover	Sagebrush canopy cover (mean)	15 to 25%
Nesting	May 15 to June 30	Cover	Sagebrush height (mean)	16 to 32 in.
Nesting	May 15 to June 30	Cover	Perennial grass height (mean)	Provide overhead and lateral concealment. See guideline (Table 36)
Nesting	May 15 to June 30	Cover	Perennial grass canopy cover (mean)	≥15%
Nesting	May 15 to June 30	Cover and food	Perennial forb canopy cover (mean)	≥10%
Summer	July 1 to Nov. 30	Cover and food	Seasonal habitat extent	>40% of the brood-rearing/summer habitat
Summer-upland	July 1 to Nov. 15	Cover	Sagebrush canopy cover (mean)	10 to 25%
Summer-upland	July 1 to Nov. 15	Cover	Sagebrush height (mean)	12 to 32 in
Summer-upland	July 1 to Nov. 15	Cover and food	Perennial forb and grass canopy cover (mean)	≥15%
Summer-upland and riparian	July 1 to Nov. 15	Food	Preferred forbs availability	Preferred forbs are common with several species present
Summer – upland and riparian/ meadow	July 1 to Nov. 15	Cover	Perennial grass height (mean)	Guideline #: Manage for >4-inches of upland perennial grass height. Retain an average stubble height of 4-inches for herbaceous riparian / mesic meadow vegetation in all Greater Sage-grouse habitat. (See Table 36)
Summer – riparian/ meadow	July 1 to Nov. 15	Cover and food	Riparian function /stream bank stability/ PFC	Meets the riparian function objective, 75 to 85% stream bank stability depending on stream type, or proper functioning condition

Table 36. Summary of Grazing Guideline for Greater Sage-grouse Seasonal Habitat

Pertinent Seasonal Habitat	Grazing Guidelines
Areas managed for breeding and nesting within 5.3 miles of occupied leks	Perennial grass height: When grazing occurs during breeding and nesting season (from March 15 to June 30) manage for upland perennial grass height of 7 inches. Measure average droop height, assuming current vegetation composition has the capability to achieve these heights. Heights will be measured at the end of the nesting period (Connelly et al. 2000). When grazing occurs post breeding and nesting season (from July 1 to November 30) manage for 4-inches of upland perennial grass height.
Areas managed for brood rearing and summer habitat	When grazing occurs post breeding and nesting season (from July 1 to November 30) retain an average stubble height of 4-inches for herbaceous riparian/mesic meadow vegetation in all Greater Sage-grouse habitat.

Existing Condition

General Description of Indicators by Seasonal Habitats

Approximately 46,881 acres has been designated as Greater Sage-grouse habitat (general and connectivity habitats) in the Upper Green River project area, or about 14 percent of the designated Greater Sage-grouse habitat (core, general, and connectivity) on the Bridger-Teton National Forest. This does not include additional nesting habitat acres (5.3 mile radius of leks) in the Upper Green project area that are in addition to the general and connectivity habitats.

Most sagebrush communities on the project area (61 percent) exceed 25 percent canopy cover. Region 4 of the Forest Service identified the desired sagebrush cover (Forest Service Handbook 2209.21-2005-1) as 10 percent with 0-5 percent shrub canopy cover; 50 percent with 6-15 percent cover; and 40 percent with > 15 percent shrub cover. The mix of structure and age classes of sagebrush is currently outside the historic range of variation (U.S. Forest Service1997b).

Although sagebrush communities are important nesting and summer habitats for Greater Sage-grouse, sagebrush canopy cover and height were not selected as an indicator to compare alternatives because livestock do not forage on, trample, or change sagebrush to any measureable degree under these conditions.

Nesting Habitat (May 15 to June 30)

Greater Sage-grouse hens nest in sagebrush communities of the Upper Green River project area. The nesting area considered for this analysis was a 5.3-mile radius from a lek or potential lek, which encompassed 33,400 acres. A portion of this area, approximately 12,980 acres, consisted of mountain big sagebrush community type which was considered nesting habitat for this analysis. The nesting habitat overlaps entirely with capable and suitable acres identified in the DEIS as capable and suitable to support livestock grazing (U.S. Forest Service 2015, Rangeland Vegetation section). There were no areas determined to be unsuitable for livestock grazing with respect to Greater Sage-grouse.

Results of the nesting habitat monitoring indicate the existing condition for Greater Sage-grouse nesting habitat and the influence of livestock grazing. Nesting habitat data for the herbaceous indicators were collected during June 22-24 of 2015. Monitoring sites were representative of the pastures in which they were located. Average grass height ranged from 5.2 to 10.3 inches during the end of the nesting season. Five of

eight monitoring sites (63 percent) meet the 7-inch grass height objective; and three sites (37 percent) located in Wagon Creek Allotment (6.1 in), Mud Lake West (5.2 inches) and the Mosquito SW (5.6 inches) pastures of the Upper Green River Allotment, did not meet the 7-inch grass height objective. These three pastures where ungrazed by livestock during the nesting season. Two of the eight pastures monitored were grazed by livestock during the nesting season which ended on June 30th, but the monitoring sites were ungrazed at the time of monitoring. Both pastures met the 7-inch grass height objective (Mud Lake East and Mosquito SE pastures). There was no evidence of grazing at any of the randomly located monitoring sites at the time of monitoring.

Similarly, the perennial grass canopy cover met the 15 percent objective in all pastures monitored with the exception of Wagon Creek Allotment (9.9 percent) and the Mud Lake West (13.2 percent) pasture of the Upper Green River Allotment (range 9.9 – 61.7 percent).

Perennial forb canopy cover exceeded the desired 10 percent objective for all pastures monitored, ranging from 23.5 percent in Mud Lake East pasture to 52.3 percent in Wagon Creek Allotment. Preferred forbs were available for foraging grouse and young chicks but offered little in the way of lateral concealment for nesting Greater Sage-grouse due to the low stature of forbs. Forbs ranged in height from 1.3 inches in Wagon Creek Allotment to 5.3 inches in the River Bottom pasture.

Greater Sage-grouse nesting habitat generally meet the desired conditions in the project area during 2015. Approximately 80 percent of the nesting habitat surveyed met the perennial grass height, grass canopy cover, forb canopy cover and preferred forb objectives, assuming that the monitoring site represented the entire pasture. Approximately 20 percent of the nesting habitat surveyed did not meet the perennial grass height and/or grass canopy cover objectives due to some reason other than direct grazing. A 4-inch or greater residual grass height carried into the following years nesting season provides nesting cover and is associated with increased nest success (Holloran et al. 2005). Eight of the 10 upland monitoring sites surveyed had a 4-inch or greater average grass height. This represented approximately 90 percent of the nesting habitat surveyed, assuming that the monitoring site represented the entire Greater Sage-grouse nesting habitat within the pasture. Mosquito SE pasture and Roaring Fork Allotment contained grass heights less than the 4-inch objective.

Because the grass height data was available subsequent to this analysis, the effects of the alternatives on grass height during the nesting season are described in relative rather than qualitative terms. However, the data collected in 2015 supports this analysis in that a 7-inch grass height objective during the nesting season and 4-inch residual grass height objective post grazing are attainable under current management and in a high precipitation year. Although the forage utilization level at the end of the Greater Sage-grouse nesting season (June 30th) was not available, there was little to no evidence of livestock grazing at the random monitoring sites during the nesting season even though livestock entered some allotments one week early because an extension had been granted.

Summer Habitat (July 1 to November 15)

As sagebrush habitats desiccate, grouse usually move from sagebrush to more wet sites (Connelly et al. 2000). Greater Sage-grouse broods occupy a variety of habitats, including sagebrush (Martin 1970, Drut et al. 1994), relatively small burned areas within sagebrush (Pyle and Crawford 1996), wet meadows (Drut et al. 1994), farmland, and other irrigated areas adjacent to sagebrush habitats (Connelly and Markham 1983, Connelly et al. 1988). Forbs and insects are an important component of brood-rearing habitat (Patterson 1952, Drut et al. 1994, Hagen et al. 2007).

Habitat in the project area provides Greater Sage-grouse brood rearing habitat. During July and August of 2014, hens with and without broods were observed in the designated Greater Sage-grouse general and

connectivity habitats. The majority of birds were located in dense cinquefoil/silver sage habitat types where soil moistures were relatively high, and forb species and insects (primarily grasshoppers) were abundant.

Approximately 26, 262 acres of the 46,881 acres identified as connectivity and/or general habitat is considered suitable summer habitat for Greater Sage-grouse in the Upper Green River project area. The brood rearing habitat overlaps entirely with capable and suitable acres identified as in the DEIS (U.S. Forest Service 2015, Rangeland Vegetation section and Booth and Hayward 2015), as capable and suitable to support livestock grazing. There were no areas determined to be unsuitable for livestock grazing due to Greater Sage-grouse concerns.

Summer habitat met the desired habitat conditions for Greater Sage-grouse across the majority of the brood-rearing habitat with some exceptions. Herbaceous (grass and forb) canopy cover in the uplands met the objective in all pastures monitored (>15 percent) and ranged from 26 to 83 percent. Preferred forbs were common with five or more preferred forb species available in most pastures with the exception of the Mud Lake East, Noble, and Upper Gypsum pastures which contained three species of preferred forbs or less.

In 2015, the 4-inch residual grass height in the uplands and herbaceous vegetation height in the riparian/meadow areas met the 4-inch objective with the exception of portions of Noble Allotment (irrigated meadow), and Mosquito SE (upland) Mud Lake E (meadow) pastures. In 2014, grass height was not measured; however, general observation was that grass height was greater than 4-inches during the monitoring site visits conducted in September with some exceptions such as portions of Noble Pastures (2014 site visits and monitoring photos). Precipitation was above normal for June through September in 2015 and 2014. Monitoring sites were ungrazed/lightly grazed to more heavily grazed at monitoring sites not meeting objectives. Utilization data at monitoring sites was not collected.

The majority of the streams in the project area met the riparian function and stream bank stability objectives and is generally in a healthy, functioning condition (Robertson 2016). Three focus areas (Tosi Creek focus area, Klondike Creek focus area, and Wagon Creek focus area) are located within the Greater Sage-grouse summer habitat and do not meet the riparian function or stream bank stability objective (Robertson 2016).

The extent of the summer habitat for Greater Sage-grouse that meets the herbaceous canopy cover, herbaceous stubble height, preferred forb availability, and riparian function objectives was approximately 80 percent of the area monitored.

Environmental Consequences

This section describes the direct, indirect and cumulative effects of implementing Alternatives 1, 2, 3 and 4 on Greater Sage-grouse and Greater Sage-grouse habitat. Effects on nesting habitat and summer habitat are provided based primarily on four indicators: herbaceous canopy cover, grass/herbaceous height, preferred forb availability and riparian function/stream bank stability. An important component of Greater Sage-grouse habitat, sagebrush canopy cover and height were not selected as indictors to compare alternatives, because the effects of livestock grazing on these indicators were not expected to differ measurably among alternatives.

Alternative 1 – No Livestock Grazing (No Action Alternative)

Direct and Indirect Effects

Under Alternative 1, livestock grazing would not occur on the six allotments after approximately two years. In the absence of cattle grazing, more grasses and forbs would be available to Greater Sage-grouse than described in the existing condition. Alternative 1 would provide the greatest amount of herbaceous canopy cover and grass height in nesting and summer habitats and therefore would provide the most suitable Greater

Sage-grouse nesting habitat. It best meets the desired condition for riparian areas of all alternatives. Alternative 1 would meet the preferred forb availability objective but forbs may be less available than under Alternative 3 and 4 which proposes moderate to light grazing in riparian areas, respectively. Overall, Alternative 1 best meets the desired conditions for Greater Sage-grouse and would provide suitable nesting and summer habitats.

Under Alternative 1, riparian function within the Greater Sage-grouse summer habitat would improve relative to existing conditions at the fastest rate of all alternatives as described in the Riparian and Fisheries sections (Robertson 2016, Anderson 2015). The riparian function would improve specifically at three focus areas (Tosi Creek focus area, Klondike Creek focus area, and Wagon Creek focus area), a segment of Crow Creek and a segment of the Upper Green River in the Mud Lake East Pasture, and Wagon Creek in the Mosquito NW Pasture. These areas of concern are located in Greater Sage-grouse summer habitat and their improvement would provide more succulent forbs and insects later in the summer, thereby enhancing brood rearing habitat. Alternative 1 best meets the desired condition for riparian function and stream bank stability of all alternatives and would meet or move all allotments towards the desired conditions for Greater Sage-grouse habitat.

Approximately 62 miles of fencing would be considered for removal under Alternative 1. Approximately 14 miles of fence along the Forest and allotment boundaries, campgrounds, administrative sites and inholdings would remain in place. This would have a beneficial effect on Greater Sage-grouse because grouse collide with wire fences due to poor visibility and can become injured or killed (Christiansen 2009). Vehicles would be used to remove fencing materials. There is a potential that Greater Sage-grouse nests, chicks, and/or adults could be crushed or injured by vehicles; however, this effect is expected to be slight. Shrubs and herbaceous plants along the fenceline would be crushed by vehicles and fencing material which would have a short term negative effect. There would be a reduction in fence maintenance which would result in long-term beneficial effects on shrubs and herbaceous plants along the fenceline that would continue to be crushed in the action alternatives during fence maintenance. Alternative 1 has the fewest miles of fencing maintained on the project area of all alternatives. The effect of implementing Alternative 1 would be the fewest number of Greater Sage-grouse injuries and mortalities associated with fence collisions and minor benefits to Greater Sage-grouse habitat.

Four water developments and associated water troughs would be considered for removal under Alternative 1. Capturing water from springs using pipelines and troughs may adversely affect wet meadows used by grouse for foraging (Connelly et al. 2000). Removal of spring developments, return of natural water flow to meadows, and decrease in water consumption in summer habitats would benefit Greater Sage-grouse. Alternative 1 would have the greatest potential to increase water availability, prolong soil moisture in meadows, and increase effective meadow area supporting preferred forbs. This is especially important in summer habitat in dry years.

Cumulative Effects for All Alternatives

The cumulative effects analysis area for Greater Sage-grouse is the area identified as state of Wyoming including Pinedale anticline areas where Upper Green River Greater Sage-grouse winter and the Bridger-Teton National Forest with emphasis on the Upper Green River project area. The spatial boundary is the state level because trend information was available and Bridger-Teton National Forest is the unit level in which viability determinations are made. The temporal boundary for this analysis is 10 years into the past and future. This temporal boundary was selected because 10 years is the life of a typical term grazing permit. Within this analysis area past, present and reasonably foreseeable future activities that have the potential to impact Greater Sage-grouse habitat are the Wyoming Sage-grouse Land Use Plan Amendment, Green River Corridor Recreation Planning, Pinyon Osborn Vegetation Treatment, Upper Green River Elk Feed Program, climate change, oil and gas development, residential subdivisions, and historical livestock grazing.

Table 37. Past, present, and reasonably foreseeable future actions used in cumulative effects analysis for Greater Sage-grouse

Other Projects / Activities	Project Description	Potential Effects	Effect on Sage-grouse Habitat
Green River Corridor Recreation Planning (future)	An assessment of existing roads and campsites within the Green River Corridor. Project would reduce recreation impacts associated with dispersed camping and off-road vehicle use along the Green River.	Net increase of vegetation and stream bank stability along Green River with areas of reduction associated with planned recreation use.	Beneficial effects primarily to summer habitat. Potential net increase in grass height, herbaceous canopy cover, forb availability and riparian function in Greater Sage-grouse nesting and summer habitats along the Green River.
Pinyon Osborn Vegetation Treatment (future)	Project (about 26,000 acres) would reduce conifer fuels and restore shrub and aspen communities using mechanical and prescribed fire treatments. The proposed treatments will likely be reduced.	Reduce sagebrush canopy cover and height in the short-term and increase herbaceous canopy cover and height.	Short-term negative effects on nesting and summer habitats because project would reduce sagebrush canopy cover and height. Short-term benefits to summer habitat as result of increased herbaceous canopy cover and height. Long-term benefits once sagebrush regenerates and increases in height and canopy cover because of improved age class diversity of sagebrush community and increases in herbaceous understory possible if livestock managed effectively. Potential for invasive plant establishment.
Upper Green River Elk Feedground (present)	Wyoming Game & Fish Dept. feeds about 500 elk during the winter (U.S. Forest Service 2008) along the Upper Green River near the confluence of Roaring Fork.	Reduced vegetation and riparian function along the Green River near the feedground. Reduced plant species composition due to elk foraging near the feedground.	Effect described as part of the existing condition. Continued impaired riparian function along the Green River at the confluence of Roaring Fork and impaired species composition at the Roaring Fork focus area result in negative effects to Greater Sage-grouse nesting and summer habitats.
Climate Change	General increase in air temperatures and decrease in precipitation	Ground cover would increase and sagebrush communities across Wyoming would become more vulnerable to fire, insects and disease. Potential 12 % reduction in sagebrush and Greater Sage-grouse nesting habitat in southwestern Wyoming by 2050 (Homer et al. 2015).	Sagebrush communities on the Bridger-Teton National Forest are higher elevation and receive relatively more precipitation than the majority of sagebrush communities in Wyoming. These high elevation, peripheral areas may become more important to Greater Sage-grouse as climate changes.

Other Projects / Activities	Project Description	Potential Effects	Effect on Sage-grouse Habitat
Oil and Gas Development	Establishment of wells and production of oil and natural gas in Wyoming, particularly the Pinedale Anticline area affects the Greater Sage-grouse population that uses the Upper Green project area.	Fragmentation and reduction of sagebrush habitat. Oil and gas production and increased vehicle activity contributes to CO2 emissions and reduced air quality.	Reduces quality and quantity of Greater Sage-grouse leks, nesting, summer and winter habitats through loss of habitat and increased disturbance. Oil and gas development associated with decline of Greater Sage-grouse populations. Negatively affects the Upper Green River Greater Sage-grouse population primarily due to loss of winter habitat, reduced winter survival, disturbance of breeding activity and potential decline in the number of Greater Sage-grouse nesting and summering in the project area.
Residential subdivision	Construction of residential homes and commercial development	Fragmentation and reduction of sagebrush habitat	Reduces quality and quantity of Greater Sage-grouse breeding, nesting, summer and winter habitats through loss of sagebrush habitat and increased disturbance.
Historic livestock grazing (past)	Historically, grazing intensity was much higher in the project area and there are residual effects to stream and riparian conditions that are still detectable in some areas in the project area. Some of the areas that have been identified as having low stream bank stability and impaired riparian vegetation conditions are on a recovery trajectory from historical grazing impacts. These areas that have long-term grazing impacts are limited in extent across the project area and most have been identified as focus areas including Tepee Creek, Wagon Creek, Klondike Creek, and Tosi Creek focus areas. (Anderson 2015)		Effect described as part of the existing condition. Riparian vegetation, stream bank stability, and riparian function have been impacted in some areas that have been historically overgrazed, most notably focus areas. This results in negative effects to Greater Sage-grouse brood rearing habitats (summer habitats) and is discussed in direct and indirect effects by alternative.

The cumulative effects of Alternative 2 (negative effects) combined with the effects of the Green River Corridor Recreation Planning (beneficial effects), Pinyon Osborn Vegetation Treatment (short-term negative and long-term beneficial effects), Upper Green River elk feed program (negative effects), climate change (slight negative effects), oil and gas production (negative effects), and residential development (negative effects) may contribute to a trend towards a loss of viability to the population on the Bridger-Teton National Forest because the net cumulative effect would be a decline in Greater Sage-grouse habitat conditions. The cumulative effects of Alternative 1 (greatest beneficial effects), Alternative 4 (beneficial effects greater than Alternative 3 and less than Alternative 1) or Alternative 3 (beneficial effects) when combined with the effects of the Green River Corridor Recreation Planning (beneficial effects), Pinyon Osborn Vegetation Treatment (short-term negative and long-term beneficial effects), Upper Green River elk feed program (negative effects), climate change (slight negative effects), oil and gas development (negative effects), and residential development (negative effects) would not contribute to a trend towards a loss of viability to the population on

the Bridger-Teton National Forest because the net cumulative effect would result in either maintaining or, in most cases, improving current habitat conditions for Greater Sage-grouse in the project area. This conclusion was reached by using the indicators for direct and indirect effects (herbaceous canopy cover, grass height, preferred forb availability, and riparian function) from the proposed activities described in the alternatives and adding them to the expected effects from other management activities described in Table 37.

Determination for Alternative 1

Implementing Alternative 1 would have "**beneficial impact**" to Greater Sage-grouse and Greater Sage-grouse habitat on the Bridger-Teton National Forest.

Rationale: Alternative 1 would have "**beneficial impact**" on Greater Sage-grouse and Greater Sage-grouse habitat because herbaceous canopy cover, grass height, and riparian function/stream bank stability would all meet or move towards the objectives at the fastest rate of recovery and would reach the highest levels of any alternative. Grass height and herbaceous canopy cover in nesting habitat would be the most favorable (greatest amount) among all of the alternatives because livestock grazing would not reduce these components. Scientists concluded that tall, dense grass and forb cover at nest sites enhanced nesting success (Connelly et al. 2000, Greg et al. 1994, Holloran et al 2005, Doherty 2014). Thus, Alternative 1 would provide the best nesting habitat, greatest nest concealment from predators, and greatest nesting success of all alternatives. Preferred forbs may be slightly less available in riparian areas under Alternative 1 than Alternative 4 and 3 because light to moderate livestock grazing has been demonstrated to make preferred forbs more available to Greater Sage-grouse (Crawford et al. 2004). However, preferred forb availability under Alternative 1 is expected to meet objective for this indicator and desired conditions. Under Alternative 1, about 62 miles of fencing would be removed in the Upper Green River project area and 14 miles would be maintained. This would reduce the potential for Greater Sage-grouse to collide with fences, compared to existing conditions, and would reduce injury and mortality – all of which would be beneficial effects. Retained fences would in part serve the purpose of keeping livestock off of the Bridger-Teton National Forest when adjacent to private lands, which would have a net beneficial effect to Greater Sage-grouse on the Bridger-Teton National Forest.

The Greater Sage-grouse habitat in the Upper Green River is important habitat to maintain the viability of Greater Sage-grouse on the Bridger-Teton National Forest, because it comprises more than 14 percent of the habitat area on the Bridger-Teton National Forest. At the Forest (unit) scale, Alternative 1 would provide adequate amounts of suitable habitat for Greater Sage-grouse in the project area or 46,881 acres of connectivity and general habitat in or moving towards desired conditions for nesting and brood rearing Greater Sage-grouse.

In addition, the Greater Sage-grouse habitat in the Upper Green River area provides a potential dispersal route between the Pinedale (central-west portion of the Wyoming Basin) Greater Sage-grouse population to the relatively isolated Gros Ventre and Jackson Hole populations, although Schulwitz et al. (2014) did not demonstrate genetic connectivity between these populations. Connectivity corridors are important for maintaining the transmission of genetic material between populations (Wyoming, Executive Order 2015-4, Crist et al. 2015). Otherwise, isolated populations may result in negative fitness consequences that could result in local extirpation and/or loss of unique genetic diversity (Schulwitz et al. 2014). Habitat for the Greater Sage-grouse in the Upper Green River provides a connectivity corridor and the potential for demographic and genetic exchange to the Gros Ventre and Jackson populations (i.e., Jackson Hole population) that inhabit an additional 185,779 area of core, connectivity, and general Greater Sage-grouse habitat on the Bridger-Teton National or 56 percent of the Greater Sage-grouse habitat on the Forest. As a result, the Upper Green River corridor is important to the viability of Greater Sage-grouse on the Bridger-Teton National Forest because Alternative 1 would positively contribute to Greater Sage-grouse occupying approximately 70 percent of the habitat on the Bridger-Teton National Forest.

At a larger scale, these beneficial effects on Greater Sage-grouse habitat and to the viability of Greater Sage-grouse on the Forest scale would contribute negligible beneficial effects to the entire species when considering trend towards federal listing because the Greater Sage-grouse habitat on the Forest is a small proportion of the habitat in Wyoming and in light of the magnitude of negative impacts associated with other activities such as climate change, oil and gas development, and residential development occurring throughout the state. Although, the Upper Green River habitat is currently considered periphery habitat, it is relatively high elevation and receives high precipitation for sagebrush communities and may become more important in light of climate changes.

Alternative 2 - Grazing as Currently Permitted and Current Management

Direct and Indirect Effects

Utilization data can be a valuable tool for helping to interpret the influence of livestock herbivory on vegetation trend (Sanders 1998 as cited by Crawford et al. 2004). Likewise, Clary and Webster (1989) stated that the level of utilization occurring on a site is the most important consideration in grazing management. Forage utilization levels differ by alternative and were used to evaluate impacts on Greater Sage-grouse habitat indicators because utilization level was the most influential activity on Greater Sage-grouse habitat. Under Alternative 2- Grazing as Currently Permitted, forage utilization would range from 50 to 60 percent maximum in the uplands and 55 to 65 percent forage utilization in the riparian areas.

This alternative allows the greatest amount of forage consumed by livestock and therefore, the grass and forbs available to Greater Sage-grouse would be the lowest under Alternative 2 compared with all other alternatives. Alternative 2 would provide the least amount of herbaceous canopy cover and grass height in nesting and summer habitats and therefore would provide the lowest amount of suitable Greater Sage-grouse nesting and foraging habitat. Alternative 2 would not meet the desired condition for riparian function in allotments with 65 percent forage utilization (Robertson 2016) and decline in preferred forb availability below objective would be likely because heavy grazing would remove herbaceous vegetation and degrade riparian conditions (Crawford et al. 2004) compared to existing conditions. Overall, Alternative 2 would not meet the desired conditions for Greater Sage-grouse nesting and summer habitats.

Nesting Habitat (May 15-June 30)

<u>Herbaceous canopy cover and grass height</u>

Herbaceous species in sagebrush plant communities are predominantly cool-season plants (C-3) that are vulnerable to defoliation during late spring and early summer (Crawford et al. 2004). Heavy grazing (approximately 60 percent or greater utilization by weight) during this time has predictable results: 1) the vigor, yield, and canopy cover of late-seral grasses and forbs decrease; 2) early-seral species may increase; and 3) transition of sagebrush uplands to higher ecological status is inhibited (Mueggler 1950, Eckert and Spencer 1986, Laycock 1987 as cited by Crawford et al. 2004). These effects would be expected under Alternative 2 because livestock grazing would be permitted at a maximum of 60 to 65 percent maximum forage utilization in upland and riparian/meadow areas, respectively, which is considered heavy grazing.

Beaver-Twin, Roaring Fork, Wagon, and the Upper Green River Allotments contain Greater Sage-grouse nesting habitat while Badger and Noble Pastures allotments do not. Livestock grazing would overlap in time and space with the Greater Sage-grouse nesting season and nesting habitat in the Roaring Fork and Upper Green River allotments. In these allotments, herbaceous canopy cover and grass height would decrease under Alternative 2- Grazing as Currently Permitted with a permitted 50-60 percent forage utilization compared with existing conditions (30 percent forage utilization under current management), because considerably more herbaceous vegetation could be consumed as forage.

Herbaceous canopy cover and grass height under Alternative 2 would provide the least amount of overhead and lateral concealment of Greater Sage-grouse nests, incubating hens, and chicks compared to all other alternatives (Alternatives 1, 3, and 4). Hagen et al. (2007) reported that grass height was greater at nest sites than at random locations. Gregg et al. (1994) found that successful Greater Sage-grouse nests had greater canopy cover of tall grasses (>7 inches) surrounding the sagebrush nest sites than unsuccessful nests. In northeast Wyoming and southeast Montana, Doherty et al. (2014) found that greater average grass height had positive effects on nest survival. In Wyoming, Holloran et al. (2005) found that taller, thicker residual grass cover in dense sagebrush stands appeared to increase the probability of a successful nest. Therefore, Alternative 2 would likely support the lowest level of nesting success in the project area because herbaceous canopy cover and grass height would be the least of all alternatives.

In addition livestock may trample nests or cause nest abandonment which has been reported to occur occasionally (Rasmussen and Griner 1938, Patterson 1952, and Call 1979 as cited by Crawford et al. 2004). Nest trampling and abandonment would likely occur at similar to slightly greater rates under Alternative 2 than Alternatives 3 and 4 because the alternatives would permit about the same number of livestock (although Alternative 2 permits 270 head more than Alternatives 3 and 4 in the Mosquito Lake rotation of the Upper Green River Allotment) and authorize the same season of use with an infrequent (about 2 out of 10 years) one week shift prior to the season of use that would occur in nesting areas under Alternative 2 but not in Alternatives 3 and 4.

Under existing conditions, average grass height ranged from 5.2 to 10.3 inches during the end of the nesting season and 2.6 to 18.1 late in the grazing season. Five of eight monitoring sites (63 percent) meet the 7-inch grass height objective and three sites (37 percent) located in Wagon Creek Allotment (6.1 in), Mud Lake West (5.2 inches) and Mosquito SW (5.6 inches) pastures of the Upper Green River Allotment, did not meet the 7-inch grass height objective. However, these three sites were ungrazed by livestock during the nesting season. Two (Mosquito SE pasture and Roaring Fork Allotment) of 10 monitored sites did not meet the residual grass height (>4-inch) objective post grazing season. These sites were grazed by livestock. Alternative 2-Grazing as Permitted would move herbaceous canopy cover and grass height further away from 7 and 4-inch height objectives in sagebrush areas identified as Greater Sage-grouse nesting habitat, if maximum utilization levels were realized.

Grazing would occur after the nesting season in Beaver-Twin and Wagon allotments even with the one week possible early shift in season of use and therefore, livestock grazing would not affect the 7-inch grass height objective during the nesting season for these two allotments. The 4-inch grass height objective during the summer season (post livestock grazing) is aimed at carrying residual grass nesting cover into the following nesting season and would be a relevant indicator for all allotments with nesting habitat (Beaver-Twin, Roaring Fork, Wagon, and the Upper Green River Allotments). Alternative 2 is the least likely alternative to meet the 4-inch grass height objective in Greater Sage-grouse nesting habitat because the permitted forage utilization is the greatest, 50 percent in Beaver-Twin Allotment and Roaring Fork Allotment south of the Green River to 60 percent in the Roaring Fork Allotment north of the Green River, Wagon Allotment and the Green River Allotment in the uplands under Alternative 2 compared to 50 percent for all allotments in Alternatives 3 and 4.

Alternative 2 allows for season-long grazing of Greater Sage-grouse nesting habitat in the Beaver-Twin, Roaring Fork and Wagon Creek allotments which reduces the residual grass cover and height available during the nesting season in the following year across these allotments. Season-long grazing in the Roaring Fork Allotment has the greatest overlap in time and space between livestock grazing and Greater Sage-grouse nesting. Livestock have the entire season of use across the Greater Sage-grouse nesting habitat within the allotment to graze, reducing herbaceous canopy cover and grass height important for Greater Sage-grouse nesting. Therefore, a season-long grazing system would annually reduce herbaceous canopy cover and grass

height over the greatest nesting area compared with a rotation system (Alternatives 3, 4, and certain allotments in Alternative 2) or no livestock grazing (Alternative 1). Season-long livestock grazing potentially reduces Greater Sage-grouse nesting success to the greatest degree, followed by rotational grazing system, then no livestock grazing.

A deferred and rest rotation system reduces the overlap in time and space between livestock grazing and Greater Sage-grouse nesting by limiting livestock to one pasture of the allotment during nesting season (ending June 30th) and alternates this grazed pasture yearly. The grazed pasture would have reduced herbaceous cover and grass height, but the ungrazed pastures would provide nesting areas with more herbaceous cover, grass height and less disturbance and may enhance nesting success. The Mud Lake/Fish Creek, Tosi/Tepee Creek and Gypsum Creek rotations of the Upper Green River Allotment are deferred rotations and the Mosquito Lake rotation of the Upper Green River Allotment is a rest rotation. Therefore, the Upper Green River Allotment would provide ungrazed areas of nesting habitat yearly under Alternative 2. These ungrazed pastures would have more herbaceous canopy cover providing overhead and lateral concealment from predators; however, livestock would be concentrated in the grazed pastures where nesting cover may be less suitable and nest failure more common.

Under Alternative 2, a one week shift in the season of use could apply to the four allotments containing nesting habitat (Beaver-Twin, Roaring Fork, Wagon Creek, and Upper Green River allotments and the River Bottom Pasture/livestock driveway). The extension would not affect nesting habitat during the nesting season in the Beaver-Twin and Wagon Creek allotments but would affect the Roaring Fork and Upper Green River allotments and the River Bottom Pasture/livestock driveway. A shift of up to one week to the permitted season of use could be authorized for any given year by the District Ranger on an infrequent basis (approximately two years out of ten). This would slide the season of use a maximum of one week prior to or one week following the permitted season of use; the season of use would remain the same number of days. The entry dates for Roaring Fork and Upper Green River allotments could occur as early as June 9th, when a one week shift prior to the permitted season of use is granted. This action would increase livestock use in nesting habitat during the nesting season by a maximum of seven days or a 29 percent increase. The effect of a one week shift prior to the season of use would be a reduction of herbaceous canopy cover and grass height by an additional 29 percent of the herbaceous off-take expected on the typical nesting season of use. In addition, a slight increase in nest abandonment and trampling would be expected, which would decrease Greater Sage-grouse nesting success.

Alternative 2 is least likely of all alternatives to meet the 7-inch nesting grass height objective during the nesting season in pastures grazed by livestock and least likely to meet the 4-inch grass stubble height objective at the end of the grazing season intended to carry over adequate residual grass cover for the following year's nesting season. Alternative 2 would likely not meet desired conditions for herbaceous canopy cover and grass height in the Greater Sage-grouse nesting habitat across the project area.

Summer Habitat (July 1-November 15)

Herbaceous canopy cover and grass height

The pattern of habitat use during the brood-rearing period is related to changes in food availability and hens with broods are typically found where forb abundance is greatest (Klebenow 1969, Drut et al. 1994a as cited by Crawford et al. 2004). Hagen et al. (2007) found that brood areas had significantly taller grasses and greater forb and grass cover than at random locations. Under existing conditions (30-50 percent utilization), herbaceous canopy cover, preferred forb availability, and grass/ herbaceous height in uplands and riparian areas generally meet the objectives (≥15 percent, common with ≥5 present, and ≥4-inches, respectively) with the exception of herbaceous height in portions of Noble Pasture Allotment and Mud Lake East pastures.

Under Alternative 2, forage utilization permitted would range from 50 to 60 percent in the uplands and from 55 to 65 percent in riparian/meadow areas. Herbaceous canopy cover and grass height would be considerably less than existing conditions because under current management forage utilization of key forage species is 30 to 50 percent. Alternative 2 permits the largest utilization level of all the alternatives. This utilization level would translate to the least amount of herbaceous canopy cover and grass height available in Greater Sage-grouse summer habitat (upland and riparian) of all alternatives and likely would result in these indicators falling below the respective objectives.

Preferred forb availability

Crawford et al. (2004) reported that brood-rearing habitat may be enhanced by well-managed grazing practices that favor upland forb production (e.g., fall grazing) and prescribed light (< 40 percent) to moderate (40-60 percent) spring grazing which can remove standing herbage and make forbs more accessible (Smith et al. 1979, Fulgham et al. 1982 as cited by Crawford et al. 2004). Alternative 2 would allow spring and summer grazing in riparian areas at heavy utilization levels (55-65 percent, season-long in Badger, Beaver, Roaring Fork and Wagon allotments) which would result in declines in forb abundance and species diversity below objective and limit Greater Sage-grouse forb availability (Call 1979 as cited by Crawford et al. 2004). In riparian brood-rearing habitat, Greater Sage-grouse prefer the lower vegetation and succulent forb growth stimulated by light to moderate livestock grazing (Crawford et al. 2004). Moderate use equates to a 4-inch residual stubble height for most grasses and sedges in meadows (Crawford et al. 2004). Clary (1995) concluded that when defoliation, compaction, and nutrient return effects are considered in the mountain meadow sedge-dominated communities, grazing once annually during the growing season to a 5-cm (2-inch) stubble height in the spring, or to a 10-cm (4-inch) stubble height in late summer, or at a utilization rate exceeding 30 percent of the total annual biomass production can reduce herbage production significantly.

To the extent that heavy livestock grazing contributes to the establishment of invasive and increaser forbs that are preferred forage by Greater Sage-grouse such as common dandelion (*Taraxacum officinale*), western salsify (*Tragopogon dubius*), western yarrow (*Achillea millefolium*), fleabane (*Erigeron spp*.), sweetclover (*Melilotus spp*.), and milkvetch (*Astragalus spp*.), preferred forb availability in nesting and summer habitats may slightly increase preferred forb availability, but would have negative effects on rangeland species composition objectives (Booth and Hayward 2015). Alternative 2 would likely not meet desired conditions for availability of preferred forbs because the level of grazing intensity is greater than that reportedly beneficial to Greater Sage-grouse forb availability (Crawford et al. 2004) and is expected to result in decreases in riparian function (Robertson 2016) which reduces soil moisture and forb availability.

Riparian function/ Stream bank stability

Under Alternative 2, forage utilization of up to 55 to 65 percent would cause riparian areas, especially those currently in less than desired condition, to decline in riparian function and stream bank stability at the fastest rate of all alternatives as described in the Riparian Areas section (Robertson 2016). Stubble heights at the greenline of streams and within meadows would be expected to be less than 4-inches and cattle would browse on willows as herbaceous vegetation became unavailable. The reduction in riparian vegetation would result in less root mass stabilizing stream banks and increased high water flows and erosion, resulting in declines in riparian function and stream bank stability. In the long-term overall declines in riparian function would have negative effects on Greater Sage-grouse forb availability and summer habitat due to loss of forb abundance and species' diversity. Declines in riparian function at focus areas and areas of concern would be the result of 55 to 65 percent forage utilization because stream banks would lack riparian vegetation to prevent erosion and stabilization. Specifically, the riparian function would decline and continue to not meet the objective at three focus areas (Tosi Creek focus area, Klondike Creek focus area, and Wagon Creek focus area), a segment of Crow Creek and a segment of the Upper Green River in the Mud Lake East Pasture, and

Wagon Creek in the Mosquito NW Pasture. These areas of concern are located in Greater Sage-grouse summer habitat.

Alternative 2 (55-65 percent forage utilization) would provide less favorable riparian foraging habitat than Alternative 4 (35 percent forage utilization) and Alternative 3 (50 percent forage utilization) because grass/sedge height would be shorter, forbs less accessible, and riparian function declining.

Additional Effects – Structural Improvements

Approximately 76 miles of existing fence would be maintained for livestock management. Reconstructed fences would conform to the Fencing Riparian Area Guideline and the Structural Improvement Standard which would benefit Greater Sage-grouse by increasing visibility of riparian fences. In Sublette County, Wyoming, Christiansen (2009) reported Greater Sage-grouse mortality associated with fences and found that fence markers reduced grouse mortality by 61 percent. Fence markers in the upland nesting areas are not part of Alternative 2; therefore, Greater Sage-grouse injury and mortality associated with fences in Greater Sage-grouse habitats would continue similar to existing condition. Motorized vehicle traveling overland and along fence lines could be used to maintain fences. There is a potential that Greater Sage-grouse nests, chicks and adults could be crushed or injured by vehicles used to maintain fence lines, although the effect is expected to be slight.

Four water developments and associated water troughs would remain under Alternative 2. Capturing water from springs using pipelines and troughs may adversely affect wet meadows used by grouse for foraging (Connelly et al. 2000). Connelly et al. (2000) recommended in order to protect summer habitat, avoid developing springs for livestock water, but if water from a spring will be used in a pipeline or trough, design the project to maintain free water and wet meadows at the spring. No additional water developments are proposed under Alternative 2, 3 or 4; therefore effects of water developments and water trough under Alternative 2 is the same as under existing conditions and the same for all action alternatives.

In summary, Alternative 2 is least likely of all alternatives to meet the herbaceous canopy cover, grass height, preferred forb availability, and riparian function objectives in the Greater Sage-grouse summer habitat across the project area.

Cumulative Effects

See discussion of Cumulative Effects Common to All Alternatives under Alternative 1

Determination for Alternative 2

Implementing Alternative 2 - Grazing as Currently Permitted "**will impact individuals or habitat with a consequence that the action will contribute to a trend towards federal listing or cause a loss of viability to the population or species**". Under Alternative 2 – Current Management, the Forest Service is currently in the process of amending Annual Operating Instructions for permittees to include livestock management direction in compliance with the 2015 Greater Sage-grouse Wyoming Plan Amendment. Implementing Alternative 2 – Current Management (30 – 50 percent forage utilization) "**may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.**"

Rationale: Alternative 2- Grazing as Currently Permitted would negatively impact Greater Sage-grouse nesting and summer habitats on the Upper Green River project area and would have the potential to contribute to a loss of viability of Greater Sage-grouse on the Bridger-Teton National Forest. The Greater Sage-grouse habitat in the Upper Green River project area is important because it provides Greater Sage-grouse nesting and brood rearing habitat, and is extensive in size, comprising more than 14 percent (46,881

acres) of the Greater Sage-grouse habitat on the Forest. Poor habitat quality in the project area would negatively affect nesting success and recruitment.

In addition, the Upper Green River area provides connectivity habitat to Gros Ventre and Jackson Greater Sage-grouse populations (Jackson Hole population) which inhabit another 56 percent of the Forest (185,779 acres). A reduction in quality of connectivity habitat would decrease the effectiveness of this potential dispersal route. Connectivity corridors are important for maintaining the transmission of genetic material between populations (Wyoming, Executive Order 2015-4, Crist et al. 2015). Schulwitz et al. (2014) suggested that isolated populations may result in negative fitness consequences that could result in local extirpation and/or loss of unique genetic diversity. Although they did not demonstrate genetic connectivity between the Pinedale (central-west) Greater Sage-grouse population and the Gros Ventre and Jackson Hole populations, the connectivity habitat provides an opportunity for demographic and genetic exchange. At the Bridger-Teton National Forest scale, inadequate amounts of suitable habitat would be available to Greater Sage-grouse on the Forest under Alternative 2 because the alternative would negatively impact 14 percent of the Greater Sage-grouse habitat Forest-wide and could negatively influence Greater Sage-grouse occupying up to 70 percent of the Forest. Therefore, Alternative 2 would cause a loss of viability of the Greater Sage-grouse population inhabiting the Forest.

Under current management (30-50 percent forage utilization), Greater Sage-grouse habitat in the project area is meeting herbaceous canopy cover and preferred forb availability objectives in summer habitats. Existing conditions generally meet the riparian function/ stream bank stability objectives and the grass height at the end of the grazing season (>4-inches) objective, with some exceptions such as in portions of the Noble Pastures Allotment and Mud Lake East Pasture. However, Alternative 2 would cause overall declines in herbaceous canopy cover, grass height, herbaceous stubble height, preferred forb availability and riparian function because livestock forage utilization would be allowed to increase to a maximum permitted use levels of 60 percent in the uplands and 65 percent in the riparian and meadow areas. Scientists found shorter and sparse grass and forb cover at unsuccessful Greater Sage-grouse nests than successful nests (Connelly et al. 2000, Greg et al. 1994, Holloran et al 2005, Doherty 2014) and heavy livestock grazing (>60 percent forage utilization, Crawford et al 2004) in riparian and meadow areas provided less favorable brood rearing and foraging habitat (Hagen et al. 2007, Crawford et al. 2004). Thus, declines in the quality of Greater Sage-grouse habitat would result in reduced nesting success and brood survival which would translate into a reduction in Greater Sage-grouse productivity in the Upper Green River project area. In addition, Greater Sage-grouse reportedly collide with wire fences due to poor visibility which can result in injury and/or mortality (Christiansen 2009). Under Alternative 2, 76 miles of existing fenceline would be maintained which results in no changes to the potential for Greater Sage-grouse to collide with fences from current conditions. Livestock would trample Greater Sage-grouse nests and cause nest abandonment to a minor degree (Crawford et al. 2004).

Negative impacts described for Alternative 2, in light of the negative impacts associated with other activities such as climate change, oil and gas development, and residential development occurring throughout the state, would contribute only negligibly to a trend towards federal listing because the Greater Sage-grouse habitat in the Upper Green River project area and the Forest are a minor proportion of the habitat in Wyoming. Although, the Upper Green River habitat is currently considered periphery habitat in Wyoming, it is relatively high elevation and receives high precipitation for sagebrush communities and may become more important in light of climate change.

Alternative 3 - Modified Grazing Management

Direct and Indirect Effects

Utilization data can be a valuable tool for helping to interpret the influence of livestock herbivory on vegetation trend (Sanders 1998 as cited by Crawford et al. 2004). Clary and Webster (1989) concluded that the level of utilization occurring on a site is the most important consideration in grazing management. They recommended that a minimum herbage stubble height be present on all streamside areas at the end of the growing season, or at the end of the grazing season if grazing occurs after frost in the fall. The residual stubble or regrowth should be at least 4 to 6 inches in height to provide sufficient herbaceous forage biomass to meet the requirements of plant vigor maintenance, bank protection, and sediment entrapment. Clary and Webster (1989) recommended that fall use of streamside vegetation should not exceed about 30 percent utilization, and the herbaceous stubble remaining at the end of the grazing period should meet the 4 to 6- inch criterion.

Forage utilization levels differ by alternative and were used to evaluate impacts on Greater Sage-grouse habitat indicators because utilization level was the most influential activity on the habitat. Under Alternative 3- Modified Grazing Management, maximum forage utilization would be 50 percent in the uplands, riparian and meadow areas with a 4-inch stubble height minimum along the greenline of streams. This level of utilization would apply in areas meeting desired range and riparian conditions, with more restrictive prescriptions at areas of concern.

The allowable livestock use proposed under Alternative 3 is expected to decrease herbaceous canopy cover and grass height from existing conditions (30 percent - 50 percent forage utilization), but would still meet the herbaceous canopy cover, grass height, preferred forb availability and riparian function objectives. However, the herbaceous height retained at the end of the season may not be sufficient to meet the 4-inch herbaceous stubble height objective in meadows under a 50 percent forage utilization and 4-inch stubble height on the greenline allowable use (based on 2014/2015 data, Clary and Webster 1989, Kinney and Clary 1994, BLM 1999). This alternative allows a moderate amount of forage offtake and therefore, the grass and forbs available to Greater Sage-grouse would be a moderate amount compared with all other alternatives. Less forage would be consumed by livestock under Alternative 3 than under Alternative 2 (50-65 percent), but more than under Alternative 1 (no livestock grazing) and Alternative 4 (35 percent - 50 percent in riparian areas and 50 percent in uplands). Therefore, the grasses and forbs available to Greater Sage-grouse under Alternative 3 would be greater than that under Alternative 2 and less than that under Alternative 1 and 4.

Alternative 3 would provide a moderate amount of herbaceous canopy cover and would likely meet the greater than or equal to 25 and 15 percent herbaceous canopy cover objectives in nesting and summer habitats, respectively, based on monitoring data. Likewise, taller grass height would be available under Alternative 3 than Alternative 2, similar grass height to Alternative 4 in the uplands, and lower grass height than Alternative 1, assuming maximum utilization levels were achieved. Alternative 3 would likely meet the 7-inch grass height objective in nesting habitat because the majority of pastures are ungrazed by livestock during the nesting season, a one week shift prior to the livestock season of use would not apply to pastures with nesting habitat (Wagon Creek Allotment and the Mud Lake/Fish Creek, Mosquito Lake, and the Tosi Creek/Tepee Creek/Kinky Creek rotations of the Upper Green River Allotment) and grazed pastures would likely not reach the maximum utilization allowed (50 percent) during the nesting season (through June 30th) based on existing conditions monitoring under current management. However, the forage utilization level during the nesting season would be greater under Alternative 3 with maximum permitted number of livestock than under current management in which livestock numbers average 68 percent of permitted livestock numbers across the project area.

Based solely on a 50 percent key forage utilization and 4-inch stubble height on the greenline, Alternative 3 would likely not meet the 4-inch herbaceous stubble height objective across the entire Greater Sage-grouse summer habitat, with a moderate degree of uncertainty. This is based on data collected in 2014 and 2015 in which 2 of 10 transects did not meet the 4-inch objective during relatively wet years with 30 to 50 percent forage utilization. However, under Alternative 3, administrative action would be implemented, as necessary, to modify livestock grazing management in order that the 4-inch stubble height objective in Greater Sage-grouse brood rearing habitat would be met as directed by the Greater Sage-grouse livestock grazing guidelines (U.S. Forest Service 2015).

Riparian areas that currently meet the riparian function and stream bank stability objectives would continue to meet the objectives at 50 percent forage utilization and 4-inch stubble height along the greenline, or adaptive management (option for reduction in forage utilization to a minimum of 30 percent and/or increase in stubble height to 6 inches) would be implemented to ensure existing conditions move towards the riparian function and stream bank stability objectives. Focus areas and areas of concern that are currently not meeting riparian function and/or stream bank stability objectives (identified in Table 1) would trend towards desired conditions because site specific design features would be implemented. Overall, riparian areas that are currently showing impacts from grazing would improve in the long term under Alternative 3 compared to Alternative 2, but would not improve as much – or as quickly – as under Alternative 1 or 4 due to the greater livestock allowable use and associated grazing impacts associated with Alternative 3 (Riparian Area section).

Alternative 3 would be more likely to meet the desired conditions for Greater Sage-grouse and would provide suitable nesting and summer habitats than Alternative 2, but less likely than Alternatives 1 and 4. If monitoring indicates that desired conditions are not being met, administrative actions would be implemented, as necessary, to modify livestock grazing management in order that the herbaceous canopy cover, grass height and preferred forb availability objectives for Greater Sage-grouse would be met with emphasis on meeting the grazing guidelines (7- and 4-inch requirements in the Greater Sage-grouse Wyoming Plan Amendment 2015).

Nesting Habitat (May 15-June 30)

Herbaceous canopy cover and grass height

Under Alternative 3, livestock grazing would occur on the six allotments at 50 percent maximum forage utilization in the uplands and riparian areas (considered moderate grazing; Crawford et al. 2004). Livestock grazing would overlap in time and space with the Greater Sage-grouse nesting season and nesting habitat in the Roaring Fork and Upper Green River allotments. In these allotments, herbaceous canopy cover and grass height would decrease under Alternative 3 compared with existing conditions (30-50 percent forage utilization under current management) as potentially more grass would be consumed as forage. Herbaceous canopy cover and grass height under Alternative 3 would provide moderate amounts of overhead and lateral concealment of Greater Sage-grouse nests, incubating hens, and chicks, providing more than Alternative 2 and less than Alternative 1. Greater Sage-grouse select nest sites with greater grass height (Hagen et al. 2007) and successful nests had greater canopy cover of tall grasses (>7 inches) surrounding the sagebrush nest site than unsuccessful nests (Gregg et al. 1994). Doherty et al. (2014) reported that greater average grass height had positive effects on nest survival. Thus, Alternative 3 would likely support a moderate level of nesting success in the project area because herbaceous canopy cover and grass height would be more than Alternative 2 and less than Alternatives 1 and 4.

Although maximum forage utilization in the uplands is the same under Alternative 3 and 4 (50 percent), actual forage utilization and resulting grass height in the uplands may differ by alternative. Alternative 3 may result in slightly lower grass height in the uplands than Alternative 4, because actual livestock forage utilization of the uplands would be influenced by the amount of time livestock spend in the pasture which

would be limited by forage utilization limits allowed in the riparian/meadow areas. Under Alternative 3, forage utilization in riparian/meadow areas is 50 percent compared to 35 percent under Alternative 4. This would result in livestock spending more time in a pasture under Alternative 3 than Alternative 4 and, therefore, likely more grass would be consumed in the uplands under Alternative 3 than 4.
On the flip-side, cattle are likely to spend more time in the uplands in late spring and early summer when range conditions are relatively moist and forbs succulent and riparian areas are saturated. In this case, forage utilization in the uplands may reach 50 percent at a similar rate in both Alternatives 3 and 4.

Grass height in nesting areas would be reduced in the first pasture grazed by livestock for each rotation in the Upper Green River Allotment and Roaring Fork Allotment. Grass height would attain maximum height during the nesting season in remaining pastures. These pastures would be grazed post nesting season and would likely meet the 4-inch stubble height objective in the uplands based on 2014 and 2015 monitoring data. Alternative 3 would provide moderate lateral concealment of nests, hens and chicks.

Deferred and rest rotation systems reduce the overlap in time and space between livestock grazing and Greater Sage-grouse nesting by limiting livestock to one pasture of the allotment during the nesting season (ending June 30th). The grazed pasture would have reduced herbaceous cover and grass height, but the ungrazed pastures would provide herbaceous cover and grass height near its potential which would benefit nesting success. Pastures grazed during the nesting season would change annually. Beck and Mitchell (2000) recommended that managers consider delaying grazing of known nesting areas until after the nesting season. Rotational grazing systems are one way to provide areas (i.e., pastures) free from livestock disturbance during nesting. This benefit may be offset if heavy use occurs in the grazed pastures (Holechek et al. 1982), especially since Greater Sage-grouse can display high site fidelity (Fischer et al. 1993 as cited by Crawford et al. 2004). Heavy livestock use was not evident under existing conditions; therefore, deferred and rest rotations would be beneficial to nesting Greater Sage-grouse in the project area.

Livestock grazing is delayed until after the nesting season in the Beaver-Twin and Wagon Creek allotments and therefore, grass height would attain maximum height during the nesting season and provide suitable nesting habitat in these allotments. Livestock would not trample nests or cause nest abandonment in Beaver-Twin and Wagon Creek allotments, but livestock may trample nests or cause nest abandonment in the first pasture grazed in the Roaring Fork and Upper Green River allotments. The last pasture grazed in these allotments may not meet the 4-inch stubble height objective at the end of the grazing season because there would be insufficient time to allow for regrowth of grasses in the uplands when the season of use end date is October 15th or October 22nd if a one week shift in season of use was granted.

In summary, Alternative 3 would provide less herbaceous canopy cover and grass height than existing conditions but is more likely to meet the herbaceous canopy cover objective (>25 percent), the grass height objective during the nesting season (>7 inches), and the residual grass height post nesting season in nesting habitat than Alternative 2, and less likely to meet these objectives than Alternatives 4 and 1. Alternative 3 would likely meet desired conditions for herbaceous canopy cover and grass height in the Greater Sage-grouse nesting habitat across the project area, because the season of livestock use and deferred rotation limits the pastures grazed by livestock during the nesting season, a one week shift prior to the livestock season of use would not be granted, and maximum utilization would likely not be reached during the nesting season. However, the 4-inch residual grass height post nesting season in the nesting habitat would be more difficult to maintain at 50 percent forage utilization in the upland and riparian/meadow areas. If monitoring were to indicate that the 4-inch residual grass stubble height objective was not met, livestock management would be modified through administrative action to move conditions toward Greater Sage-grouse habitat objectives.

Summer Habitat (July 1-November 15)

Herbaceous canopy cover and herbaceous height

The pattern of habitat use during the brood-rearing period is related to changes in food availability and hens with broods are typically found where forb abundance is greatest (Klebenow 1969, Drut et al. 1994a as cited by Crawford et al. 2004). Hagen et al. (2007) found that brood areas had significantly taller grasses and greater forb and grass cover than at random locations. Under existing conditions (30-50 percent utilization), herbaceous canopy cover, preferred forb availability, and residual grass height in uplands and riparian areas meet or nearly meet the objectives (≥15 percent, common with ≥5 present, and ≥4-inches, respectively) across the Greater Sage-grouse brood rearing habitat.

Under Alternative 3, forage utilization permitted would be a maximum of 50 percent in uplands, riparian and meadow areas and a 4-inch stubble height on the greenline with lower utilization and stricter allowable use levels to address some areas of concern. Herbaceous canopy cover and height would generally be less than under existing conditions because of the increased livestock forage utilization level. Herbaceous canopy cover would meet the 15 percent objective because the values recorded under existing conditions ranged from 26 – 62 percent under current management (30-50 percent forage utilization). However, herbaceous height may not meet the 4-inch stubble height objective because livestock would consume more herbaceous forage based on the values obtained under existing conditions which ranged from 1.8 - 13.9 inches under current management (30-50 percent forage utilization). Monitoring would be necessary to validate that the grazing guideline (Table 36) was met at 50 percent forage utilization in riparian and meadow areas across the allotments and 4-inch retained along the greenline or administrative action would be taken to ensure compliance with this guideline.

A utilization level of 50 percent of key forage species under Alternative 3 would provide a median amount of herbaceous canopy cover and herbaceous height available in Greater Sage-grouse summer habitat (upland and riparian) of all the action alternatives.

Preferred forb availability

Crawford et al. (2004) reported that brood-rearing habitat may be enhanced by well-managed grazing practices that favor upland forb production (e.g., fall grazing) and prescribed light (< 40 percent) to moderate (40-60 percent) spring grazing which can remove standing herbage and make forbs more accessible (Smith et al. 1979, Fulgham et al. 1982 as cited by Crawford et al. 2004). Alternative 3 would allow spring and summer grazing in riparian areas at moderate grazing levels (50 percent) which would likely maintain forb abundance and species diversity at objective for Greater Sage-grouse forb availability. In riparian brood-rearing habitat, Greater Sage-grouse prefer the lower vegetation and succulent forb growth stimulated by light to moderate livestock grazing (Crawford et al. 2004). Moderate use equates to a 4-inch residual stubble height for most grasses and sedges (Crawford et al. 2004). Therefore, under Alternative 3, preferred forbs are accessible and would continue to meet the objective.

Riparian function/ stream bank stability

Under Alternative 3 (50 percent forage utilization and 4-inch stubble height minimum along the greenline), riparian areas that are currently at desired condition would continue to meet the riparian function and stream bank stability objectives (Robertson 2016, Anderson 2015). If monitoring indicated that conditions were declining below the objectives, adaptive management would be implemented with an option to retain a 6-inch stubble height minimum along the greenline and/or reduce utilization levels in 10 percent increments to a minimum of 30 percent forage utilization of key forage species. Implementation of adaptive management would ensure that riparian function and stream bank stability of streams in Greater Sage-grouse habitat would meet these objectives and desired conditions for these two indicators. Implementation of site specific

prescriptions at areas of concern including structural improvements, 6-inch stubble height minimum, and 20 percent bank alteration limits would improve riparian conditions at these sites (Robertson 2016, Anderson 2015) moving them towards the riparian function and stream bank stability objectives and desired conditions.

Additional effects - structural improvements

Approximately 76 miles of existing fence across the project area would be maintained for livestock management. Reconstructed fences would conform to the Fencing Riparian Area Guideline and the Structural Improvement Standard which would benefit Greater Sage-grouse by increasing visibility of riparian fences. In Sublette County, Wyoming, Christiansen (2009) reported Greater Sage-grouse mortality associated with fences and found that fence markers reduced grouse mortality by 61 percent. Reconstruction of fences within 4 miles of occupied leks would be designed to minimize the risk of collision with fences including marking fences, using laydown fences, and considerations regarding location of fences. Greater Sage-grouse injury and mortality associated with existing fences in the project area would be similar to slightly less than the injury and mortality occurring under existing conditions.

Approximately 2.3 miles of permanent fence and 1.2 miles of electric fence are proposed in Greater Sage-grouse habitat. The effect of these proposed fences on injury and mortality would be minimized by fence design. Fences would be either laydown electric fences, fences marked with reflective markers or riparian fences with a wooden top rail. These wildlife-friendly fence design features would reduce collision of Greater Sage-grouse with newly constructed fences proposed in Alternative 3. There is a potential that Greater Sage-grouse nests, chicks and adults could be crushed or injured by vehicles when used to construct new and maintain existing structural improvements, although the effect is expected to be negligible.

Four water developments and associated water troughs would remain under Alternative 3. Capturing water from springs using pipelines and troughs may adversely affect wet meadows used by grouse for foraging (Connelly et al. 2000). Connelly et al. (2000) recommended in order to protect summer habitat, avoid developing springs for livestock water, but if water from a spring will be used in a pipeline or trough, design the project to maintain free water and wet meadows at the spring. No additional water developments are proposed under Alternative 3; therefore effects of water developments and water trough under Alternative 3 is the same as under existing conditions. The potential to develop a spring near Crow Creek will be analyzed in a future NEPA analysis. Until then, this spring may be heavily impacted by livestock (reduced riparian/wetland vegetation) when Crow Creek is moved from Mud Lake East Pasture to Mud Lake West via a fenceline adjustment. Riparian function on Crow Creek would improve but the nearby spring would likely not meet desired conditions.

Cumulative Effects

See discussion of Cumulative Effects for All Alternatives under Alternative 1.

Determination for Alternative 3

Implementing Alternative 3 "**may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species**".

Rationale: This determination was made because Greater Sage-grouse habitat would meet or move towards the herbaceous canopy cover, grass height, herbaceous stubble height, preferred forb availability and riparian function objectives across the nesting and summer habitats in the Upper Green River project area, with some uncertainty. If Alternative 3 is insufficient in meeting the Greater Sage-grouse livestock grazing guidelines, administrative action would be taken as directed by the Sage-grouse Wyoming Plan Amendment and 2015 Record of Decision (U.S. Forest Service 2015) to ensure that the Greater Sage-grouse guidelines are met. Alternative 3 and any additional administrative actions necessary to meet the livestock grazing guidelines is

expected to provide suitable and adequate amounts of Greater Sage-grouse habitat that meets desired conditions for nesting and brood rearing. This determination is contingent upon habitat monitoring being conducted under Alternative 3 in order to validate that Greater Sage-grouse nesting and summer habitats are meeting desired conditions. If monitoring were to indicate habitat conditions are not suitable and the causative factors were associated with livestock management, administrative action would be implemented to improve Greater Sage-grouse habitat to meet or move towards habitat objectives and desired conditions.

Alternative 3 would provide adequate amounts of suitable habitat for Greater Sage-grouse, with moderate uncertainty, and minor negative impacts associated with fences and trampling. The net effect would contribute to the viability of Greater Sage-grouse inhabiting the Forest. Individual birds would be negatively impacted if they collide with fences (Christiansen 2009), although new fences would be designed to increase visibility and reduce collisions. Likewise, as existing fences are rebuilt, they would be designed to increase visibility of the fence by Greater Sage-grouse in designated habitat. Livestock would trample nests or cause nest abandonment to a minor degree (Crawford et al. 2004). Neither impacts from fences or livestock trampling would offset benefits of this alternative associated with habitat quality. Alternative 3 would provide Greater Sage-grouse habitat that is less favorable than that provided by Alternative 4, because Alternative 4 would permit a lower maximum forage utilization in the riparian/meadow areas (35 percent) than Alternative 3 (50 percent) on four of six allotments, which would provide greater herbaceous stubble height in meadows, enhance riparian function of streams and may result in slightly greater grass height in upland nesting habitat. Scientists found that tall, dense grass and forb cover at nest sites enhanced nesting success (Connelly et al. 2000, Greg et al. 1994, Holloran et al 2005, Doherty 2014). Alternative 3 would generally provide more favorable Greater Sage-grouse habitat than Alternative 2 (which would not meet habitat objectives) across the project area and less favorable habitat than Alternative 1 and 4 (which would meet habitat objectives).

The Greater Sage-grouse habitat in the Upper Green River is important to maintain the viability of Greater Sage-grouse on the Bridger-Teton National Forest, because it comprises more than 14 percent of the Greater Sage-grouse habitat on the Forest. Under Alternative 3, this Greater Sage-grouse nesting and brood-rearing habitat would meet desired habitat conditions to support Greater Sage-grouse. In addition, the Greater Sage-grouse habitat in the Upper Green River area provides a potential dispersal route or connectivity between the larger Pinedale (central-west) Greater Sage-grouse population to the relatively isolated Gros Ventre and Jackson Hole populations. Connectivity corridors are important for maintaining the transmission of genetic material between populations (Wyoming, Executive Order 2015-4, Crist et al. 2015). Schulwitz et al. (2014) suggested that isolated populations may result in negative fitness consequences that could lead to local extirpation and/or loss of unique genetic diversity. Although they did not demonstrate genetic connectivity between the Pinedale (central-west) Greater Sage-grouse population and the Gros Ventre and Jackson Hole populations, the Greater Sage-grouse habitat in the Upper Green River provides a connectivity corridor and the potential for demographic and genetic exchange. The Gros Ventre and Jackson populations inhabit an additional 185,779 area of core, connectivity, and general Greater Sage-grouse habitats or 56 percent of the Greater Sage-grouse habitat on the Forest. As a result, the Upper Green River corridor is important to the viability of Greater Sage-grouse on the Bridger-Teton National Forest. Alternative 3 would provide suitable nesting and brood-rearing habitat in 14 percent of the Greater Sage-grouse habitat Forest-wide and positively influence Greater Sage-grouse occupying up to 70 percent of the Forest. Therefore, Alternative 3 would contribute to the viability of the Greater Sage-grouse population inhabiting the Forest.

At a larger scale, Alternative 3 would not contribute to a trend towards federal listing because the Greater Sage-grouse habitat in the Upper Green River project area would meet habitat objectives, negative effects would be minor, and habitat in the Forest is a small proportion of the Greater Sage-grouse habitat in Wyoming and is a net positive effect in light of the magnitude of negative impacts associated with other activities such as climate change, oil and gas development, and residential development occurring throughout

the state. Although, the Upper Green River Greater Sage-grouse habitat is currently considered peripheral habitat, it is relatively high elevation and receives high precipitation for sagebrush communities and may become more important in light of climate changes.

Alternative 4 - Modified Grazing Management with Riparian Emphasis

Direct and Indirect Effects

Utilization data can be a valuable tool for helping to interpret the influence of livestock herbivory on vegetation trend (Sanders 1998 as cited by Crawford et al. 2004). Clary and Webster (1989) concluded that the level of utilization occurring on a site is the most important consideration in grazing management. They recommended that a minimum herbage stubble height be present on all streamside areas at the end of the growing season, or at the end of the grazing season if grazing occurs after frost in the fall. The residual stubble or regrowth should be at least 4 to 6 inches in height to provide sufficient herbaceous forage biomass to meet the requirements of plant vigor maintenance, bank protection, and sediment entrapment. Clary and Webster (1989) recommended that fall use of streamside vegetation should not exceed about 30 percent utilization, and the herbaceous stubble remaining at the end of the grazing period should meet the 4 to 6- inch criterion.

Alternative 4 is expected to maintain herbaceous canopy cover and grass height similar to existing conditions (30 percent - 50 percent forage utilization under current management), and would likely meet or move towards the herbaceous canopy cover, grass height, preferred forb availability and riparian function objectives for Greater Sage-grouse. Less forage would be consumed by livestock under Alternative 4 (35 percent - 50 percent forage utilization) than Alternative 2 (50-65 percent utilization) and Alternative 3 (50 percent utilization), but more than under Alternative 1 (no livestock grazing). Therefore, the grasses and forbs available to Greater Sage-grouse under Alternative 4 would be greater than that under Alternative 2, slightly greater than Alternative 3, and less than that under Alternative 1. Alternative 4 would provide the greatest amount of herbaceous canopy cover of all action alternatives and would meet the greater than or equal to 25 and 15 percent herbaceous canopy cover objectives in nesting and summer habitats, respectively. Likewise, taller grass height would be available under Alternative 4 than Alternatives 2 and 3, but less than Alternative 1. Alternative 4 would meet or move towards the 7-inch grass height objective in nesting habitat because the majority of pastures are ungrazed by livestock during the nesting season, a one week shift prior to the livestock season of use would not apply to pastures with nesting habitat (Wagon Creek Allotment and the Mud Lake/Fish Creek, Mosquito Lake, and the Tosi Creek/Tepee Creek/Kinky Creek rotations of the Upper Green River Allotment) and grazed pastures would likely not reach the maximum utilization allowed (50 percent) during the nesting season (through June 30th) based on current management. The forage utilization level during the nesting season would be greater under Alternative 4 with maximum permitted number of livestock than under current management in which livestock numbers average 68 percent of permitted livestock numbers. Alternative 4 would meet the 4-inch herbaceous stubble height objective after the grazing season in the summer/brood rearing habitat because 35 percent maximum forage utilization in the riparian and meadow areas would be implemented and is expected to provide suitable Greater Sage-grouse habitat. The exception to 35 percent utilization is in Noble Pastures and Wagon allotments in which 40 to 50 percent forage utilization would be allowed and these two allotments may not meet the 4-inch herbaceous stubble height objective at 50 percent utilization. However, if any allotment does not meet the 4-inch herbaceous stubble height objective, administrative action would be taken to insure the Greater Sage-grouse livestock grazing guidelines (U.S. Forest Service 2015) are met.

Alternative 4 would generally promote healthy riparian and wetland conditions and improve existing conditions at areas of concern. Riparian areas that currently meet the riparian function and stream bank stability objectives would continue to meet the objectives and improve conditions at 35 percent forage utilization and 4-inch stubble height along the greenline, or adaptive management (option for reduction in

forage utilization to minimum of 30 percent and/or increase in stubble height to 6-inches) would be implemented to ensure existing conditions move towards the objectives. Focus areas and areas of concern that are currently not meeting riparian function and/or stream bank stability objectives (identified in Table 1 of the DEIS for the Upper Green River Area Rangeland Project) would trend towards desired conditions because site specific design features would be implemented.

Overall, Alternative 4 would have the greatest likelihood to meet the desired conditions for Greater Sage-grouse habitat across all action alternatives and would provide a greater amount of suitable nesting and summer habitats than the other action alternatives. If monitoring indicates that desired conditions are not being met, administrative actions would be implemented, as necessary, to modify livestock grazing management in order that the herbaceous canopy cover, grass/herbaceous stubble height and preferred forb availability objectives for Greater Sage-grouse would be met.

Nesting Habitat (May 15-June 30)

Herbaceous canopy cover and grass height

Under Alternative 4, livestock grazing would occur on the six allotments at 35 to 50 percent maximum forage utilization of key forage species in riparian and meadow areas (considered light to moderate grazing; Crawford et al. 2004) and 50 percent in the uplands. Livestock grazing would overlap in time and space with the Greater Sage-grouse nesting season and nesting habitat in the Roaring Fork and Upper Green River allotments. In these allotments, herbaceous canopy cover and grass height may decrease slightly in the uplands compared with existing conditions (30-50 percent forage utilization under current management) as potentially more grass would be consumed as forage in the uplands. Herbaceous canopy cover and grass height under Alternative 4 would provide moderate amounts of overhead and lateral concealment of Greater Sage-grouse nests, incubating hens, and chicks, providing more than Alternative 2 and less than Alternative 1. Greater Sage-grouse select nest sites with greater grass height (Hagen et al. 2007). Successful Greater Sage-grouse nests had greater canopy cover of tall grasses (>7 inches) and medium height shrubs (15.7 – 31 inches) surrounding the sagebrush nest site than unsuccessful nests (Gregg et al. 1994). Doherty et al. (2014) reported that greater average grass height had positive effects on nest survival. Therefore, Alternative 4 would likely support a moderate level of nesting success in the project area because herbaceous canopy cover and grass height would be more than Alternative 2 and less than Alternatives 1. Alternative 4 would provide taller grass height in nesting habitat than Alternative 2, similar to slightly taller than Alternative 3, and lower than Alternative 1. Alternative 4 best meets grass height objectives of the action (grazing) alternatives because livestock forage utilization is the lowest and the greatest amount of grass height and cover would be retained for nesting.

Although maximum forage utilization in the uplands is the same under Alternative 3 and 4 (50 percent), actual forage utilization and resulting grass height in the uplands may differ by alternative. Alternative 3 may result in slightly lower grass height in the uplands than Alternative 4, because actual livestock forage utilization of the uplands would be influenced by the amount of time livestock spend in the pasture which would be limited by forage utilization limits allowed in the riparian/meadow areas. Under Alternative 3, a 50 percent forage utilization level in riparian areas allows for more time spent in the pasture compared to Alternative 4 which permits 35 percent forage utilization in the riparian areas in most pastures. More conservative allowable use levels in the riparian areas proposed under Alternative 4 would likely be the early trigger to move cattle from the pasture and likely equate to lower utilization levels in the uplands. On the flip-side, cattle may spend more time in the uplands in late spring and early summer when range conditions are relatively moist, forbs succulent and riparian areas are saturated. In this case, forage utilization in the uplands may reach 50 percent at a similar rate in both Alternatives 3 and 4.

Grass height in nesting areas would be reduced in the first pasture grazed by livestock for each rotation in the Upper Green River Allotment and Roaring Fork Allotment. Grass height would attain maximum height during the nesting season in the remaining pastures. These pastures would be grazed post nesting season and would likely meet the 4-inch stubble height objective post grazing season in the uplands based on 2014 and 2015 monitoring data. Alternative 4 would provide moderate lateral concealment of nests, hens and chicks.

Deferred and rest rotation systems reduce the overlap in time and space between livestock grazing and Greater Sage-grouse nesting by limiting livestock to one pasture of the allotment during nesting season (ending June 30th). The grazed pasture would have reduced herbaceous cover and grass height, but the ungrazed pastures would provide herbaceous cover and grass height near its potential which would benefit nesting success. Pastures grazed during the nesting season would change annually. Beck and Mitchell (2000) recommended that managers consider delaying grazing of known nesting areas until after the nesting season. Rotational grazing systems are one way to provide areas (i.e., pastures) free from livestock disturbance during nesting. This benefit may be offset if heavy livestock use occurs in the grazed pastures (Holechek et al. 1982), especially since Greater Sage-grouse can display high site fidelity (Fischer et al. 1993 as cited by Crawford et al. 2004). Heavy livestock use was not evident under existing conditions; therefore, deferred and rest rotations would be beneficial to nesting Greater Sage-grouse in the project area.

Livestock grazing is delayed until after the nesting season in the Beaver-Twin and Wagon Creek allotments and therefore, grass height would attain maximum height during the nesting season and provide suitable nesting habitat in these allotments. Livestock would not trample nests or cause nest abandonment in Beaver-Twin and Wagon Creek Allotments, but livestock may trample nests or cause nest abandonment in the first pasture grazed in the Roaring Fork and Upper Green River Allotments. The last pasture grazed in these allotments would likely meet the 4-inch stubble height objective at the end of the grazing season because the 35 percent forage utilization in meadows would be the early trigger to move livestock.

In summary, Alternative 4 is more likely to meet the herbaceous canopy cover objective (>25 percent) and the grass height objective (>7 inches) for nesting habitat than Alternatives 2 and 3, and less likely to meet these objectives than Alternative 1. Alternative 4 would meet desired conditions for herbaceous canopy cover and grass height in the Greater Sage-grouse nesting habitat across the project area, because the season of livestock use and deferred rotation limits the pastures grazed by livestock during the nesting season, a one week shift prior to the livestock season of use would not be granted, and maximum utilization would likely not be reached during the nesting season. Under Alternative 4, the 4-inch residual grass height post nesting season in nesting habitat would be met because 35 percent forage utilization in the riparian/meadow areas would be the early trigger to move livestock out of the pasture. If monitoring were to indicate that sufficient and adequate amounts of Greater Sage-grouse habitat were not provided, livestock management would be modified through administrative action to move conditions toward Greater Sage-grouse habitat objectives.

Summer Habitat (July 1-November 15)

Herbaceous canopy cover and herbaceous stubble height

The pattern of habitat use during the brood-rearing period is related to changes in food availability and hens with broods are typically found where forb abundance is greatest (Klebenow 1969, Drut et al. 1994a as cited by Crawford et al. 2004). Hagen et al. (2007) found that brood areas had significantly taller grasses and greater forb and grass cover than at random locations. Under existing conditions (30-50 percent utilization), herbaceous canopy cover, preferred forb availability, and residual grass height in uplands and riparian areas meet or nearly meet the objectives (≥15 percent, common with ≥5 present, and ≥4-inches, respectively) across the Greater Sage-grouse brood rearing habitat.

Under Alternative 4, forage utilization of key forage species permitted would be a maximum of 50 percent in uplands and 35 percent in riparian and meadow areas and a 4-inch stubble height on the greenline with stricter allowable use levels to address some areas of concern. Herbaceous canopy cover and height would be similar to that expressed under existing conditions and expected to meet or nearly meet the objectives because the values under existing conditions (26 - 62 percent canopy cover and 1.8 - 13.9 inches) primarily exceeded the 15 percent and 4-inch objectives. Alternative 4 may not meet the 4-inch grass height objective in Noble Pastures Allotment because it would be grazed at 50 percent forage utilization with 2-3 times over grazing. All other allotments would likely meet the 4-inch herbaceous stubble height objective. Administrative action would be taken if monitoring indicated that the livestock grazing guideline (Table 36) was not being met. Adequate amounts of suitable Greater Sage-grouse brood rearing habitat would be available for Greater Sage-grouse.

The utilization levels proposed under Alternative 4 would provide the greatest amount of herbaceous canopy cover and grass height available in Greater Sage-grouse summer habitat (upland and riparian) of all the action alternatives and likely would result in these indicators meeting the objective.

Preferred forb availability

Crawford et al. (2004) reported that brood-rearing habitat may be enhanced by well-managed grazing practices that favor upland forb production (e.g., fall grazing) and prescribed light (< 40 percent) to moderate (40-60 percent) spring grazing which can remove standing herbage and make forbs more accessible (Smith et al. 1979, Fulgham et al. 1982 as cited by Crawford et al. 2004). Alternative 4 would allow spring and summer grazing in riparian areas at light grazing levels (35 percent) which would likely maintain forb abundance and species diversity at objective for Greater Sage-grouse forb availability (Call 1979 as cited by Crawford et al. 2004). In riparian brood-rearing habitat, Greater Sage-grouse prefer the lower vegetation and succulent forb growth stimulated by light to moderate livestock grazing (Crawford et al. 2004). Moderate use equates to a 4-inch residual stubble height for most grasses and sedges (Crawford et al. 2004). Therefore, under Alternative 4, preferred forbs are accessible and continue to meet the objective.

Riparian function/ stream bank stability

Riparian areas that are currently in desired condition remain so with high certainty due to implementation of light livestock grazing (35 percent maximum forage utilization of key forage species) and a 4-inch minimum prescription for stubble height on the greenline of streams. The 4-inch stubble height along greenline provides for stream bank stability. Fall browsing on willows is not expected because cattle would prefer to graze on the herbaceous vegetation instead. Implementation of site specific prescriptions at areas of concern including structural improvements, 6-inch stubble height minimum, and 20 percent bank alteration maximum improves riparian conditions towards desired conditions. Implementation of adaptive management (option to retain a 6-inch stubble height minimum along the greenline and/or reduce utilization levels to a minimum of 30 percent forage utilization) would be limited because a 35 percent utilization level would already be implemented across 4 out of 6 allotments (Badger, Beaver-Twin, Roaring Fork, and Upper Green River allotments). When adaptive management is necessary, it would move conditions towards riparian function and stream bank stability objectives. The riparian function would improve specifically at three focus areas (Tosi Creek focus area, Klondike Creek focus area, and Wagon Creek focus area), a segment of Crow Creek, and Wagon Creek in the Mosquito NW Pasture. These areas of concern are located in Greater Sage-grouse summer habitat. A segment of the Upper Green River at the confluence of Roaring Fork in the Mud Lake East Pasture would likely not improve because the effects are related to congregating elk rather than livestock effects. Alternative 4 best meets the desired condition for riparian function and stream bank stability of all action alternatives and would meet the desired conditions for Greater Sage-grouse summer

habitat. Alternative 4 meets or moves towards desired condition for riparian function and stream bank stability as described in the Riparian and Fisheries sections (Robertson 2016, Anderson 2015).

Additional effects - structural improvements

Approximately 76 miles of existing fence would be maintained for livestock management in the project area. Reconstructed fences would conform to the Fencing Riparian Area Guideline and the Structural Improvement Standard which would benefit Greater Sage-grouse by increasing visibility of riparian fences. In Sublette County, Wyoming, Christiansen (2009) reported Greater Sage-grouse mortality associated with fences and found that fence markers reduced grouse mortality by 61 percent. Reconstruction of fences within 4 miles of occupied Greater Sage-grouse leks would be designed to minimize the risk of Greater Sage-grouse collision with fences including marking fences, using laydown fences, and considerations regarding location of fences. Greater Sage-grouse injury and mortality associated with existing fences in the project area would be similar to slightly less than the injury and mortality occurring under existing conditions.

Approximately 2.3 miles of permanent fence and 1.2 miles of electric fence are proposed in Greater Sage-grouse habitat. The effect of these proposed fences on Greater Sage-grouse injury and mortality would be minimized by fence design. Fences would be either laydown electric fences, fences marked with reflective markers or riparian fences with a wooden top rail. These wildlife-friendly fence design features would reduce collision of Greater Sage-grouse with newly constructed fences proposed in Alternative 4 (Christiansen 2009). There is a potential that Greater Sage-grouse nests, chicks and adults could be crushed or injured by vehicles used to construct new and maintain existing structural improvements, although the effect is expected to be slight.

Four water developments and associated water troughs would remain under Alternative 4. Capturing water from springs using pipelines and troughs may adversely affect wet meadows used by grouse for foraging (Connelly et al. 2000). Connelly et al. (2000) recommended in order to protect summer habitat, avoid developing springs for livestock water, but if water from a spring will be used in a pipeline or trough, design the project to maintain free water and wet meadows at the spring. No additional water developments are proposed under Alternative 4; therefore effects of water developments and water trough under Alternative 4 is the same as under existing conditions. The potential to develop a spring near Crow Creek will be analyzed in a future NEPA analysis. Until then, this spring may be heavily impacted by livestock (reduced riparian/wetland vegetation) when Crow Creek is moved from Mud Lake East Pasture to Mud Lake West via a fenceline adjustment. Riparian function on Crow Creek would improve but the nearby spring would likely not meet desired conditions.

In summary, Alternative 4 would meet the herbaceous canopy cover, grass height, herbaceous stubble height, preferred forb availability, and riparian function objectives across the Greater Sage-grouse summer habitat in the project area. Alternative 4 would best meet or move conditions towards desired conditions for Greater Sage-grouse summer habitat when comparing all action alternatives. Alternative 4 would provide suitable and adequate amounts of forage and cover for Greater Sage-grouse.

Cumulative Effects

See discussion of Cumulative Effects for All Alternatives under Alternative 1

Determination for Alternative 4

Implementing Alternative 4 "**may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species**".

Rationale: This determination was made because Greater Sage-grouse habitat would likely meet or move towards the herbaceous canopy cover, grass height, herbaceous stubble height, preferred forb availability and riparian function objectives across the nesting and summer habitats in the Upper Green River project area. Alternative 4 is expected to provide suitable and adequate amounts of Greater Sage-grouse habitat that meets desired conditions for nesting and brood rearing. In the low likelihood that Alternative 4 is insufficient in meeting the Greater Sage-grouse livestock grazing guidelines, administrative action would be taken as directed by the Greater Sage-grouse Wyoming Plan Amendment and 2015 Record of Decision (U.S. Forest Service 2015) to ensure that the Greater Sage-grouse guidelines are met. This determination is contingent upon habitat monitoring being conducted under Alternative 4 in order to validate that Greater Sage-grouse nesting and summer habitats are meeting desired conditions. If monitoring were to indicate habitat conditions are not suitable and the causative factors were associated with livestock management, administrative action would be necessary to improve Greater Sage-grouse habitat to meet or move towards habitat objectives and desired conditions.

Alternative 4 would provide adequate amounts of suitable habitat for Greater Sage-grouse and minor negative impacts associated with fences and trampling. The net effect would positively contribute to the viability of Greater Sage-grouse inhabiting the Forest. Individual Greater Sage-grouse would be negatively impacted if they collide with fences (Christiansen 2009), although new fences would be designed to increase visibility and reduce collisions. Likewise, as existing fences are rebuilt in Greater Sage-grouse habitat, they would be designed to increase visibility of the fence by birds. Livestock would trample nests or cause nest abandonment to a minor degree (Crawford et al. 2004). Neither impacts from fences or livestock trampling would offset benefits of this alternative associated with habitat quality. Alternative 4 best provides suitable Greater Sage-grouse nesting and summer habitats of all action (grazing) alternatives, because 35 percent forage utilization in the riparian/meadow areas would enhance riparian function of streams, provide hiding cover and preferred forbs and may result in slightly greater grass height in nesting habitat than Alternative 3 and considerably more grass height in nesting habitat than Alternative 2. Alternative 4 would provide more favorable brood rearing habitat in meadows and less favorable nesting habitat than Alternative 1. Scientists found that tall, dense grass and forb cover at nest sites enhanced nesting success (Connelly et al. 2000, Greg et al. 1994, Holloran et al 2005, Doherty 2014).

The Greater Sage-grouse habitat in the Upper Green River is important to maintain the viability of Greater Sage-grouse on the Bridger-Teton National Forest, because it comprises more than 14 percent of the Greater Sage-grouse habitat on the Forest. Under Alternative 4, this Greater Sage-grouse nesting and brood-rearing habitat would meet desired habitat conditions to support Greater Sage-grouse. In addition, the Greater Sage-grouse habitat in the Upper Green River area provides a potential dispersal route or connectivity between the larger Pinedale (central-west) Greater Sage-grouse population to the relatively isolated Gros Ventre and Jackson Hole populations. Connectivity corridors are important for maintaining the transmission of genetic material between populations (Wyoming, Executive Order 2015-4, Crist et al. 2015). Schulwitz et al. (2014) suggested that isolated populations may result in negative fitness consequences that could lead to local extirpation and/or loss of unique genetic diversity. Although they did not demonstrate genetic connectivity between the Pinedale (central-west) Greater Sage-grouse population and the Gros Ventre and Jackson Hole populations, the Greater Sage-grouse habitat in the Upper Green River provides a connectivity corridor and the potential for demographic and genetic exchange. The Gros Ventre and Jackson populations inhabit an additional 185,779 area of core, connectivity, and general Greater Sage-grouse habitats or 56 percent of the Greater Sage-grouse habitat on the Forest. As a result, the Upper Green River corridor is important to the viability of Greater Sage-grouse on the Bridger-Teton National Forest. Alternative 4 would provide suitable nesting and brood-rearing habitat in 14 percent of the Greater Sage-grouse habitat Forest-wide and positively influence Greater Sage-grouse occupying up to 70 percent of the Forest. Therefore, Alternative 4 would contribute to the viability of the Greater Sage-grouse population inhabiting the Forest.

At a larger scale, Alternative 4 would not contribute to a trend towards federal listing because the Greater Sage-grouse habitat in the Upper Green River project area would meet habitat objectives; negative effects associated with fencing and trampling would be minor; habitat in the Forest is a small proportion of the Greater Sage-grouse habitat in Wyoming and are a net positive in light of the magnitude of negative impacts associated with other activities such as climate change, oil and gas development, and residential development occurring throughout the state. Although, the Upper Green River Greater Sage-grouse habitat is currently considered peripheral habitat, it is relatively high elevation and receives high precipitation for sagebrush communities and may become more important in light of climate change.

Trumpeter Swan (*Cygnus buccinator*) - Sensitive

The trumpeter swan section presents the indicators addressed in this analysis, the existing condition and the environmental effects of each alternative on trumpeter swans. Information provided in this section was summarized from the Supplemental Wildlife Report (Roberts 2016).

Indicators Used for Comparison of Alternatives

- Number of territories and nesting success (actual or potential)
- Riparian condition and cover (height and extent of vegetative cover)
- Presence/extent of flight hazards such as power lines and fences

Affected Environment

Population

Trumpeter swans in Wyoming are a breeding segment of the Tri-State Area Flocks of the U.S. segment of the Rocky Mountain Population of trumpeter swans. They are one of the rarest avian species that nests in Wyoming (Patla 2011). Management strategies and population goals for trumpeter swans are directed by the Trumpeter Swan Recovery Plans because year-round resident trumpeter swans in Wyoming comprise part of the historic population that nests in the Greater Yellowstone area. The state set a management goal of 10 breeding pairs in the Green River Basin of Wyoming. The total year-round resident population in Wyoming based on fall 2014 surveys was 223 swans (167 adults/56 cygnets, Patla 2015). Assuming all these swans are still alive in February, survey results indicate that only 17 percent of the swans wintering in Wyoming are resident birds. Broken down by drainage, in the Snake River area only 14 percent of wintering birds are resident while in the Green River area 61 percent of the swans likely are resident birds. The Green River population of trumpeters in the project area has continued to increase annually (USFWS 2009) due to continued expansion in prime breeding habitats.

Project Area

The habitat within the project area has been extensively used by swans since 2008. Single birds and groups of swans are often seen in suitable habitat throughout the project area during spring, summer, and fall, especially within the Green River Allotment. In 2009, there were three territorial pairs of swans in the Green River Allotment. In 2014, five pairs occupied breeding and nesting sites in the project area, and the Mosquito Lake pair successfully fledged two cygnets. For February 2015, Patla reported totals for the Green River drainage as: 211 adults/33 cygnets (13.5 percent cygnets). This is very similar to the five year average (2010-2014) of 204 adults/35 cygnets (14.8 percent cygnets).

Trumpeter swans frequently attempt to nest in the project area. However, the high average elevation commonly leads to late dates of ice-off for lakes and delayed development of emergent vegetation needed for nesting cover and security, factors that may limit the productivity of swans in the area (pers. comm., Wyoming Game and Fish Department 2009). The amount of suitable available wetland habitat fluctuates

naturally, and can also decrease with drought. If climate change results in warmer spring weather and earlier ice-off, potholes in this area will be available earlier and may improve nesting and nest success, and higher elevations sites such as this may become more important (Wyoming Game and Fish Department, pers. comm., 2015).

Habitat

Trumpeter swans are a riparian-dependent species, nesting on a wide variety of shallow freshwater marshes, ponds, lakes, and occasionally slow-moving rivers (Gale et al. 1987). They prefer areas with abundant and diverse communities of aquatic plants. Suitable wetlands can vary substantially in their physical characteristics, but several basic features are required: about 100 meters of unimpeded water for take-off; accessible forage (submerged, floating, and emergent plants); shallow, non-fluctuating levels of unpolluted water; structural materials to build a nest platform, such as an island, a beaver or muskrat lodge, or emergent vegetation; and low human disturbance (Mitchell 1994). Their nests are often partially hidden. Cygnets initially feed on aquatic invertebrates, but they shift to an herbivorous diet at the age of 5 weeks (Banko 1960, Hansen et al. 1971). The adults and young migrate together in the fall to lower elevation wintering areas where the water is not fully frozen, and food is accessible. Trumpeter swans often maintain the same territories and nest sites year after year.

Risk Factors

At a regional and national scale, the primary risk factors for trumpeter swans are human disturbance at nest sites, brood-rearing and wintering areas; sedimentation, de-watering, and chemical contamination of aquatic habitats; invasions of non-native aquatic weeds and invertebrates; the presence of in-flight hazards such as power lines and fences; and effects of domestic livestock on emergent vegetation needed for nesting cover and brood rearing (Patla and Lockman 2004, Olliff 1999). Wetland-dependent birds are also considered to be at particularly high risk for negative climate change effects (Steen and Powell 2012).

Environmental Consequences

Alternative 1 – No Livestock Grazing (No Action Alternative)

Direct and Indirect Effects

Under Alternative 1, riparian areas and potential swan nesting sites would no longer see disturbance or be subject to loss of cover or nest trampling due to cattle grazing. Water would not be contaminated or depleted in riparian habitats due to cattle presence. Ungulates such as moose, elk, and pronghorn would continue to graze throughout the project area. Predators such as coyotes, wolves and grizzly bears would not be removed due to livestock conflicts.

Seventy-five miles of wire and wood pasture fencing would be removed, including those near breeding and nesting sites (e.g., 22 miles of barbed wire around Mosquito Lake pastures would be removed). No temporary electric fencing would be needed to protect riparian areas, or for herd management or horse pasturing. Removal of fencing would benefit trumpeter swans because of the reduced potential of colliding with fences and potential injury. Property boundary fences would remain, including in the vicinity of Wagon Creek and Mud Lake, along with a small scale private cattle operation and the associated water diversion/development. Human disturbance from recreational activities such as hunting, fishing, OHV (off-highway vehicle) use and camping would continue.

When seasonal climate conditions do allow open water for nesting, trumpeter swans would continue to nest successfully. In exposed sites, such as Mud Lake, without grazing pressure from cattle, edge vegetation can

recover, reducing nest exposure to predation, and improving the water and forage quality, which could result in greater nesting success at that site.

In the absence of grazing, habitat conditions in riparian sites may stabilize or improve to provide better quality breeding, nesting, and foraging sites; allow for establishment of additional nesting territories; and contribute to greater adult fitness and nesting success. And potentially fewer swans would die as a result of collisions with fences.

Cumulative Effects Common to All Alternatives

Cumulative effects include past, present, and reasonably foreseeable future activities that have occurred or are reasonably certain to occur, posing additional influences or stressors on the trumpeter swans in the project area and on the population at the Forest level. The cumulative effects analysis area for trumpeter swans includes the Pacific Flyway, Green River and Snake River population segments in Western Wyoming, across the Forest. The temporal boundary for this analysis is 100 years into the past and ten years into the future (life of the grazing permit). Past, present, and reasonably foreseeable future activities considered for this cumulative effects analysis include those found in Appendix A, Supplemental Wildlife Specialist Report (Roberts 2016) and discussed further in the Wildlife Report (Murphy 2016, Appendix 1).

Effects include those from recreational activities including agricultural, big game (elk feedground), and fire management practices in the Upper Green River corridor and the Snake River valley on vegetation composition and structure; water diversions and developments; agricultural and recreation-related disturbances; habitat conversion; urban sprawl; oil and gas and other development; power lines; fences; and climate change. All these factors had or have the potential to modify, remove, or reduce the quality of nesting and foraging habitat, increase disturbance, and affect nesting success or eliminate territories. See Roberts' (2015) table of cumulative actions immediately within the project area.

The Wyoming population of swans has been gradually increasing since conservation and reintroduction efforts began. Winter 2015 was mild, with less snow and ice cover, allowing broader distribution of wintering birds, especially for the Green River population segment. The total number of swans wintering in the Pacific Flyway portion of Wyoming in 2015 (931) was 2 percent higher compared to 2014 winter survey results: 911 total (795 adults and 116 cygnets) (Patla 2015). The 2015 data shows a decrease of 3 percent in the number of adults and an increase of 33 percent in the number of cygnets compared to 2014. The Green River population is increasing and expanding throughout the Green River Basin (USFWS 2009) due to successful reintroduction and existence of available suitable habitat. Overall, the indirect and direct impacts to trumpeter swans associated with this project together with cumulative actions would not add substantial cumulative effects to the trumpeter swan populations in western Wyoming that would further impact the population viability on the Forest.

Determination for Alternative 1

For reasons discussed above, Alternative 1 (no grazing) is expected to provide **beneficial impacts** to individual trumpeter swans, breeding pairs, and their nesting success.

Alternative 2 - Grazing as Currently Permitted and Current Management

Direct and Indirect Effects

The direct and indirect impacts to trumpeter swans from current grazing management and all action alternatives include impacts to breeding habitats from the changes in the composition and structure of riparian and wetland vegetation which alter stream bank stability, stream bank trampling, pollution of water sources from livestock waste, minor disturbance from the presence of cattle and riders (cattle herders), and hazards to individual birds posed by flight-path obstructions from fences and other grazing infrastructure.

Of the action alternatives, Alternative 2 allows the highest utilization rates for vegetation within riparian areas (up to 65 percent) and thus provides the least protection to breeding and nesting swans and their habitat. As stated in the Rangeland Vegetation Resource Report (Booth and Hayward 2015), however, riparian utilization measured in Upper Green Allotment in the past eight years measured at key sites has not exceeded 55 percent. And in recent seasons, Mosquito Lake pastures have been managed under rotation that limits utilization to just 30 percent (Booth and Hayward 2015). Range monitoring for Mosquito Lake pastures reported stubble heights of 4.4 - 13 inches. If, under Alternative 2, grazing utilization reached the 65 percent maximum allowable use (about 35 percent retention), or stubble heights were as low as 2 inches in riparian areas, objectives for stream bank stability and retaining herbaceous vegetation, species composition, and structural characteristics of riparian habitat for nesting and foraging sensitive species would not be achieved. To graze areas in Mosquito Pasture and Mud Lake at 65 percent utilization could negatively impact riparian areas and therefore, potentially impact wetlands and associated swan nesting habitat within the project area; individual trumpeter nests could be lost or territories could be abandoned.

Cumulative Effects

See discussion of Cumulative Effects Common to All Alternatives under Alternative 1.

Determination for Alternative 2

Alternative 2 would continue to provide less than satisfactory riparian conditions in some areas, which may impact individuals, breeding pairs, and their nesting success. However, because the breeding pairs in the project area do not currently contribute significantly to population growth of the Green River Basin population (Wyoming Game and Fish Department, pers. comm., 2015) to viability on the Forest, the determination for this alternative is "**may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability**."

Alternative 3 - Modified Grazing Management

Direct and Indirect Effects

The main difference in Alternative 3 as compared to Alternative 2 is the increase in stubble height requirements in riparian areas and the adaptive management actions that are applied if objectives are not being met. If the maximum utilization of key forage species in riparian areas was reached, these areas could see an increase in use, leading to an increase in current year bank alteration, a decrease in stream bank stability (Robertson 2016), and stubble heights below 4-inches (Clary and Webster 1989). These changes could affect the water table and degrade otherwise suitable nesting habitat.

In the Mud Lake East Pasture, under current conditions, Alternative 2 is not meeting species composition range objectives. Under Alternative 3, with a minimum 4-inch stubble height and relocating the salt lick 1/2 mile away from Mud Lake, some improvement of the site is expected.

Alternatives 3 and 4 have reduced cattle numbers at Mosquito Lake pastures (270 less, or 15 percent fewer permitted cattle), an increase in stubble height requirements in riparian areas, and adaptive management features that are applied if resource objectives are not being met. In Mosquito Lake pastures, recent livestock management efforts have resulted in improvements in riparian condition and upland vegetation composition, with utilization of less than 30 percent in uplands and stubble heights from 4.4 - 13 inches in riparian areas (greenline of Wagon Creek, Booth and Hayward 2015). Elmore (1988) in Clary and Leininger (2000) suggested that 3- to 4-inch stubble heights would provide stream bank protection and aid deposition of sediment. However, a minimum 4-inch stubble height may not be sufficient to allow recovery of willow communities along degraded riparian areas, and stubble heights of 6 inches or more sometimes may be required to protect ecosystem function (Meyers 1989 cited in Clary and Leininger 2000).

At Mosquito Lake, breeding trumpeter swans would benefit from the reduced cattle numbers in the Mosquito Lake pastures. However, objectives for retaining riparian function (resiliency) still may not be achieved at sensitive sites under Alternative 3. Grazing at the levels in Alternative 3 may negatively impact nesting habitat, individual breeding pairs, and their nest success.

Alternative 3 could increase utilization from current actual use (about 30 percent) at Mosquito Lake pastures to 50 percent, and a 4-inch stubble height which is lower than current conditions (4.4-13 inches) (Booth and Hayward 2015). This could slow or prevent recovery of some riparian areas, and could lead to lowering of the water table and loss of some potholes in dry years, making some otherwise good nesting sites unsuitable or making nests more vulnerable to predation and failure. With less cover and moisture, the riparian sites could be less resilient to climate change (Steen and Powell 2012).

Cumulative Effects

See discussion of Cumulative Effects Common to All Alternatives under Alternative 1.

Determination for Alternative 3

At this time, the breeding pairs in Upper Green do not contribute significantly to population growth of the Green River Basin population or viability at the Forest level. Alternative 3 "**may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability**".

Alternative 4 - Modified Grazing Management with Riparian Emphasis

Direct and Indirect Effects

Of the action alternatives, Alternative 4 provides the greatest protection for swan nesting habitat, and has the least potential for impacts to individual swans, breeding pairs, or their nesting success. Alternative 4 would provide for faster recovery and greater vegetative cover retention (compared to Alternatives 2 and 3), and maintenance or improvement of riparian function (and associated wetlands and water table), which would support ongoing occupancy by breeding pairs by providing better cover and food for nests and young.

Forage utilization limits of 35 percent in riparian areas and adaptive management for improvements in pastures such as Mud Lake/Fish Creek, Mud Lake East and Roaring Fork (similar to Alternative 3) would improve wetland and riparian conditions which could improve or provide new additional nesting sites with greater protection from predators and disturbances. At Mosquito Lake pastures, breeding trumpeter swans would benefit from utilization limits of 35 percent in riparian areas and reduced cattle numbers, which would afford greater herbaceous retention, less soil compaction and greater stream bank stability provided by 4-6-inch minimum stubble heights.

Although the breeding pairs in Upper Green do not currently contribute significantly to population growth of the Green River Basin population, with climate change, some of the higher elevation lakes and ponds in Upper Green River may become more important for nesting in the future, as long as the riparian habitat quality is maintained (Steen and Powell 2012, Patla 2015).

For all action alternatives, the range improvements of any new or replacement permanent fencing includes a wooden top rail in riparian areas to improve visibility and pass-ability for wildlife. Temporary electric fencing is proposed in Alternatives 3 and 4. Temporary wire fencing, and wire fencing that crosses meadows or temporary electric fencing can also pose a hazard to swans and other birds such as Greater Sage-grouse. An on-the-ground evaluation of the extent of existing hazards to nesting swans from power lines or fences in these allotments has not yet been conducted.

Cumulative Effects

See discussion of Cumulative Effects Common to All Alternatives under Alternative 1.

Determination for Alternative 4

Alternative 4 provides the greatest protection for swan nesting habitat of all action alternatives. Fencing and other grazing infrastructure would still pose flight hazards, vegetation would be trampled or removed, and disturbances from grazing-related activities could still occur. This alternative "**may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability**".

Bald Eagle (*Haliaeetus leucocephalus*) - Sensitive, MIS

This section presents the indicators addressed in this analysis, the existing condition and the environmental effects of each alternative on bald eagles. Information provided in this section was summarized from a Supplemental Wildlife Report (Roberts 2016).

Indicator Used for Comparison of Alternatives

- Habitat condition (proper functioning condition and riparian function)

Affected Environment

Status and Population: The bald eagle is managed as a sensitive species in Region 4, and it is also a management indicator species. In the state of Wyoming, bald eagles are classified as a species of greatest conservation need (NSS2 Ba) (WGFD 2010). The U.S. Fish and Wildlife Service declared the species recovered in 2007. Bald eagle nesting territories within or near the project occur near Dollar Lake (Upper Green River Allotment, Upper Gyp pasture) and near the Green River Lakes (just outside the project area). The primary nests are located in Douglas fir trees. Both eagle pairs forage along the Green River, Green River Lakes, and/or Dollar Lakes. (Patla 2013)

Habitat: Bald eagles are closely associated with water, and their nest sites are commonly found less than one mile from a lakeshore or riverbank. Large trees are necessary to support eagle nests. Old-growth stands, with their structural diversity and open canopies provide important habitat for eagles because snags and open-canopied trees located near the nest site and foraging areas offer favorable perches. Bald eagles feed on fish during the summer-long grazing season, and on carrion during the winter months if/when the river and lakes are frozen. Bald eagles with access to open water or alternate food sources near their nesting territories may not migrate in winter; however, many eagles migrate southward to areas with available prey. Riparian habitat provides essential cover and nutrients for bald eagle aquatic and terrestrial prey species- fish, passerine birds, and ungulates (carrion). There are approximately 11, 846 acres of riparian community types in the Upper Green project area. Of this, approximately 2,350 acres provide foraging habitat in the primary bald eagle nesting territory (located near the Big Bend of the Green River). There are no acres of capable habitat for bald eagles that are outside capable lands for cattle grazing that are within the project area.

Risks: A variety of human activities can potentially interfere with bald eagles, affecting their ability to forage, nest, roost, breed, or raise young (USFWS May 2007). Risk factors faced by eagles at a regional and national scale include habitat loss, disturbance-related effects on nesting (e.g., abandonment) and roosting, poisoning and shooting, mortalities associated with collisions with aerial structures such as towers and electrocution, and environmental contamination of rivers and lakes via the application of pesticides (USFWS 2007). Disruption, destruction, or obstruction of roosting and foraging areas can also negatively affect bald eagles. Bald eagles nesting in Wyoming face site-specific risks due to increasing energy development and rural development, recreational activities, and environmental contaminants (WGFD 2010). West Nile virus has also been responsible for bald eagle deaths (UDWR 2013).

Cattle-grazing potentially affects bald eagle foraging success indirectly through browsing and grazing impacts to riparian soils and vegetation along rivers and lakes which affects water quality, and fish habitat and abundance. Riparian vegetation provides cover and nutrients for foraging and resting fish, and shading that helps maintain cooler water temperatures. In the project area, the primary effect of cattle grazing management is herbivory and trampling on herbaceous and woody vegetation. Although disturbance can also be a risk factor for bald eagles, the birds may be somewhat adjusted to the low level disturbance of cattle grazing management, since they continue to roost and nest successfully in this area.

Environmental Consequences

This section describes the direct, indirect and cumulative effects of implementing Alternatives 1, 2, 3, and 4 on bald eagles and their habitat.

Alternative 1 – No Livestock Grazing (No Action Alternative)

Direct and Indirect Effects

Removing livestock would contribute to improvement of stream bank stability and riparian vegetation that supports healthy fisheries. This improvement would be to stream reaches not currently meeting riparian function or properly functioning condition within the territory.

In the absence of grazing, habitat conditions may stabilize or improve to provide better quality breeding, nesting, and foraging sites; allow for establishment of additional nesting territories; and contribute to greater adult fitness and nesting success.

Cumulative Effects Common to All Alternatives

Cumulative effects include past, present, and reasonably foreseeable future activities that are reasonably certain to occur, posing additional influences on bald eagles in the area of analysis, which includes the project area and the population at the Forest level. The temporal boundary for this analysis is 100 years into the past and ten years into the future (life of the grazing permit). Projects occurring or scheduled to occur in the analysis area (Appendix A) and their additive effects are reviewed (Murphy 2016, Appendix 1). Cumulative negative effects include effects of century-long grazing and agriculture; big game management and fire suppression practices in the Upper Green River corridor on vegetation composition and structure; water diversions and developments; agricultural and recreation-related disturbances; habitat conversion; urban sprawl, oil and gas and other development; and climate change. All these factors had or have the potential to modify, remove, or reduce the quality of bald eagle nesting and foraging habitat, increase disturbance, and affect nesting success or eliminate territories. The impacts of livestock grazing together with past, current and future cumulative actions are not expected to have substantial negative effects on bald eagle Forest populations or the population viability of the species in Wyoming.

Determination for Alternative 1

Alternative 1 would have minor **beneficial impact** for bald eagles; territories would continue to be maintained and productive throughout the project area, contributing to the overall ongoing maintenance and recovery of the population in the Greater Yellowstone area. The overlap of capable habitat overlap in alternative one is not applicable because livestock would not be authorized on the allotments.

Alternative 2 - Grazing as Currently Permitted and Current Management

Direct and Indirect Effects

Current livestock grazing practices do not appear to be preventing bald eagle use of the Upper Green River. While some stream channels are in less-than-satisfactory condition (Robertson 2016) and current livestock

grazing practices continue to impact trout habitat in some parts of the Upper Green project area, overall, the summertime food supply for nesting eagles appears to be sufficient (Anderson 2015).

Alternative 2, which allows for up to 65 percent forage utilization in riparian areas, could lead to at-risk riparian function, and further stream bank degradation as compared to current conditions. Thus Alternative 2 might not maintain quality riparian habitat that supports abundant prey that allows existing bald eagle territories to thrive and contribute to maintenance of the local population. Nests might fail or be less productive. It could prevent young bald eagles from staying in the area and establishing additional territories in what might otherwise be suitable habitat.

Cumulative Effects

See discussion of Cumulative Effects Common to All Alternatives under Alternative 1.

Determination for Alternative 2

Although some riparian sites may remain stressed or degraded due to trampling and loss of vegetative cover, as long as fisheries remain intact and disturbance does not increase, Alternative 2 "**may impact individuals but is not likely to cause a trend toward federal listing or loss of viability**".

MIS determination for bald eagles: Alternative 2 which allows for grazing up to 65 percent in riparian areas could lead to at-risk riparian function, and further streambank degradation from current conditions. Thus Alternative 2 might not maintain quality riparian habitat that supports abundant prey that allows existing bald eagle territories to thrive and contribute to maintenance of the local population. Nests might fail or be less productive. It could prevent young bald eagles from staying in the area and establishing additional territories in what might otherwise be suitable habitat.

Alternative 3 - Modified Grazing Management

Direct and Indirect Effects

Alternative 3 provides adaptive management and a 4-inch stubble height minimum along the greenline which maintains riparian function, or can allow for recovery of stressed riparian sites, to the benefit of fisheries and eagles. However, grazing may increase in places like Mosquito Creek pastures from 30 percent to up to 50 percent in riparian areas under authorized limits. A 4-inch minimum greenline stubble height would be sufficient to maintain conditions in stream and riparian areas that are meeting riparian function and stream bank stability objectives, which is the case across most of the project area (Anderson 2015). In some areas, this level of forage use by cattle would even result in improving trends in riparian condition in locations that are impaired due to historical overgrazing (Anderson 2015). For riparian areas not meeting the riparian function objective, a 6-inch stubble height would likely improve conditions (Meyers 1989 cited in Clary and Leininger 2000). Thus the condition of most wetlands, riparian areas across the project area and fisheries is likely to remain stable or slightly improve under this alternative. This would maintain suitable foraging habitat conditions for bald eagles.

Cumulative Effects

See discussion of Cumulative Effects Common to All Alternatives under Alternative 1.

Determination for Alternative 3

Alternative 3 "**may impact individuals but is not likely to cause a trend toward listing**".

MIS determination for bald eagles: Livestock grazing potentially affects fish distribution and abundance, important habitat variables for bald eagles. Population objectives for bald eagles in Wyoming have been

exceeded. The level of impacts for the action alternatives 3 and 4 do not cause more than minor localized- to beneficial- impacts to fisheries, and no increase in disturbance, and thus are not likely to affect the existing productive territories and ongoing recovery in the Greater Yellowstone Area. Of the action alternatives, Alternative 4 provides for the best riparian conditions, and thus the most benefit to maintaining bald eagles' foraging habitat within the project area.

Although this analysis shows that cattle grazing management within the Upper Green River Project Area affects riparian habitat and cover to the extent discussed in each alternative, the determination from this analysis is that none of this overlapping area would be considered unsuitable (or incompatible) for cattle grazing in terms of also being able to meet the needs of bald eagles, as long as cattle grazing is managed to minimize or avoid negative impacts to riparian zones to maintain adequate/suitable bald eagle foraging habitat. Of the action alternatives, alternatives two through four have decreasing levels of impact on riparian habitat, respectively.

Based on the analysis and discussion provided above, the action alternatives would have negligible effects or no effect on the population at the Forest scale, and they would not deter from sustained population recovery across the region. With grazing at the levels proposed under the action alternatives, and with adaptive management to restore and improved riparian conditions under alternatives 3 and 4, bald eagle nesting is expected to continue in the project area, contributing to the ongoing maintenance and recovery of populations in the Greater Yellowstone Area.

Alternative 4 - Modified Grazing Management with Riparian Emphasis

Direct and Indirect Effects

Livestock grazing potentially affects fish distribution and abundance, important habitat variables for bald eagles. Alternative 4 provides additional protection for riparian habitats overall, compared to Alternative 3. Under Alternative 4, forage utilization limits of 35 percent in riparian/wetland areas and 4-6-inch stubble height limits along the greenline would generally provide for reduced impacts to stream bank stability and riparian function which would maintain or improve conditions for the bald eagle's primary prey within the allotments.

Of the action alternatives, Alternative 4 provides the most protection for riparian areas, and the best conditions to maintain healthy fisheries and wetlands. This alternative provides a good food supply owing to its increased stubble heights (4-6 inches), adaptive management, and a forage utilization limit of 35 percent in riparian areas.

Cumulative Effects

See discussion of Cumulative Effects Common to All Alternatives under Alternative 1.

Determination for Alternative 4

Continued grazing, but at lower forage utilization levels in riparian areas than Alternatives 2 and 3 and with adaptive management, would improve riparian conditions of stressed sites. Alternative 4 "**may impact individuals but is not likely to cause a trend toward federal listing or loss of viability**".

See the "Determination for Alternative 3" for a further discussion.

Peregrine Falcon (*Falco peregrinus anatum*) – Sensitive, MIS

This section presents the issues and indicators addressed in this analysis, the existing condition and the environmental effects of each alternative on peregrine falcons. Information provided in this section was summarized from the Supplemental Wildlife Report (Roberts 2016).

Indicator Used for Comparison of Alternatives

- Number of peregrine territories affected
- Riparian habitat conditions and amount of riparian foraging habitat affected.

Affected Environment

Status: Peregrine falcons are on the Region 4 sensitive species list and are also a management indicator species. The USFWS, after removing the species from the Endangered Species List in 1999, developed a monitoring plan for the American peregrine falcon in cooperation with state agencies (USFWS 2003), and the birds remain federally protected under the Migratory Bird Treaty Act. The Wyoming State Wildlife Action Plan lists the peregrine as a rare species with severe limiting factors but these are not increasing significantly. The population size or distribution is considered restricted or declining but extirpation is not imminent (WGFD 2010).

Habitat: Peregrines typically hunt and nest near wetlands, lakes, rivers, and mountain valleys that support abundant avian prey such as ducks, shorebirds, or songbirds that they catch midair. For nesting, peregrines use vertical cliff habitats that support holes or ledges that are inaccessible to land predators. Most foraging is done within seven miles of the nest, although they can forage as far away as 15 miles. Nesting requirements include vertical cliff habitat with large potholes or ledges that are inaccessible to land predators and are preferentially located near habitat that has a high avian prey population such as wetlands, large bodies of water, or rivers. There are six recorded territories on the Forest.

There are approximately 14 different peregrine territories documented on the Forest (NRIS, WYNDD, and Patla 2015). The project area currently supports up to three active territories (one unconfirmed). Riparian habitats and surrounding conifer and aspen stands provide potential prey such as mallard and goldeneye ducks, gray jays, and mourning doves. An active accipiter (unconfirmed peregrine) nesting territory (5 total birds observed in 2013, including offspring) occurs in the Upper Green River allotment, Lower Gypsum pasture. These birds likely forage in riparian areas along the Green River and Gypsum Creek. A nesting territory occurs west of the Kinky Creek pasture. This pair likely forage in the riparian zone along the Upper Gros Ventre River near the Darwin Ranch. The third nest is in Wilderness just outside the project area, which provides ready access to foraging around Green River Lakes and adjacent riparian areas along Green River, within the Roaring Fork Allotment.

Peregrine foraging habitats in the analysis area can be adversely impacted by cattle grazing. Long-term alterations to riparian willow and cottonwood communities caused by cattle herbivory can adversely impact bird communities (Mosconi and Hutto 1981, Bock 1993. Fagerstone and Ramey 1996, Knopf 1996, Sanders and Edge 1998). Adverse impacts to bird communities caused by the degradation and loss of aspen stands is also well documented (Dobkin et al. 2002, Wyoming Partners in Flight 2003). The project area contains approximately 11,846 acres of riparian herb land and willow habitat type that support the primary prey species for peregrines.

Risks: At a national and regional scale, risk factors for peregrine falcons include disturbance effects associated with human activity, including climbing, shooting, trapping, egg collecting, and scientific monitoring; poisoning from pesticides and other contaminants in agricultural areas; aerial collisions with objects such as power lines; and habitat loss to development or degradation, often due to loss of wetlands,

chemical contamination of prey such as from oil spills or treatment ponds, and disease such as West Nile virus (Cade and Bird 1990, Bull and Wales 2001, WGFD 2010, White et al. 2002, Zuberogoitia et al. 2006). A change in hunting territory habitat that affects the prey base can also have adverse effects due to greater energy expended in search of food, or even nest abandonment. Nest predation by other raptors can occur when adults are foraging far away from the nest for long periods of time (Cade et al. 1988).

For the project area, the most significant effect of grazing on peregrine falcons is herbivory and trampling of foraging habitat and nests of prey in riparian communities. Overall, peregrine habitats in the analysis area are in good ecological condition, with the exception of some riparian and meadow sites near water that are impacted by cattle grazing. Alternatives that maintain or improve riparian function and provide good habitat for waterfowl and other birds would benefit peregrines' productivity and survival within the project area.

Environmental Consequences

This section describes the direct, indirect and cumulative effects of implementing Alternatives 1, 2, 3 and 4 on peregrine falcons and their habitat.

Alternative 1 – No Livestock Grazing (No Action Alternative)

Direct and Indirect Effects

Under no livestock grazing, the increase in vegetation cover and structure would improve habitat conditions for most raptor prey, including waterfowl and passerine birds such as western meadowlarks, red-winged blackbirds and willow flycatchers that use riparian, wetland and moist upland communities (Fleischner 1994).

Elimination of livestock and range management activities might reduce the associated human disturbance that affects peregrines or their prey; although this type of disturbance is probably minimal, compared to recreation-related disturbances, which would continue under Alternative 1. Activities associated with removal of structures such as rider cabins and fencing would cause only short term minor disturbances for peregrine falcons and their prey.

Cumulative Effects Common to All Alternatives

Cumulative actions affecting peregrine populations and their recovery include the past, present, and future private, state, and federal activities across the project area, the Forest, and western Wyoming that affect peregrine nesting and foraging habitat, their prey, and survival. These actions are the same as those mentioned under the bald eagle Cumulative Effects section and are discussed in the Wildlife Report (Murphy 2016, Appendix 1). The spatial boundary for the cumulative effects analysis is primarily the Bridger-Teton National Forest including the project area, and extends through western Wyoming. The temporal boundary for this analysis is 100 years into the past (historic and recent land uses) and ten years into the future (life of grazing permit).

Population recovery is expected to continue, but remains limited by available suitable nesting habitat. Development, habitat conversion, and grazing will continue to expand in western Wyoming, and climate change will affect the distribution of and amount of wetland habitat for nesting avian prey species. These stressors will combine to negatively influence the quality and amount of foraging habitat for peregrines across the state. However the primary threat of pesticides has been removed from the western United States. For some of the more northern peregrine populations that leap-frog migrate to the tropics, the pesticide threat remains. Overall the project effects are not expected to add significant negative effects to threaten viability at the Forest or state level.

Determination for Alternative 1

The direct and indirect effects of Alternative 1 would be (mildly) **beneficial** for peregrine falcons in the analysis area and for the Forest. In the absence of livestock grazing, associated range management structures and activities, habitat conditions for raptor prey, particularly for riparian zones and meadows, would improve and contribute to the ecological health of the watershed.

Alternative 2 - Grazing as Currently Permitted and Current Management

Direct and Indirect Effects

Livestock grazing in the project area can negatively affect the abundance and distribution of avian prey by reducing vegetative cover, density, and vertical structure, particularly in riparian zones and open meadows that are close to system trails, water sources, and roads. Alternative 2 provides the least protection for riparian habitat and peregrine prey, because some sites are not meeting riparian function objectives and would continue to not meet these objectives under Alternative 2.

Cumulative Effects

See discussion of Cumulative Effects Common to All Alternatives under Alternative 1.

Determination for Alternative 2

The direct and indirect effects of Alternative 2 would be minor adverse effects on peregrine falcons and their habitat in the analysis area and for the Forest. Overall, Alternative 2 "**may impact individuals but is not likely to cause a trend toward listing or loss of viability**".

Alternative 3 - Modified Grazing Management and Alternative 4 - Modified Grazing Management with Riparian Emphasis

Direct and Indirect Effects

In Alternatives 3 and 4, adaptive management and 4-6-inch stubble height requirements along stream banks in areas such as Wagon Creek and Roaring Fork allotments and Mud Lake, Tepee Creek, and Lower Gypsum pastures, would provide for recovery of stream bank stability and willow establishment in wetland and riparian foraging habitat for the three known peregrine territories. However, under Alternative 3, a minimum 4-inch stubble height may not be sufficient to allow recovery of willow communities along the Green River, such as at the confluence of the Roaring Fork. Alternative 4 would likely allow for faster recovery and maintenance of healthy conditions in willow communities. Of the action alternatives, Alternative 4 provides the greatest habitat protection with no more than 35 percent forage utilization in riparian areas which would improve willow/shrub cover and herbaceous cover that provide secure nesting sites for passerine birds and waterfowl. These habitats would support prey for peregrines.

Cumulative Effects

See discussion of Cumulative Effects Common to All Alternatives under Alternative 1.

Determination for Alternative 3

Alternative 3 "**may impact individuals but is not likely to cause a trend toward listing or loss of viability**".

Determination for Alternative 4

Although grazing would continue, impacts and disturbances would occur at lower levels, and Alternative 4 would result in maintaining or improving most riparian foraging habitats across the project area. Therefore

the determination is "**may impact individuals but is not likely to cause a trend toward listing or loss of viability**."

MIS Analysis and Determination for Peregrine Falcon

Peregrine falcons are a Region 4 Management Indicator Species (MIS) for which we monitor population trends related to population recovery. Across the Forest, there are 80,719 acres of capable/suitable riparian habitat overlapping potential peregrine foraging habitat. Within the Upper Green project area, 11,846 acres of riparian acres exist that are capable/suitable for grazing, all of which overlap potential peregrine foraging habitat. There are two (possibly three) occupied territories in the Upper Green River watershed out of 14 documented territories on the Forest.

Under Alternative 2, with 50-65 percent forage utilization, riparian areas that are not meeting desired conditions would continue to deteriorate. Although Alternative 3 has adaptive management to move some degraded riparian sites towards desired conditions, with up to 50 percent utilization in riparian areas, recovery may be slow, and it would not necessarily maintain existing high quality riparian habitat for foraging peregrines, which supports continued reproductive success of the three territories. Because Alternatives 1 and 4 contribute positively to vegetation conditions in riparian habitats that support peregrine falcon prey, it enhances the breeding success of the nesting pairs and contributes to the continued recovery of the species at the scale of the Forest and Wyoming.

Of the action alternatives, alternatives two through four have decreasing levels of impact on riparian habitat, respectively. Based on the MIS analysis, none of the overlapping capable/suitable riparian area would be considered unsuitable (or incompatible) for cattle grazing in terms of also being able to meet the needs of peregrines, as long as cattle grazing is managed to minimize or avoid negative impacts to riparian zones which would maintain adequate/suitable peregrine foraging habitat. In conclusion, the action alternatives are expected to have negligible effects or no effect on the peregrine population recovery at the Forest scale, and are not expected to deter from sustained population recovery across the region.

Great Gray Owl (*Strix nebulosa*) Sensitive

This section presents the indicator used in this analysis, the existing condition and the environmental effects of each alternative on great gray owls. Information provided in this section was summarized from the Supplemental Wildlife Report for Raptors (Roberts 2016).

Indicators Used for Comparison of Alternatives

- Condition and extent of montane riparian meadow foraging habitat

Affected Environment

Status: The great gray owl is designated as a sensitive species for 11 of 16 National Forests in U.S. Forest Service Region 4, including the Bridger-Teton National Forest. The Wyoming Game and Fish Department classifies this species as a Species of Greatest Conservation Need (status unknown) in the 2010 State Wildlife Action Plan.

Habitat: Great gray owls occur in boreal and montane forests across North America and Eurasia, generally associated with lodgepole pine, Douglas fir, spruce fir, and aspen forests. Semi-open areas where small rodents are abundant, and that occur near dense coniferous forests for roosting and nesting, are optimum habitat for great gray owls. They select mature or old growth forests on flat or moderate slopes for nesting and high crown cover for security (Duncan 1997). The owls do not build their own nests, but rather rely upon broken top snags, stumps, dwarf-mistletoe platforms, or old nests of goshawks or ravens (Bull and Duncan 1993). Dense stands of smaller diameter trees are also used for roosting by adults and their young. They

forage primarily in wet montane meadows, riparian zones, forblands in good ecological condition, and older open forest stands with a high density of voles and/or pocket gophers. In areas where nest sites are readily available, raptor densities are often limited by food abundance (Village 1990, Newton 1991) (Reynolds et al. 1992:11). This is particularly true for raptors, such as the great gray owl, that specialize in one or two prey species (Reynolds et al. 1992, Newton 2003, as cited by Rutz and Bijlsma 2006). Higher populations of microtine voles are associated with greater amounts of herbaceous vegetation and higher populations of pocket gophers are associated with greater herbaceous species diversity (Fleischner 1994, DeLong 2009).

Great gray owls occur in suitable habitat throughout the Greater Yellowstone area, including the Upper Green River watershed. Suitable nesting and foraging habitat exists throughout the project area, and it is likely to support gray owl territories. Formal surveys have not been conducted for this project, but sightings records confirm their presence in the area. Most recently, a pair was observed in Fish Creek pasture in 2014. There are approximately 12,171 acres of riparian habitat within the project area which are affected by grazing, and which potentially support prey for great gray owls.

Risks: Risk factors include human disturbance, habitat loss or conversion including loss of mature coniferous forest due to beetle kill, logging, or loss of meadow foraging habitat, urban sprawl, and climate change. Because its habitat is restricted and vulnerable, timber harvesting can reduce and eliminate nest sites. Moderate to heavy grazing may reduce the suitability of great gray owl foraging areas by reducing the abundance of pocket gophers or microtine voles, which are important prey species (Winter 1986).

Environmental Consequences

This section describes the direct, indirect and cumulative effects of implementing Alternatives 1, 2, 3 and 4 on great gray owls and their habitat.

Alternative 1 – No Livestock Grazing (No Action Alternative)

Direct and Indirect Effects

Removing livestock grazing on the project area allotments would benefit great gray owls that forage in the project area by improving habitat for their primary prey. Herbaceous (grass, forb and sedge), mountain shrub, and tree cover would improve. This increase in vegetation cover and structure would improve habitat conditions for meadow voles that live in moist open meadows and riparian herb land (Fleischner 1994).

Alternative 1 would carry no direct mortality risks or disturbance effects to great gray owls. Elimination of herding activities and riders might reduce human disturbance that potentially disturbs vital activities (primarily feeding) of great gray owls. More riparian and meadow herbaceous vegetation would be retained for small mammal food and cover, in areas where the owls forage. Other ungulates such as moose and elk would still be present throughout the allotment to till or fertilize the soil, but at lower densities that would create conditions more suitable for small mammals to burrow and thrive. Some fencing would be removed, but boundary fences would remain in and around the project area. Snags and trees would still be available for roosting and nesting. Risks from timber harvest or fire in the nest stand would remain, and natural processes such as beetle kill, wildfire, and microtine population fluctuations would continue to shape the available nesting and foraging habitat.

Cumulative Effects Common to All Alternatives

The spatial boundary for the cumulative effects analysis is the Greater Yellowstone area, including the project area. The temporal boundary for this analysis is 100 years into the past (historic land use patterns and habitat conversion) and ten years into the future (life of the grazing permit). Projects occurring or scheduled to occur in the analysis area (Appendix A), and their additive effects are reviewed in wildlife reports (Roberts 2016, Murphy 2016 Appendix 1).

Across the Greater Yellowstone area, great grey owl populations are likely impacted by loss or degradation of foraging and nesting habitat due to direct and indirect impacts from timber harvest, intensive grazing, elk feedgrounds, habitat conversion and suburban sprawl, roads and development, invasive species, and soil-compacting disturbances that affect prey in montane riparian habitat from activities such as agricultural operations and recreation activities. These all have the potential to increase disturbance, remove or reduce the quality of nesting and foraging habitat, reduce nesting success or cause abandonment of territories. Undisturbed montane meadows are probably one of the most endangered habitat types in the Greater Yellowstone area.

The cessation of livestock grazing in Alternative 1 would have beneficial impacts to great gray owls, providing for gradual recovery of soils and vegetation in impacted meadows and riparian areas which support small mammalian prey for the owls. Alternative 1 may allow for greater densities of owls within the project area, and greater survival of young, which would maintain or improve viability of the population on the Bridger-Teton National Forest and potentially contribute to greater densities or growth in the Greater Yellowstone area population.

Of all the alternatives, Alternative 2 would have the greatest potential for negative impacts to great gray owls because of loss or changes in prey due to the impacts to meadow and riparian habitat function, quality, and extent. When combined with past, present and future impacts to great gray owl populations at the Forest and Greater Yellowstone area level, Alternative 2 would likely contribute to an overall slow decline in great gray owls, since similar grazing and development impacts have been and continue to occur throughout the region.

With measures to reduce impacts to riparian areas and restore properly functioning conditions of degraded sites, the indirect and direct impacts to great gray owls from grazing at the levels proposed in Alternatives 3 and 4 are not expected to add substantial negative cumulative effects that would further impact the population viability at the Forest level or in the Greater Yellowstone area.

Determination for Alternative 1

Removing livestock grazing would have a **beneficial impact** on great gray owls, their fitness, and productivity, which would contribute to species viability on the Bridger-Teton National Forest.

Action Alternatives – Alternatives 2, 3, and 4

Direct and Indirect Effects

Livestock grazing throughout the watershed negatively affects the abundance and distribution of raptor prey by reducing vegetative cover, density, and vertical structure, particularly in riparian zones and open meadows that are close to system trails, water sources, and roads. Foraging areas might be reduced or lost. Nests might fail.

Soil compaction can adversely impact small mammals that rely on burrowing (Fagerstone and Ramey 1996, Klaus and Beauvais 2004); small mammals such as voles or gophers can be killed directly by trampling and crushing, or habitat degradation can lead to abandonment. Reduction in suitable habitat can lead to reduced densities of key prey species (Reynolds et al. 1992). They may be replaced by other larger generalist species, which great gray owls are not adapted to hunt. The owls' fitness may be reduced by having to forage over greater distances, and the owls would abandon the site if suitable prey is no longer available. Dispersing birds may experience increased mortality through increased risk of predation, accidents, or inadequate prey. In the western United States, pocket gophers can provide a buffer, as alternative prey that allow great gray owls to remain locally, although they may experience limited reproduction. Voles are generally adversely impacted by livestock grazing because they prefer tall, dense herbaceous cover and in some cases have disappeared from areas grazed by livestock (DeLong, D. 2009).

Under Alternative 2, if grazing utilization reached 65 percent (maximum permitted), or stubble heights were as low as 2 inches in riparian areas, objectives for riparian function, stream bank stability, herbaceous vegetation retention, species composition, and structural characteristics of riparian habitat for nesting and foraging sensitive species such as the great gray owl would likely not be achieved.

Cumulative Effects

See discussion of Cumulative Effects Common to All Alternatives under Alternative 1.

Determination for Alternative 2

Alternative 2: Grazing under current conditions in the Upper Green area "**may impact individuals, but will not likely cause a trend toward federal listing or loss of viability**" on the Bridger-Teton National Forest.

Determination for Alternative 3

Reducing stocking levels under Alternatives 3 and 4 compared with Alternative 2- Grazing as Currently Permitted would have some beneficial effects for the great gray owl. Greater retention of herbaceous material in meadows and riparian areas would improve habitat for voles, the primary prey of the owls. The indirect and direct impacts to great gray owls from grazing at the levels proposed in Alternatives 3 and 4 are not expected to add substantial cumulative effects that would further impact the population viability of the species. Overall, Alternative 3 could negatively affect individual owls by impacting availability and species of prey, reducing the owls' fitness and reproductive capabilities, which could lead to abandonment or loss of a local territory. Therefore the determination is "**may impact individuals but would not likely cause a trend toward federal listing or loss of viability**."

Determination for Alternative 4

Of all action alternatives, Alternative 4 would provide the best habitat protection for great gray owls and their habitat, because the forage utilization limit of 35 percent in riparian and meadow areas is the lowest proposed for the action alternatives. This level of allowable livestock use in conjunction with adaptive management would stimulate restoration of degraded sites. Grazing at these lower levels in riparian areas in Alternative 4 would have only minor negative to negligible effects for great gray owls. Overall this alternative "**may impact individuals but would not likely cause a trend toward federal listing or loss of viability.**"

Northern Goshawk (*Accipiter gentilis*) - Sensitive

This section present the indicator used in this analysis, the existing condition and the environmental effects of each alternative on northern goshawk. Information provided in this section was summarized from the Supplemental Wildlife Report for Raptors (Roberts 2016).

Indicators Used for Comparison of Alternatives

- Prey availability of avian species (numbers, distribution, or/and type)

Affected Environment

Status: The northern goshawk is designated as a sensitive species in the Forest Service Region 4, including on the Bridger-Teton National Forest. Population trends for the goshawk are poorly understood. Forest management activities such as logging and fuels reduction have the potential to negatively impact goshawk populations (Squires and Reynolds 1997).

Goshawks are a forest bird of high regional priority and concern in the Northern Rockies Bird Conservation Region 10, which includes Wyoming and the Bridger-Teton National Forest, because of declining or

unknown population trend (USFWS 2008). Breeding goshawks are rare throughout the state, and limited in their distribution, and thus are ranked S3 (vulnerable).

Habitat: Northern goshawks are known to forage in diverse habitats ranging from open-sage steppes to dense forests, including riparian areas, but their habitat selection factors are not well understood (Squires and Reynolds 1997). Northern goshawks feed on small to moderately large birds and mammals, including corvids, thrushes, woodpeckers, grouse, tree and ground squirrels, snowshoe hares, and cottontail rabbits (Anderson et al. 2004). They generally forage in late-succession forests with relatively dense canopy cover, but they occasionally forage in open habitats such as sagebrush or meadows (Anderson et al. 2004). Studies suggest that prey availability may be more important than abundance, and that goshawks may select foraging sites based on structural characteristics that favor their foraging strategies (Widen 1989, Good 1998, and Drennan and Beier 2003 in Greenwald et al. 2005).

Goshawks nest in Douglas-fir, lodgepole pine, and aspen forests, particularly dense old-growth conifers, or dense clumps of lodgepole pine (Wyoming Partners in Flight 2003, Anderson et al. 2004). On the Bridger-Teton National Forest, they also establish nesting territories within spruce/fir forest types. High canopy closure is one of the most uniform habitat characteristics of goshawk nest stands (Hayward and Escaño 1989). Average goshawk home range sizes during nesting are 1,400–8,600 acres in North America, depending on sex and habitat characteristics (Squires and Reynolds 1997).

Territories in the Project Area: Forested coniferous and aspen stands in and around the allotments provide favorable goshawk nesting habitat, and a variety of prey species. The Upper Green watershed supports two known, active, productive territories in the vicinities of Lower Gypsum and Upper Green River Lakes. Formal surveys have only been conducted in select areas within the Upper Green in relation to other timber or fuels projects, but recorded sightings indicate that Fish Creek and Elk Ridge may also support active territories.

Risk factors include loss of forested cover or nest trees in nesting and foraging areas, due to timber harvest, fuelwood cutting, fuels reduction, or grazing; human disturbance; insect or disease outbreaks; or wildfire. Grazing impacts can result in changes in prey availability of avian species (numbers, distribution, or/and type). Goshawk nesting and foraging habitat can be adversely impacted by grazing where aspen stands are heavily grazed by livestock, elk, deer, or moose (Lucas and Oakleaf 1975). Grazing pressure may contribute to a loss of habitat complexity that can lead to loss of a decline of prey base in aspen stands and riparian communities (Reynolds et al. 1992).

Environmental Consequences

This section describes the direct, indirect and cumulative effects of implementing Alternatives 1, 2, 3 and 4 on northern goshawks and their habitat.

Alternative 1 – No Livestock Grazing (No Action Alternative)

Direct and Indirect Effects

Removing livestock grazing would benefit goshawks that forage in the project area by improving habitat for their prey. Herbaceous (grass, forb and sedge), mountain shrub, and tree cover would improve across the project area; more riparian and meadow vegetation would be retained. This increase in vegetation cover and structure would improve habitat conditions for many bird species that nest and occur in and around meadows and forest edge habitats where goshawks forage (Fleischner 1994).

Alternative 1 would carry no direct mortality risks or disturbance effects. Risks from timber harvest or fire in the nest stand would remain, and natural processes such as beetle kill, wildfire, and some management and recreation-related disturbances would continue to shape the available nesting and foraging habitat.

Cumulative Effects Common to All Alternatives

The spatial boundary for the cumulative effects analysis is primarily the Bridger-Teton National Forest including the project area, and extends through western Wyoming. The temporal boundary for this analysis is 100 years into the past (historic land use patterns and habitat conversion) and ten years into the future (life of the grazing permit). Projects occurring or scheduled to occur in the analysis area (Appendix A), and their additive effects are reviewed in wildlife reports (Roberts 2016, Murphy 2016, Appendix 1).

Multiple factors such as changes in wildfire intensity, frequency, and extent; beetle kill, climate change, and loss of quality nesting habitat and habitat connectivity affect goshawk populations at the Forest and state level. Timber removal, grazing, development, roads, timing of fires (wild or prescribed), and other human-caused impacts continue to affect the quality of habitat and survival/availability of avian prey populations region-wide. These stressors will combine to influence the quality and amount of nesting and foraging habitat for goshawks in forested habitats across the state. Because goshawks can use both grassland and forest avian prey species, grazing effects are not as predominant a factor as for other raptor species, such as peregrines or bald eagles. Thus the action alternatives are not expected to add substantial negative cumulative effects that would further threaten population viability on the Bridger-Teton National Forest or at the regional level.

Determination for Alternative 1

Alternative 1 would have minor **beneficial impact** for goshawks.

Action Alternatives - Alternatives 2, 3 and 4

Direct and Indirect Effects

Livestock grazing, at the levels described in the action alternatives, is expected to have little effect on the composition and structure of coniferous forest stands, the primary foraging habitat for goshawks. Aspen habitat, also used by goshawks, would be affected by cattle grazing and browsing within forestlands no more than a negligible amount. Goshawks occasionally forage in open habitats such as sagebrush, and Graham et al. (1999) assessed that, while livestock grazing “most likely” has affected goshawks where it has altered plant community composition and structure in high elevation meadows and open parklands, the extent of this possible effect is poorly documented. Potential adverse effects include localized reduction of or change in certain prey species, such as ground-nesting passerine birds that can be affected by grazing. If the local prey base changed, individual birds might need to alter their behavior to catch alternative prey, or spend more time foraging across a broader area. Alternatives that provide better understory or grassland and shrub habitat would promote/retain prey species diversity and numbers of passerine birds. But because goshawks forage primarily in forested coniferous, aspen, and edge habitats, and they can take a wide variety of prey, such as squirrels or a variety of bird species, these effects are likely minimal.

Cumulative Effects

See discussion of Cumulative Effects Common to All Alternatives under Alternative 1.

Determination for Alternatives 2 and 3

Livestock grazing use and management under Alternatives 2 and 3 “**may impact individuals, but would not likely cause a trend toward federal listing or loss of viability**”.

Determination for Alternative 4

Of all the action alternatives, Alternative 4 would maintain and improve riparian conditions and therefore provide the most benefits to the prey base of goshawks. Alternative 4 "**may impact individuals but is not likely to cause a trend toward federal listing or loss of viability**".

Summary of Effects Determination for TES Species

Species	Effects Determination
Kendall Warm Spring dace (endangered)	*May affect, not likely to adversely affect*
Colorado River cutthroat trout (sensitive and MIS species)	*May impact individuals or habitat but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.*
Grizzly bear (threatened and MIS species)	*May affect, likely to adversely affect*
Gray wolf (experimental, non-essential)	*Will not jeopardize the continued existence of the species.*
Wolverine (proposed)	*Will not jeopardize the continued existence of the species.*
Canada lynx and critical habitat (threatened)	*May affect, not likely to adversely affect individual lynx or critical habitat.*
Amphibian - boreal toad (sensitive & MIS species)	*May impact individuals or habitat but will not likely contribute to a trend toward federal listing or loss of viability to the population or species.*
Amphibian - Columbia spotted frog (sensitive species)	*May impact individuals or habitat but will not likely contribute to a trend toward federal listing or loss of viability to the population or species.*
Greater sage grouse (sensitive species)	*May impact individuals or habitat but will not likely contribute to a trend toward federal listing or loss of viability to the population or species.*
Trumpeter swan (sensitive species)	*May impact individuals or habitat but will not likely contribute to a trend toward federal listing or loss of viability to the population or species.*
Great gray owl (sensitive species)	*May impact individuals or habitat but will not likely contribute to a trend toward federal listing or loss of viability to the population or species.*
Bald eagle (sensitive species)	*May impact individuals or habitat but will not likely contribute to a trend toward federal listing or loss of viability to the population or species.*
Peregrine falcon (sensitive species)	*May impact individuals or habitat but will not likely contribute to a trend toward federal listing or loss of viability to the population or species.*
Northern goshawk (sensitive species)	*May impact individuals or habitat but will not likely contribute to a trend toward federal listing or loss of viability to the population or species.*

Harvest Management Indicator Species (Elk, Mule Deer, Moose and Pronghorn)

This section presents the indicator used in this analysis, the existing condition and the environmental effects of each alternative on elk, mule deer, moose and pronghorn. Information provided in this section was summarized from the Supplemental Wildlife Report for Harvest Management Indicator Species (Wilmot 2015).

Indicators Used for Comparison of Alternatives

- Available forage

Forage availability was selected as the primary indicator to compare the effects of the alternatives on elk, mule deer, moose and pronghorn. The forage availability objective is to have sufficient forage available after livestock grazing to meet the needs of resident elk, mule deer, moose, and pronghorn. Forage availability, measured in pounds of forage after livestock grazing is important to elk, mule deer, moose, and pronghorn during all seasons, particularly during winter and the lactation, juvenile growth, and accumulation of energy reserves season from mid-June to mid-October (Cook 2002). According to Cooperider (1982), the competition for forage between elk and cattle is more intense than with any other herbivores in the western United States. While in most elk/cattle competition situations the timing of forage utilization is important to elk survival during critical periods (winter) (Miller 2002). Winter elk feedgrounds in and near the project area mitigate against nutritional stress during the height of winter. However, diet quality in the summer and late fall can be a major influence on the growth of elk calves and is linked to overwinter survival.

Mule deer tend to select herbaceous food sources when they are seasonally abundant (Mackie et al. 2003), which, during the primary livestock grazing season put mule deer and livestock in competition for herbaceous forage. Deer are primarily browsers in the fall and winter, which reduces competition with cattle for grasses and forbs in these seasons. It is not expected that significant dietary overlap would occur between cattle and moose in most cases since moose are browsers, eating mostly the stems and twigs of woody plants in winter and the leaves and succulent shoots of those shrubs and trees in the remaining season (Bowyer et al. 2003). Cattle eat mostly grasses, forbs, and aspen when forage is not limiting, but may turn to willows when herbaceous forage is limited, so any significant resource competition between moose and cattle would occur in forage limited conditions. Pronghorn are very selective feeders and forage on grasses, forbs, and shrubs, with Jacques et al. (2006) reporting a dietary mix of these vegetation types but a strong dietary selection for shrubs in the context of their study environment.

Affected Environment

Elk (*Cervus elaphus nelsoni*)

Elk are habitat generalists and are mobile, adaptive and wide-ranging (Peek and Krausman 1996, Wisdom and Thomas 1996, Skovlin et al. 2002, Kie and Czech 2000). They use a wide variety of vegetation types to meet their life history needs according to season and availability, including aspen, several conifer types, big sagebrush, several mountain shrubland types, meadows, grasslands, herb lands, and tall forb communities. The Wyoming Game and Fish Department has defined seasonal ranges for elk, including summer, winter and transition ranges, and parturition areas, and the project area includes all of these ranges.

Approximately 157,282 acres in the project area are mapped as spring, summer, and fall habitat for elk. The remaining portion is delineated as crucial winter range. Approximately 20,393 acres of mapped elk calving grounds occur in the project area. Sixty-seven percent (13,707 acres) of these acres are in the Green River (7,395 acres) and in the Roaring Fork (6,312 acres) allotments near the Green River feedground and Green

River Lakes. The rest of these elk calving grounds in the project area are in the Beaver-Twin and Badger Creek allotments, in the south section of the project area.

This habitat consists mostly of early successional aspen aspen/mixed forests. Valley drainage bottoms are used by elk during the summer, where riparian habitat provides late-summer food and water (Skovlin et al. 2002). Forage conditions on native winter range are critically important to elk that use natural habitat areas (Cook 2002), but the quality of winter range is less important to elk that consistently use winter feed grounds, like those in Upper Green River herd unit. Approximately 10,650 acres of crucial winter/yearlong range is mapped within the Green River and Roaring Fork allotments, associated with the Green River Lakes feed ground and Pinyon Ridge. The majority of the elk wintering on this feed ground (an average of 584 elk from 2010-2013) are associated with the Green River herd unit. However, a portion of elk using feed grounds occasionally use native winter range, and some migrate to native range in other areas. In general, the majority of native winter range for harvest management indicator species, including elk, is located off the Bridger-Teton National Forest on adjacent lower elevation Bureau of Land Management and private lands.

Five elk herd units overlap the project area: 102, 104, 106, 107 and 635. All project area allotments are within the bounds of the Upper Green elk herd unit (107) except for the Upper Green Allotment which includes portions of the Upper Green herd unit (84 percent of the allotment, 110,797 acres) and the Jackson elk herd (102) unit (16 percent of the allotment, 21,035 acres). Herd units 104, 106, and 635 have less than twenty acres of habitat that overlaps with grazing capable lands within the project area. Since this is a very small percentage of the total acres mapped for these herd units, trend and status information for these units will not be discussed.

The 2013 postseason population estimate for the Upper Green River herd unit (107) was 2,787 elk, which is 11 percent higher than the 2,500 population objective. Overall, the data collected annually on this herd unit has indicated slow population increases since 2003 with the 2013 trend count within management objectives. The Wyoming Game and Fish Department has identified approximately 43 acres of native winter range for this herd, mainly located in the Upper Green River drainage near Pinyon Ridge and Osborn Mountain, an area that supports approximately 100-200 elk through the winter in recent years. Over 90 percent of the elk in the herd unit 107 rely on feedgrounds, and the Wyoming Game and Fish Department does not consider winter and other seasonal habitat to be limiting factors for herd dynamics. Wolves and grizzly bears are likely impacting elk recruitment and survival. In particular, elk calves are vulnerable to grizzly bears in the project area. The Upper Green River unit is considered extremely “leaky”; therefore, a population simulation model has not been developed.

There is considerable forage overlap between cattle and elk. However, seasonal variation in dietary overlap limits negative effects on elk foraging. During early summer, cattle diets consist of mostly grasses, while elk diets consist of a mix of grasses, shrubs and forbs (Kie et. al. 2005). Cook (2002) found that in winter and spring, elk used feeding sites where cattle had grazed moderately during the previous summer. During fall, elk selected sites where cattle use in the summer had been light. Winter feeding makes consideration of winter range forage availability significantly less of an issue for elk, whereas competition for forage between elk and cattle may be at its peak during the fall months, particularly when range conditions are at their most depleted during the non-winter months. Peek (2003) noted that elk and cattle distribute themselves spatially and temporally so competition is minimized and that differences in diets may also reduce competition. Also, some habitats available to elk in the project area would not be impacted by cattle grazing (i.e. vegetation on steeper slopes outside of grazing capable lands). Since it is difficult to estimate direct competition between elk and cattle due to variation in grass species selection and variation in the intensity of foraging on different grass species, a conservative approach was taken here, assuming elk and cattle are in direct competition for the same forage resources.

Mule Deer (*Odecoileus hemionus*)

Mule deer are habitat generalists and are mobile, adaptive and wide-ranging (Peek and Krausman 1996, Wisdom and Thomas 1996, Skovlin et al. 2002, Kie and Czech 2000). The species uses a wide variety of vegetation types to meet its life history needs, including aspen, several conifer types, big sagebrush, several mountain shrubland types, meadows, grasslands, herb lands, and tall forbs. Seasonal ranges defined by the Wyoming Game and Fish Department show that mule deer inhabit nearly all habitats of the Bridger-Teton National Forest at most elevations during summer and fall, although they are most abundant between 7,500 and 10,000 feet in elevation where abundant forage is available. All mule deer on the Bridger-Teton National Forest rely on native winter range. Much of this habitat type is located at and below the lowest elevations on the Pinedale Ranger District and off the Bridger-Teton National Forest on adjacent lower elevation Bureau of Land Management and private lands (Sawyer et al. 2005).

The project area is entirely encompassed by the Sublette Mule Deer herd #104 (Figure 4), and only includes spring/summer/fall and parturition ranges for this herd deer. No crucial winter range is present in the project area. Thus, 100 percent of the 74,532 acres of grazing capable lands in the project area overlaps spring/summer/fall mule deer range. Zero percent of grazing capable lands in the project area overlap mule deer winter range, crucial winter range, crucial winter/yearlong range, or winter/yearlong range. The Sublette herd is one of the most migratory deer populations known in the United States (Sawyer, et al. 2005), and the herd unit contains 2,682 square miles of habitat throughout Teton, Sublette, Lincoln and Sweetwater Counties. In 2013, the population estimate of 22,900 individuals was 28.4 percent below the population objective of 32,000 deer (WGFD 2014). Winter survival rates, winter range habitat condition and direct and indirect habitat loss from gas and residential development are the primary issues driving population dynamics for this herd (WGFD 2014). Gas field development has and will continue to impact deer numbers within this herd unit since deer avoid areas with intensive winter gas development, resulting in less forage available for wintering deer within and adjacent to gas development (Sawyer, et al. 2006 and 2010). During the past 10 years, this deer herd experienced two winters that resulted in above normal fawn mortality (> 50 percent loss), including the 2010-11 winter fawn mortality where estimates exceeded 70 percent. By comparison, winter fawn mortality averages around 30 percent on most years when winter severity is moderate to average. These relatively recent high rates of winter fawn mortality have had a significant influence on population trend. Overall fawn survival was good during the winter of 2013-14. The winter/spring losses of fawns and adults 2010-2011 resulted in one of the lowest herd levels ever documented, and these die-offs are related to poor forage conditions on winter range outside of the project area. WGFD projects that without multiple years of good forage production and overwinter fawn survival, this herd will most likely not show any significant growth.

Moose (*Alces alces shirasi*)

Vegetation types used by moose on the Bridger-Teton National Forest include aspen, many conifer types, several mountain shrubland types, big sagebrush, meadows, herb lands, and tall forbs. In a study of moose food habit preferences, willow browse made up 88 percent of the moose summer diet, followed by aquatic plants (9.3 percent), and forbs and sedges (2.7 percent) (Peterson 1955). Year round, willow and other browse species can provide 98 to almost 100 percent of a moose diet (Dorn 1970). Habitat exists across the Forest, including the project area, and on other adjacent federal and private lands, primarily associated with riparian areas.

Moose herd units Jackson #103 (21,035 acres or 12 percent of the project area) and Sublette #105 (149,474 acres or 88 percent of the project area) overlap the project area. For that portion of herd unit 105 within the project area, about 62 percent (105,339 acres) is mapped as spring/summer/fall habitat, although only 21 percent (35,527 acres) overlap occurs on capable cattle grazing lands. These acres are approximately 2 percent of all spring/summer/fall habitat mapped for the entire herd unit. Approximately 18 percent of the

project area is mapped as crucial winter/yearlong habitat, and 80 percent (25,140 acres) of that overlaps with lands capable for cattle grazing. These acres represent 4 percent of the crucial winter/year-long habitat for herd unit 105. The habitats occur principally in the Green River Allotment, and are comprised of riparian and transition zones, and some upland coniferous and deciduous habitats.

Because a variety of habitats and high forage quality are important to wintering moose populations, the direct and indirect impacts from cattle grazing can vary based on the type of habitat. Upland grasses have more protein available early in the growing season than willows. As protein levels decrease and forage dries out, cattle increase the amount of forbs and browse in their diets and potentially move to the riparian zone (Kolvachik and Elmore 1991 in Holland et al. 2005). There is little change in the protein content in twigs of willows from early to late summer (Thilenius 1990 in Holland et al. 2005).

Winter/year-long habitat (a different category than crucial winter/year-long habitat) is 7 percent of the project area; 41 percent of that overlaps lands capable for cattle grazing. These acres are less than 2 percent of the total mapped winter/year-long habitat for the entire herd unit. The Upper Green River Valley is considered one of the most important moose winter ranges for the Sublette unit (WGFD 2009) and includes the heart of the project area. Bacon Ridge and the headwaters of the Gros Ventre River occur in the far northwest corner of the Green River Allotment and occur in Jackson moose herd unit #103. The mapped winter range for this area is 1 percent of the total mapped winter range for the Jackson moose herd; about half of this area occurs on cattle grazing capable lands. The spring/summer/fall habitat in the project area is 2 percent of the total mapped for the Jackson herd unit. About a third of these acres overlap with lands capable for cattle grazing.

The two moose herd units that overlap the project area (Jackson and Sublette) are currently below objective and have been for a number of years (WGFD 2014). The 2013 postseason population for the Sublette moose herd was estimated at 1,400, a count 6.7 percent below the 1,500 (+ 20 percent) objective (WGFD 2014). While this herd has been below population objective for many years and was declining in the late 1990s, the population has slowly increased since 2006. Factors other than hunter harvest may be slowing population growth, including habitat deterioration due to current and historic over browsing, regional variation in forage quality due to climatic warming and drying, disease, the carotid arterial blood worm (*Elaeophoraschneideri*), predation, and density dependence population effects (WGFD 2010, Jesmer et al. 2015). In their assessment of moose habitat in the Jackson and Sublette moose herd units, Smith et al. (2011) reported that willow and aspen communities (important browse for moose) were generally not reaching their potential height and structure due to excessive browsing.

Pronghorn (*Antilocarpa americana*)

Wyoming supports the largest population of pronghorn, approximately 57 percent of the world population (Hack and Menzel 2002). Pronghorn habitat exists within the project area, as does a crucial migration corridor. On the Bridger-Teton National Forest, they primarily only inhabit lower elevations of big sagebrush habitat and grasslands (spring, summer, and fall range) on both sides of the Green River basin and into the Gros Ventre River drainage (U.S. Forest Service 2009). While pronghorn prefer sagebrush and grassland habitat (Yoakum and O'Gara 2000), they also use riparian and other meadows within the sagebrush/grassland matrix, as well as more limited use of transitory habitat (e.g. other types after a fire), short-stature mountain shrublands, open conifer forestland, and open aspen stands. Lesser preferred habitats typically are only used when animals are traveling (e.g. during migration and during exploratory movements). Two major habitat requirements are high visibility and opportunity for fast movement through the vegetation and, therefore, preferred habitats typically have little if any vegetation over about 18 inches tall on flat or low rolling terrain (Yoakum and O'Gara 2000).

The two pronghorn herd units that encompass the project area are units 401 and 631. The Wind River pronghorn herd unit (631) only overlaps with the project area on a total of 41 acres in two parcels in the

extreme northern and eastern portions of the project area. This habitat is considered unimportant by the Wyoming Game and Fish Department, as these areas support very few animals. Based on this information, herd unit 631 would not be discussed further. The Sublette pronghorn herd unit (401) occupies most of the Green River drainage north of Interstate Highway 80 in addition to portions of the Gros Ventre, Hoback, and Sweetwater river drainages. It covers 10,691 square miles (6,842,167 acres), about 11 percent of the state of Wyoming. Pronghorn occupy 7,902 square miles of habitat within the herd unit (#104) boundaries. The project area provides approximately 42,629 acres of spring, summer, and fall range for the Sublette herd. About 31,674 acres overlap with lands capable for cattle grazing. This is 1 percent of all the spring/summer/fall habitat (2,546,682 acres) mapped for this herd unit.

The population estimate in 2013 was 34,000 animals, 29 percent below herd objective of 48,000 (WGFD 2014). This lower than objective population size is attributed to high harvest rates starting in 2007, and a severe winter in 2010-2011 which caused higher than normal mortality for the herd.

The Sublette pronghorn herd #104 includes one of the longest migrations of any North American ungulate (Sawyer and Lindzey 2000, Berger et al. 2006) and a well-defined migration route of this herd goes through the heart of the project area. Current livestock grazing operations coexist with successful pronghorn migration in the corridor.

Desired Condition

The desired condition for elk, mule deer, moose, and pronghorn in the project area is that population herd objectives defined by Wyoming Game and Fish Department are not limited by habitat conditions as a result of any of the action alternatives. Currently, the existing conditions meet the desired conditions, since adequate forage is available in quantity and distribution to maintain the elk, mule deer, moose, and pronghorn herd units that overlap the project area.

Methodology

Forage production on the project area was determined to be sufficient to support herbivory by livestock and wild ungulates. The analysis was based on a comparison of the estimated palatable forage produced on the project area (total herbaceous production, allowable offtake by allotment which is considered available forage (Wilmot 2015, Appendix Table A-1), and estimated offtake by its principal large herbivores, namely cattle, elk, mule deer, pronghorn, and moose (Wilmot 2015, Appendix Table A-2). Forage production and total use by herbivores was not compared at the allotment or pasture scale because numbers of wild ungulates at these scales could not be reasonably estimated. Available forage left after livestock use was compared to both elk needs and management indicator species ungulate needs at the project area scale, which in all cases was a portion of the wild ungulate herd units being considered.

Total forage production on the project area was estimated at 103,933,489 pounds (Booth and Hayward 2015, Appendix 10). Across alternatives and according to stocking rates, total livestock and elk utilization in the project area was estimated to range from 26,797,706 (26 percent of total herbaceous production) at current use to 39,387,338 pounds (62 percent of allowable use in Alternative 2 and 38 percent of total herbaceous production) at maximum utilization. Use by elk across all alternatives was estimated at 2,468,938 lbs. (2 percent of total herbaceous production and ranging from 3.9 percent to 5.3 percent of allowable use; Wilmot 2015, Table A-2).

Conclusion: The foraging needs of MIS ungulates, including elk, mule deer, pronghorn and moose will be met in Alternatives 1, 3 and 4, while accommodating livestock grazing in suitable and capable lands. Overall, the use and needs of livestock and MIS ungulates are not mutually exclusive in the project area. Thus, no suitable and capable grazing lands should be identified as unsuitable for livestock to protect the ungulate management indicators in Alternatives 1, 3 and 4. Alternatives 3 and 4 address the potential negative impact

on woody browse by livestock with minimum stubble height requirements in riparian areas, deferred and rest rotations, and progressive design features. Therefore, areas in suitable and capable lands were not identified as unsuitable to livestock in order to ensure the browsing needs of moose.

As described below, grazing under Alternative 2 would provide sufficient herbaceous forage for livestock and elk, mule deer, pronghorn, and moose at the project scale. However, intensive herbaceous grazing in riparian areas at maximum allowable use by livestock may limit willow regeneration and restrict this food resource for moose, a local negative impact in the Upper Green River corridor. Under maximum allowable use in Alternative 2, some riparian areas in suitable and capable cattle range in the Green River corridor should be identified as unsuitable for livestock grazing to meet the needs of moose. However, we could not identify any areas outside the corridor that should be identified as unsuitable. Outside of capable grazing lands in the project area, the needs of MIS ungulate species would be met under all alternatives, and in doing so, would not make any such grazing suitable lands unsuitable for cattle to protect MIS ungulates.

The effect on MIS population and habitat trends at the forest scale varies by alternative. Alternative 1 contributes positively at the forest scale to both the habitat and population trends of elk, mule deer, pronghorn, and moose by providing more herbaceous food for all these ungulates relative to current conditions and by providing redundant resources in the case of any future negative effects where redundancy may be needed (i.e. climate change negative effects on forage nutrition at the forest scale). Alternatives 2 and 3 have a neutral effect on all four MIS ungulates at the forest scale, considering the net available herbaceous food resources available to ungulates after livestock grazing (surplus available), balanced with some project level net negative effects (i.e. moose populations and habitats at the project level) due to excessive grazing under maximum use and resulting net effects to riparian habitats. Alternative 4 provides a mitigating positive effect to riparian habitats and that combined with reduced livestock grazing pressure would produce a net positive effect for MIS ungulates on a forest scale, similar to Alternative 1.

All alternatives—except for Alternative 2 maximum use in regards to moose at the project scale—achieve the Forest Plan objective of maintaining habitat for viable populations of management indicator species at the forest scale, and meet state ungulate species objectives by providing habitat for populations, harvest levels, success rates, and recreation days for elk, mule deer, pronghorn, and moose at the forest scale (U.S. Forest Service 1990, p.149). Further, meeting these objectives indicates a net positive economic benefit as a result of the harvest of these MIS species on an annual basis under state herd management.

Climate change is predicted to result in an increase in average air temperatures and an increase in spring precipitation in the project area (Karl et al. 2009 and Furniss et al. 2010). Snowmelt will occur earlier than in the past and herbaceous vegetation may grow faster and more robust early in the season due to the higher temperatures and increased moisture, which is important for parturition and lactation for all ungulates. However, climate change may also result in extreme events such as droughts, heat waves, and longer, more severe droughts between rains. Less moisture available to herbaceous food sources may negatively impact all MIS harvest ungulates by restricting nutrition during the summer and fall months, but estimating the net effect is difficult given the uncertainty of effect from climate change on herbaceous production in the project area.

Environmental Consequences

This section describes the direct, indirect and cumulative effects of implementing Alternatives 1, 2, 3 and 4 on harvest management indicator species and their habitat.

Alternative 1 – No Livestock Grazing (No Action Alternative)

Direct and Indirect Effects

Under Alternative 1, no grazing would be authorized. There would be no overlap between livestock management and available spring, summer, fall, winter, or parturition habitats for elk, mule deer, moose, or pronghorn. Therefore, there would be no negative forage impact from grazing nor disturbance effects of management operations and there would be more preferred vegetation available to ungulates.

This alternative provides the maximum available forage for elk among all the alternatives. Approximately 104 million pounds of herbaceous forage is produced on grazing suitable and capable lands, and would be available to elk, other management indicator species, insects, and all other forage use in the project area. This substantially exceeds our forage availability objective of 2.5 million pounds of forage per year available for 1,089 elk.

Ungulate populations and habitat would not be negatively impacted at the project, herd unit and Forest-wide scales by forage limitations under this alternative. The relevant cumulative actions identified below, when aggregated with natural conditions and direct and indirect effects would not cause a population decline or produce negative habitat trends in the Upper Green or the Jackson elk herds or for the Forest wide population. The Wyoming Game and Fish herd unit objectives would continue to be achieved under implementation of Alternative 1. Mule deer, moose and pronghorn would continue to use the project area and forage levels would allow them to increase toward herd objectives.

Cumulative Effects

The proposed term grazing permit (ten years) is the temporal extent of the analysis. The duration of term grazing was the dominant factor affecting ungulates in the cumulative effects analysis, due to forage removal being a primary factor for ungulates, and thus provided ideal temporal bounds on the analysis. The cumulative effects analysis area was the project area.

There are multiple past, present and reasonably foreseeable actions within the cumulative effects analysis area that impact foraging, wintering and parturition habitat, mortality, and disturbance to ungulates. These include federal, state, and private actions (e.g. prescribed fires, hunting seasons) and natural forces and disturbances (wildfires, beetle kill, drought, and carnivore predation) that affect habitat conditions and carry direct effects on populations.

The elk population trend (annual estimated herd size) relative to Wyoming Game and Fish Department objectives is the indicator to gauge the effects on elk populations and habitat conditions in the herd unit. The principal action that affects elk numbers in the analysis area is winter feeding operations at the Upper Green River and Black Butte Elk feedgrounds. Artificial feeding improves elk survival and nutrition, and is a significant positive effect on herd numbers. The risk of a strong negative effect from feedgrounds is the possibility for increased disease transmission due the concentration of individuals at feedgrounds during the winter. The timing of arrival and the progression of disease and its associated mortality effects within the time period of the permit are uncertain (Johnson 2014).

The net effects of annual ungulate harvest are neutral when we consider that harvest rates are adjusted annually in response to herd trends. Although there is a negative effect on individuals, the herds sizes are within expected management by Wyoming Game and Fish.

Domestic sheep grazing west of the Green River on the Rock, Lime, Elk Ridge, and Tosi allotments would negatively affect vegetation cover in riparian and upland habitats used by ungulates. There would also be minor negative disturbance effects from sheepherding operations as well. Fire suppression carries a mix of positive and negative effects on ungulates due to suppression activity (itself negative, but temporary). Other cumulative actions such as timber sales, fuel reduction projects, and trail construction carry a mix of positive and negative effects, albeit at the local scale. Gravel pit operations and road maintenance produce some negative effects through disturbance and small-scale habitat loss. Other activities with negative effects on ungulates include disturbance and mortality from recreation such as roads, hunting pressure, dispersed camping, and OHV use. These effects accrue at the individual and population scale, with effects greatest where recreational activities are concentrated, such as along roads. Effects of disturbance due to recreation in the project area have not been measured and are difficult to estimate. A local scale water regulation project at Mud Lake would have minor positive effect on riparian habitat, benefitting ungulates.

The absence of grazing in Alternative 1 is a dominant, positive influence among the collective factors that comprise the cumulative effects by the sheer volume and distribution of forage available to ungulates. Even if they are disturbed or displaced by cumulative actions, forage should be available (not consumed by livestock).

The relevant cumulative actions identified above when aggregated with natural conditions and direct and indirect effects do not push elk, mule deer, moose, and pronghorn survivorship below a threshold to create population decline relative to Wyoming Game and Fish herd unit objectives for the respective herd units.

Alternative 2 - Grazing as Currently Permitted and Current Management

Direct and Indirect Effects

Of the estimated 104 million pounds of herbaceous forage produced on grazing suitable and capable lands in the project area, 63.4 million is available under Alternative 2. Under maximum utilization in this alternative, livestock would use approximately 36.9 million pounds of herbaceous forage, leaving 26.5 million pounds of forage for elk and all other MIS ungulates. Of this remaining portion, elk would need 2.5 million pounds of herbaceous forage annually, less than 10 percent of available forage. Mule deer, moose, and pronghorn combined would need only approximately 4.3 million pounds (4 percent). These species would continue to use the project area and likely maintain populations or be able to increase herd levels toward objectives. The Upper Green River elk herd unit extends far beyond the project area. Thus, the net effect on elk foraging requirements due to offtake by livestock is not significant to elk herds that overlap the project area. Therefore, ungulate populations would not be negatively impacted at the project, herd unit, and Forest-wide scales by forage limitations caused by cattle grazing.

Elk

While the timing of forage utilization by cattle relative to elk needs is typically considered very important for survival by elk in all seasons, for this analysis the timing of forage use was much more relevant to elk during the parturition and summer growth periods (June –August) than during winter. The growth rates of calf elk during the first two months after birth is closely linked to milk consumption, which is influenced by the nutrition and body condition of its mother (Cook 2002). Because the majority of elk in the herds using the project area are fed in the winter, the direct effect of forage limitations on elk survival in the winter is minimized. While season-long grazing would restrict re-growth and nutritional quality of forage in those areas, it would only be implemented across 27 percent of spring-summer-fall elk range included in the project area. Significant forage areas outside of grazing capable lands, particularly in the Beaver-Twin and Badger Creek allotments, buffer against negative effects as well. Higher forage quality resulting from rest or deferred rotation grazing would positively impact elk.

Mule Deer, Moose, and Pronghorn

In Alternative 2, mule deer and pronghorn populations would not be negatively impacted at the project, herd unit, or Forest-wide scales by forage limitations caused by livestock grazing. Alternative 2 may adversely affect moose populations in the local project area, but not significantly at the herd unit scale and not at a Forest-wide scale. Of the 26.5 million pounds of forage remaining after livestock and elk grazing, mule deer, moose, and pronghorn combined would need only a portion of that amount, approximately 4.3 million pounds. There is no constraint on forage availability for mule deer, moose, or pronghorn in the project area in this alternative. These species would continue to use the project area and this alternative would not preclude population increases toward Wyoming Game and Fish herd objectives.

Cumulative Effects

See cumulative effects under Alternative 1 for a description of cumulative actions, spatial and temporal bounds of the cumulative effects analysis area.

The cumulative effects associated with Alternative 2 under both current management and maximum permitted use are minimal because sufficient forage is available for elk after cattle grazing, and because the feedgrounds have a positive effect on elk survival and the stability of the herds. The elk population would continue to achieve the herd unit objective goals identified for the Upper Green and Jackson Herd Units by the Wyoming Game and Fish Commission.

Forage competition with elk (over objective) may negatively affect mule deer numbers throughout the herd unit. Within the project area, the Green River feedground also concentrates elk, locally reducing native forage for mule deer, moose, and pronghorn. However, the feedground is not an important factor for mule deer and pronghorn in the winter because they winter to the south on private and Bureau of Land Management lands. Mule deer are also susceptible to contracting chronic wasting disease, a mortality factor that would increase due to the elk feedground (Johnson 2014).

In the vicinity of the Green River elk feedground, the riparian zone is functioning at risk and willow coverage and structure is suppressed (see Hydrology Specialist Report), a negative effect on moose. However, this effect is localized when considering the broad distribution of willows in the project area and in the overall Sublette herd unit overall. Moose are also susceptible to contracting chronic wasting disease, a negative effect. Moose may also be disturbed by recreational use in riparian areas (e.g. fisherman), although this effect is minor and unimportant at the herd unit scale. Snake River Headwaters Wild and Scenic Comprehensive River Management Plan would be a net positive, but local effect on moose seasonal ranges due to the focus of planning and implementation efforts in the Upper Gros Ventre River corridor (north Kinky Creek Pasture, Upper Green River Allotment).

The Green River Corridor Recreation Planning, the Greater Sage-grouse Planning, and Snake River Headwaters Wild and Scenic Comprehensive River Management Plan would be a net positive effect for moose and pronghorn. Moose would benefit due improved riparian and upland conditions which would increase browse quantity and quality, and pronghorn would benefit from any improved habitat conditions that result from the focus on river corridors, with which the pronghorn migration route aligns. Existing fences in this alternative would be maintained as wildlife friendly and would be easily passible for pronghorn.

The cumulative effects of Alternative 2 under both current management and maximum permitted use are minimal for mule deer and pronghorn, because sufficient forage is available to these species, and because the most population-limiting feature of mule deer and pronghorn populations—crucial winter range—is not located in the project area. Implementation of this alternative does not result in range improvements or other features that interfere with migration or movement of pronghorn in the migration corridor or other portions of the project area.

The project area contains crucial winter range for moose. The direct and indirect effects of Alternative 2, such as the heavy browsing on willow communities by cattle, plus cumulative actions and natural conditions may contribute negatively to ungulate populations.

Alternative 3 - Modified Grazing Management

Direct and Indirect Effects

Alternative 3 represents the second-highest use of forage by livestock across alternatives, providing approximately 51.9 million pounds, half of what is available in total herbaceous production in Alternative 1. Cattle would consume approximately 35.8 million pounds, leaving 16.1 million pounds of forage for elk and all other harvest management indicator species.

Elk

Elk populations would not be negatively impacted at the project, herd unit or Forest-wide scales by forage limitations caused by cattle grazing, structural improvements, or progressive design features of Alternative 3. Of the 16.1 million pounds of available forage remaining for elk and all other ungulate management indicator species, elk would consume approximately 2.5 million pounds, leaving a surplus of forage available. There is no constraint on forage availability for elk in the project area in this alternative.

According to Wyoming Game and Fish data, a portion of the Badger-Twin and Beaver Creek allotments are elk parturition areas, as is a substantial portion of the Roaring Fork Allotment and a portion of the Upper Green Allotment adjacent to the Roaring Fork near the Upper Green Feedground. The 3 miles of pasture fence proposed in the Beaver-Twin Creeks Allotment could impact elk calves by restricting their movement, but because the elk calving standard in the Forest Plan would be complied with, fences in elk calving areas would be designed so they do not create movement barriers to elk calves. Also, in these areas, livestock stocking rates would be similar to current management, and the potential for human-caused disturbance in the form of livestock has not proven to be a limiting factor for parturition to date, the timing and intensity of livestock distribution in those areas overlapping parturition would not have a significant effect on elk parturition rates.

For Alternative 3, the relevant cumulative actions identified above, when aggregated with natural conditions and direct and indirect effects do not push elk survivorship below a threshold to create population decline relative to Wyoming Game and Fish herd unit objectives for either the Upper Green Herd Unit or the Jackson Herd Unit.

Mule Deer

The vital difference between this alternative and Alternative 2 is the increase in stubble height requirements in riparian key areas and some focus areas, reduced utilization in upland key sites, change from pastures using a season-long grazing system to a deferred or rest rotation and adaptive management applied when objectives are not being met. The direct and indirect impacts to mule deer from this alternative are similar to what would occur for elk (see analysis above). The main differences between impacts to mule deer and impacts to elk are: 1) mule deer use slightly different habitats than elk; 2) there is no mule deer winter range within the project area; and 3) the presence of cattle is even less of an impact on the presence of mule deer within an area.

The impacts of this alternative on the Sublette mule deer herd are minimal because of the presence of high quality forage produced by grazing, the availability of forage for mule deer not accessed by cattle (higher slopes and shrubs and forbs not selected by cattle), and the lack of winter range within the project area. Studies have shown that grazing can positively impact forage quality, and winter range crucial to mule deer overwinter survival is not impacted by the project. Utilization rates in this alternative are higher than

recommended for big sagebrush ecoregions (Cox et al. 2009); so there is a chance that if the project is grazed at a high level, spring, summer and fall forage for mule may be impacted, but not to a level that would negatively impact the population at the herd level.

The range improvements associated with this alternative may have beneficial impacts to mule deer by improving dispersal of cattle (additional fences) and implementing rotational grazing systems. Improving dispersal of cattle and implementing rotational grazing systems has been shown to reduce impacts to forage, therefore reducing the impacts to forage available to mule deer throughout the project area. Additional fences in South Kinky Creek Pasture could impact mule deer by creating a new barrier to movement.

A number of fences are proposed for Alternative 3. Some are to be rebuilt (Beaver-Twin, Noble Pasture allotments, Mud Lake East/West), others would be new permanent construction (Beaver-Twin Allotment, Tepee Creek focus area, South Kinky Creek Pasture), and others would be temporary electric fence (Noble Pasture, Wagon Creek). See design features for Alternative 3 for details. Any new fences constructed would comply with Bridger-Teton National Forest Land and Resource Management Plan fencing guidelines (U.S. Forest Service 1990). See also Wyoming Game and Fish Department Wildlife Friendly Fencing Standards, Bulletin Number 530001795.

Moose

The vital difference between this alternative and Alternative 2 is the increase in stubble height requirements in riparian key areas and some focus areas, reduced utilization in upland key sites, change from pastures using a season long grazing system to a deferred or rest rotation, and adaptive management applied if objectives are not being met. All of these differences reduce potential direct and indirect impacts of this alternative on moose. The stream bank stabilizing range improvements associated with this alternative may have reduced impacts to moose as compared to Alternative 2 because the improvements would reduce impacts from stream bank trampling and reduce impacts to streamside vegetation, an important component of this species' diet. Also, an increase in stubble height to 4-inches would help the regeneration of willow communities that are browsed by livestock, reducing the negative effect to willows used by moose.

Pronghorn

The vital difference between this alternative and Alternative 2 is the increase stubble height requirements in riparian key area and some focus areas, reduced utilization in upland key sites, change from pastures using a season-long grazing system to a deferred or rest rotation, and adaptive management applied when objectives are not being met. The direct and indirect impacts of this alternative to pronghorn are similar to that of other ungulates. However, there is even less overlap with habitat impacts and disturbance from presence of cattle within the allotments, so less negative direct and indirect impacts to this species. Research on livestock grazing and pronghorn indicates that they are not incompatible (Yoakum et al in Krausman 1996). The range improvements associated with this alternative may have reduced impacts compared to Alternative 2 to pronghorn by improving dispersal of cattle (additional fences) and implementing rotational grazing systems when compared to Alternative 2. Improving dispersal of cattle and implementing rotational grazing systems has been shown to reduce impacts to forage, therefore reducing the impacts to forage available to pronghorn throughout the project area. Pronghorn typically move through the migration corridor in April or May and again in October or November, so there is very little overlap of livestock grazing with pronghorn migration. Few pronghorn use the project area during the grazing season.

Additional effects are as described under Alternative 2 for mule deer, moose, and pronghorn. Wagon Creek and the two fences within Noble Pastures (Tosi and Klondike Creek) are within the designated Pronghorn Migration Corridor. Any new fences that would occur within the movement corridor of pronghorn would be designed to allow wildlife movement. In addition, these fences are in isolated locations that wildlife can easily avoid.

Mule Deer, Moose, and Pronghorn

Mule deer, moose, and pronghorn populations would not be negatively impacted at the herd unit scale by forage limitations caused by livestock grazing, structural improvements, or adaptive management of Alternative 3. Of the 13.7 million pounds of forage remaining after livestock and elk grazing, mule deer, moose, and pronghorn combined would need only a portion of that amount, approximately 4.3 million pounds. These species would continue to use the project area and this alternative would not preclude population increases toward Wyoming Game and Fish Department herd objectives.

The increased stubble height required in this grazing alternative to 4-inches would leave stubble above the suggested height (<3 inch stubble height) that would trigger excessive browsing on willows by cattle in the fall. This reduces the net effect to moose dependent upon healthy willow communities for browse, as compared to Alternative 2.

Wagon Creek and the two fences within Noble Pastures (Tosi and Klondike Creek) are within the designated Pronghorn Migration Corridor. Temporary fences may become permanent if the electric fences are not effective in controlling cattle. As already stated, if made permanent, these fences would be designed to allow wildlife passage and would be compliant with the Forest Plan Pronghorn Standard, which states that “All projects, activities, and infrastructure authorized in the designated Pronghorn Migration Corridor would be designed, timed and/or located to allow continued successful migration of the pronghorn that summer in Jackson Hole and winter in the Green River basin”. See also Wyoming Game and Fish Department Wildlife Friendly Fencing Standards Bulletin Number 530001795, and Paige (2012). Alternative 3 is consistent with the Forest Plan Standard for the Pronghorn Migration Corridor.

Cumulative Effects

Alternative 3 represents a reduction in forage utilization compared to Alternative 2. Similar to Alternative 2, the cumulative effects of this alternative on the elk herd units in the project area are minimal due to sufficient forage being available for elk after cattle grazing. In addition, the presence of the elk feedground within the project area creates a substantive population stabilizing effect overall.

For Alternative 3, the relevant cumulative actions identified above under Alternative 1, when aggregated with natural conditions and direct and indirect effects do not push mule deer, moose, and pronghorn survivorship below a threshold to create population declines relative to Wyoming Game and Fish herd unit objectives for the respective herd units.

Alternative 4- Modified Grazing Management with Riparian Emphasis

Alternative 4 is similar to Alternative 3 with the primary difference being a reduction in the maximum forage utilization of key forage species in the riparian and meadow areas for four allotments (Badger, Beaver-Twin, Roaring Fork, and Upper Green River allotments). Alternative 4 proposes a maximum of 35 percent forage utilization of key forage species in riparian and meadow areas across four allotments compared with Alternative 3 which proposes a maximum of 50 percent forage when meeting desired conditions.

Direct and Indirect Effects

Elk

Alternative 4 has the least use of forage by livestock among the grazing alternatives. This alternative would provide approximately 46.8 million pounds of forage, 45 percent of the total herbaceous production available in Alternative 1. Livestock would consume approximately 35.8 million pounds, leaving 11 million pounds of forage for elk and all other ungulate management indicator species.

Of the 11 million pounds of forage remaining after livestock grazing in this alternative, elk would use 2.5 million pounds, leaving a surplus of available forage. There is no constraint on forage availability for elk in the project area in this alternative. Under Alternative 4, elk populations would not be negatively impacted at the project, herd unit, or the Forest-wide scales by forage limitations caused by cattle grazing. Effects on elk under Alternative 4 are similar to the effects described in Alternative 3, only Alternative 4 would provide even more remaining forage for ungulate management indicator species, particularly in riparian areas.

Mule Deer, Moose, Pronghorn

Effects on mule deer, moose, and pronghorn under Alternative 4 are similar to the effects described in Alternative 3; only this alternative would provide even more remaining forage (4.2 million pounds), particularly in riparian areas. Riparian areas are particularly important for moose, so reduced forage utilization in riparian areas would provide even more forage for moose and less disturbance effects from cattle grazing in riparian areas. Further, the riparian areas emphasized in this alternative may provide more forage and less disturbance to pronghorn. Pronghorn typically move through the migration corridor in April or May and again in October or November, so there is very little overlap of livestock grazing with pronghorn migration.

There is no constraint on forage availability for mule deer, moose, or pronghorn in the project area in this alternative. In the aggregate, mule deer, moose, and pronghorn would consume only about 4 percent of total herbaceous production in the project area on grazing capable lands. These species would continue to use the project area and forage use by livestock in this alternative would not preclude population increases toward herd objectives.

Cumulative Effects

Alternative 4 represents a reduction in forage utilization of key forage species in the riparian and meadow areas for four allotments compared to Alternative 2 and Alternative 3. Similar to Alternative 2 and 3, the cumulative effects of this alternative on the elk herd units in the project area are minimal due to sufficient forage being available for elk after cattle grazing. In addition, the presence of the feed ground within the project area creates a substantial population stabilizing effect overall. Also similar to Alternatives 2 and 3, the cumulative effects of this alternative to the mule deer, moose, and pronghorn herd units in the project area are minimal due to sufficient forage being available for these species after cattle and horse grazing. For Alternative 4, the relevant cumulative actions identified, when aggregated with natural conditions and direct and indirect effects do not push elk survivorship below a threshold to create population decline relative to Wyoming Game and Fish Department herd unit objectives for either the Upper Green Herd Unit or the Jackson Herd Unit.

Brewer's Sparrow (*Spizella breweri breweri*) - MIS

This section presents the indicators addressed in this analysis, the existing condition and the environmental effects of each alternative on Brewer's sparrows. Information provided in this section was summarized from the Brewer's Sparrow Specialist Report (Egan 2015).

Indicators Used for Comparison of Alternatives

- Sagebrush Canopy Cover
- Herbaceous Species Composition

Affected Environment

Habitat

Brewer's sparrows are sagebrush obligates that summer in North America and winter in Central or South America. Brewer's sparrows are found to occur and nest in predominantly large expanses of sagebrush dominated shrub communities that vary in percent cover and height. Contiguous big sagebrush patches that are hundreds to many thousands of acres are best, but patches down to roughly 100 acres also provide good habitat (Wilson 2005). Patches less than 100 acres may also provide habitat for Brewer's sparrow; however isolated patches that are considerably smaller than 100 acres do not offer good habitat. Nearly 60 percent of mountain big sagebrush within the project area are patches less than 100 acres and is identified as having potential to provide habitat for Brewer's sparrow; while 40 percent of mountain big sagebrush are patches greater than 100 acres and is identified as optimal Brewer's sparrow habitat. Preferred canopy height is less than 5 feet or 152 centimeters (Wyo. Partners in Flight 2003, Holmes and Johnson 2005).

The Bridger-Teton National Forest vegetation layer shows there are approximately 47,039 acres of sagebrush habitat identified within the Upper Green River project area. Approximately 28,795 of those are identified as mountain big sagebrush, the preferred habitat for Brewer's sparrows. Nearly 95 percent of mountain big sagebrush habitat within the project area occurs on land capable of livestock grazing. The analysis shows that of the lands capable for cattle grazing within the Upper Green River project area, there are no areas that are not suitable for cattle grazing in regards to meeting the needs of Brewer's sparrows. Similarly, there are no areas identified that are outside of capable cattle grazing lands that are not suitable in regards to meeting the needs of Brewer's sparrows. Although this analysis shows that changes in cattle grazing management within the Upper Green River project area could negatively impact sagebrush canopy cover and herbaceous species composition in some situations, cattle grazing would not be unsuitable in regard to meeting the needs of Brewer's sparrows because cattle grazing can readily be managed to avoid or sufficiently mitigate negative impacts.

Brewer's sparrow nesting season is from late April to July with a post nesting period from July through September. They build cup nests of grass, rootlets, and forbs low in the branches of live sagebrush shrubs or on the ground at the base of a live sagebrush. Brewer's sparrows frequently nest twice in a season, and they commonly re-nest after nest failure, meaning that the egg-laying period extends into early to late July depending on elevation.

Sagebrush canopy cover is an indicator of sagebrush community health (O'Brien et al. 2003) and is variable in Brewer's sparrow natural history (Wyoming Partners in Flight 2003). The amount of shrub canopy cover is a strong indicator of species occurrence and abundance. According to Holmes and Altman, suitable canopy cover for Brewer's sparrows range between 10-40 percent, where at least 60 percent of the canopy cover is dominated by sagebrush. Brewer's sparrow abundance decreases when average shrub cover is below 10-13 percent or exceeds 50 percent. Brewer's sparrows are found to disappear entirely when average shrub cover decreases below 3-8 percent (Walker 2004). Reynolds (1981) and Peterson and Best (1985) identified the preferred shrub canopy cover to be 20-25 percent or greater, while 10-20 percent can provide some cover characteristics.

An estimated 100 percent of the mountain big sagebrush vegetation type within the project area has canopy cover of 10-25 percent or greater. This indicates that the existing canopy cover of mountain big sagebrush within the project area is currently suitable for Brewer's sparrows.

According to Walker (2004), the abundance and composition of the herbaceous understory or herbaceous species composition, is also an indicator of the health and functioning of sagebrush ecosystems that support Brewer's sparrow populations. Herbaceous vegetation provides Brewer's sparrows with foraging habitat by

supporting insect and seed production, as well as nesting habitat by providing cover and concealment. Herbaceous vegetation is structured by forbs and grasses within sagebrush shrub communities. This vegetation helps reduce the ability for non-native species to encroach, reduce soil compaction and erosion, and increase structural diversity by suppressing sagebrush communities that are too dense to provide Brewer's sparrow habitat. Suitable Brewer's sparrow habitat is characterized by intact sagebrush habitats, especially those with high biological diversity, adequate herbaceous species composition, and an intact soil crust (Walker 2004).

Herbaceous species composition is defined by species richness (number and identity of species) and relative abundance (canopy cover) of forbs and grasses. The rangeland species composition objective for the project is mid or late seral plant community with a stable or upward trend. The majority of the project area met this objective and likely provides suitable Brewer's sparrow habitat. Only two pastures in Mosquito Lake rotation did not meet the species composition objective as a likely consequence of livestock grazing (Booth and Hayward 2015). In addition to the range data, relevant sage grouse data was collected in 2014 at various locations within the Upper Green River project area, which can be used to describe existing conditions for herbaceous species composition. All nine allotment-pasture locations where data was collected provided preferred forbs for sage grouse that were common with a diversity of five or more preferred forb species present, suggesting that species richness is currently at objective. McAdoo et al. (2008) found the suitable canopy cover of forbs and grasses for Brewer's sparrow to be just over 30 percent. The percent canopy cover for forbs and grasses collected in 2014 ranged between 26-62 percent with an average of 36 percent, suggesting that the percent canopy cover for forbs and grasses falls within a suitable range for Brewer's sparrow and that the relative abundance of herbaceous species is currently represented.

Current Status of Populations

The U.S. Geological Survey coordinates breeding bird surveys (BBS) and presents trend data for North America by individual state and for local survey routes (data available at http://www.mbr-pwrc.usgs.gov/bbs/). Survey routes are 24.5 miles long and consist of 50, 3-minute observation periods. For the U.S. region, Brewer's sparrow counts on 640 transects from 1966 to 2013 were a stable (0.98 percent decrease, but confidence intervals for percent change included zero). For Wyoming, counts on 118 surveys from 1966 to 2013 were also stable (0.38 percent decrease, but confidence intervals included zero). For Western Wyoming specifically, the species declined by more than 1.5 percent annually for the period. In Wyoming as a whole, Brewer's sparrow population trends have been relatively stable with a -0.9 percent decrease in the occurrence of Brewer's sparrows on survey routes from 1968-2005 (USGS 2014).

Numbers of Brewer's sparrows counted on BBS routes in Southern and Eastern Wyoming declined, but counts increased on routes in Northwestern Wyoming (Dobkin and Sauer 2004).

There are five North American BBS routes on the Bridger-Teton National Forest. Species occurrence data collected from 1968 to 2003 was analyzed at the route level to determine species trend per route. Four of the routes showed a positive trend during this period (+3.3, +18.1, +8.8, and +29.1 percent increase in the number on each route). The other route showed a negative trend of -16.2 percent/year (BBS GIS data).

The Rocky Mountain Bird Observatory and Avian Data Center (RMBO; http://rmbo.org/v3/avian/home) provides data for breeding bird surveys conducted in the Rocky Mountain Region. For 2010, 2011, 2012, 2013 and 2014, Brewer's sparrow occupancy of transects (percent with the species present; Psi) on the Bridger-Teton National Forest was 0.26, 0.06, 0.062, 0.372 and 0.363, respectively, with no indication of a downward trend from 2010 to 2014, recognizing this is too short of a period to analyze for trends. The Rocky Mountain Bird Observatory completed breeding bird surveys throughout the state of Wyoming in 2011. RMBO began monitoring Wyoming's birds during 2002 in conjunction with the USDA Forest Service, Bureau of Land Management, and Wyoming Game and Fish Department. In 2009, RMBO implemented a

new spatially balanced design based upon Bird Conservation Regions (BCR) and management boundaries in Wyoming. This design allows for comparison of density estimates across public and private lands and comparisons to other long-term monitoring projects in the United States. This project is designed for long-term monitoring of birds at large spatial scales. This approach is crucial to understand trend of the species like Brewer's sparrow at the state level.

The Bridger-Teton National Forest and much of Wyoming is mapped as Bird Conservation Region 10, Northern Rockies. Prior to 2009, the RMBO observed a total of 369 sparrows along 22 survey routes. These surveys include BLM land adjacent to the BTNF along the "Piney Front." Four male Brewer's sparrows were positively identified in the Green River Allotment, adjacent to Wagon Creek Allotment. Since the RMBO implemented a new design based upon Bird Conservation Regions and management boundaries in 2009, all data collected from 2009 on is being analyzed separately from the previous data set.

The density of Brewer's sparrows for the Bridger-Teton National Forest estimated for 2013 (269 survey points) and 2014 (261 points) was 8.81 birds per km2 and 4.15 birds per km2. These points occurred in a variety of habitats other than sagebrush steppe, including designated wilderness and roadless areas. On the Pinedale Ranger District, Brewer's sparrow surveys were conducted in 5 different areas (sagebrush steppe and other habitats) from 2009 to 2011, but only one individual was detected. No estimates of density were calculated.

Brewer's sparrows are common on the Jackson and Buffalo Ranger Districts. During spring 2010 and 2011, wildlife technicians conducted point counts of Brewer's sparrows and other birds in sagebrush communities in this area. For 2010, 31 Brewer's sparrows were detected at 14 of 59 (24 percent) survey points. For 2011, 28 birds were detected at 17 of 51 (33 percent) points.

Environmental Consequences

This section describes the direct, indirect and cumulative effects of implementing Alternatives 1, 2, 3, and 4 on Brewer's sparrows and their habitats. Effects on nesting and foraging habitats are provided based primarily on two indicators: herbaceous species composition and sagebrush canopy cover.

Alternative 1 – No Livestock Grazing (No Action Alternative)

Direct and Indirect Effects

Discontinuing livestock grazing within the Upper Green River project area would positively contribute to Brewer's sparrow populations at the project level and slightly at the forest level compared to Alternatives 2, 3, and 4. Negative effects from range improvements associated with Alternative 1 may directly impact individuals over the short-term. However, these impacts are seen as minor and would not impact Brewer's sparrow populations across the project area. Eliminating livestock herbivory, trailing, and trampling within sagebrush communities would over time improve Brewer's sparrow nesting and foraging habitat. With this alternative, an upward trend in the herbaceous species composition would be expected given that the understory vegetation would not be impacted from livestock grazing. This would benefit Brewer's sparrows by increasing the amount of nesting cover, seed production, and insect availability.

Cowbirds are greatly associated with livestock and large ungulates and feed on insects that are attracted to these animals. Cowbirds are nest parasites that typically lay their eggs within the nest of host species, such as Brewer's sparrows. The intrusion of grazing land into sagebrush appears to provide a large contact zone where cowbirds have access to the breeding birds of the sagebrush habitat (Rich 1978). Cowbirds may be limited by the distance they will fly in search of a host, but sagebrush habitat grazed by livestock provides opportunities for parasitism of species otherwise isolated from cowbirds. Cowbird parasitism decreases the nesting success of Brewer's sparrows and the presence and proximity of cattle to adjacent nesting habitat

reduces the reproductive success rate for nesting sparrows. Eliminating livestock under Alternative 1 within the Upper Green River project area would contribute in a minor way to improved nesting and reproductive success for Brewer's sparrows on the project area and across the Forest by reducing cowbird nest parasitism compared to existing conditions.

Alternative 1 would provide more suitable nesting and foraging habitat for Brewer's sparrows when compared to the action alternatives and would benefit the overall structural diversity of the sagebrush ecosystem within the project area and across the Forest.

Overlap of Cattle Capable and Suitable Rangeland with Brewer's Sparrow Habitat

The analysis under Alternative 1 shows that, of the lands capable for cattle grazing within the Upper Green River project area, there are no areas that are not suitable for cattle grazing in regards to meeting the needs of Brewer's sparrows. Similarly, there are no areas identified that are outside of capable cattle grazing lands that are not suitable in regards to meeting the needs of Brewer's sparrows. In the absence of cattle grazing under Alternative 1, there would be no cattle grazing impacts to sagebrush canopy cover and herbaceous species composition and therefore no need to identify whether cattle grazing would be unsuitable in regard to meeting the needs of Brewer's sparrows.

Cumulative Effects for All Alternatives

The Upper Green River project area is the spatial area considered for the cumulative effects analysis for Brewer's sparrow. The temporal boundary for this analysis is ten years into the past and future. This temporal boundary was selected because ten years is the life of a typical term grazing permit. Under all alternatives, the past, present and reasonably foreseeable future activities that affect Brewer's sparrows in the analysis area include vehicle use on and off roads, recreational activities, private land management activities, fire suppression, climate change, and vegetation treatments.

Vehicle use, recreational activities, such as horseback riding, hiking, and camping, that is currently taking place within the project area would continue to carry negative direct effects from human-caused disturbance and crushing mortality, as well as negative indirect effects on Brewer's sparrow habitat from trampling vegetation. The presence of horses from recreational activities would also contribute, although slightly, to the cumulative impacts by increasing the amount of cowbirds and nest parasitism. Combined with the impacts from Alternative 2, cowbird parasitism would contribute to the nesting and reproductive failure of Brewer's sparrows within the Upper Green River project area and in a minor way across the Forest. Combined with the impacts from Alternatives 3 and 4, cowbird parasitism would decrease the nesting and reproductive success of Brewer's sparrow within the Upper Green Allotment. However impacts would be less than those resulting from Alternative 2 but more than impacts from Alternative 1.

Activities on private lands south of the project area currently contribute to livestock grazing activities and may reduce forage, cover, and habitat available to Brewer's sparrow populations outside of the project area. Therefore, the value of the Brewer's sparrow habitat that is within the project area is amplified.

Long-term fire suppression in rangelands in and near the project area would contribute to altering the successional stage of sagebrush and understory vegetation communities to a stage that is different from what would occur naturally. This could negatively affect the foraging and nesting habitat quality for Brewer's sparrows.

General impacts to Brewer's sparrow summer habitat would be expected in the distant future due to global climate temperature changes, increasing drought, and decreasing snowpack runoff. The average air temperature across western Wyoming is expected to increase over time and along with other climate change factors, would likely result in a decrease in sagebrush communities and native grasses and forbs in the project area and throughout Wyoming. Climate change would also exacerbate cheat-grass growth and other

harmful invasive species that do well in these types of climate shifts. This would overtime decrease the amount of Brewer's sparrow nesting and foraging habitat in the project area and across Wyoming over the long term. However, because climate change is expected to occur gradually over a long period, any reductions in the amount of sagebrush due to climate change would be no more than negligible in the near future and is not likely to affect Brewer's sparrow habitat within the Upper Green River project area.

The proposed Pinyon Osborn Vegetation Treatment is a 26,000-acre project to reduce conifer fuels and restore shrub communities using mechanical and prescribed fire treatments along the Upper Green River Corridor. Disturbances from the Pinyon Osborn Vegetation Treatment project may negatively affect individual sparrows and prescribed fire would reduce sagebrush cover negatively impacting nesting and foraging habitat in the short term. However, the project is expected to have long-term benefits to Brewer's sparrow nesting and foraging habitat once sagebrush is reestablished.

The overall cumulative effects on Brewer's sparrows, associated with vehicle use and recreational activities (negative effects), activities on private lands (negative effects), fire suppression (negative effects), climate change (negative effects), and the proposed Pinyon Osborn Vegetation Treatment (short-term negative effects and long-term positive effects) combined with the effects of livestock grazing under Alternative 2-Grazing as Currently Permitted (negative effects), would result in the greatest negative cumulative effects of all alternatives. Cumulative effects associated with Alternative 1-No Livestock Grazing would result in the fewest negative cumulative effects and Alternatives 3-Modified Grazing Management and 4-Modified Grazing Management with Riparian Emphasis would have similar cumulative effects, more than cumulative effects associated with Alternatives 2 and less than Alternative 1.

Alternative 2 - Grazing as Currently Permitted and Current Management

Direct and Indirect Effects

Negative short-term direct and long-term indirect effects to Brewer's sparrows under this alternative would be anticipated and would be greater than those associated with Alternatives 1, 3 and 4. Under Alternative 2, direct impacts to Brewer's sparrow nests would result from livestock trampling and crushing mortality would be expected. Indirect impacts would negatively contribute to Brewer's sparrow populations by a minor degree at the project level and a slight degree on the Forest level. By allowing the greatest forage utilization for cattle grazing, high (maximum) key forage utilization in big mountain sagebrush communities (50-60 percent) would likely result in a downward trend in herbaceous species composition (Booth and Hayward 2015). For that reason, Alternative 2 would not meet the species composition objective (mid or late seral plan community with a stable or upward trend) for herbaceous species composition and would result in a negative impact on nesting and foraging Brewer's sparrows. A reduction in herbaceous understory would result in a faster rate of increase in mountain big sagebrush throughout the Upper Green River project area. This would negatively impact Brewer's sparrow if the sagebrush canopy cover increases to the extent that the herbaceous understory vegetation is out-competed and becomes unsuitable for nesting and foraging. In the absence of design features and the use of season-long grazing in some allotments, this alternative would have the greatest impact to the overall integrity of sagebrush communities. In addition, the residual herbaceous vegetation available to Brewer's sparrows during current nesting seasons would be limited.

Cowbirds are greatly associated with livestock and large ungulates and feed on insects that are attracted to these animals. Cowbirds are nest parasites that typically lay their eggs within the nest of host species, such as Brewer's sparrows. The intrusion of grazing land into sagebrush appears to provide a large contact zone where cowbirds have access to the breeding birds of the sagebrush habitat (Rich 1978). Cowbirds may be limited by the distance they will fly in search of a host, but the continued alteration of sagebrush habitat for livestock grazing would provide opportunities for parasitism of species otherwise isolated from cowbirds.

Cowbird parasitism decreases the nesting success of Brewer's sparrows and the presence and proximity of cattle to adjacent nesting habitat reduces the reproductive success rate for nesting sparrows.

Under Alternative 2, 3 and 4, the presence of livestock would increase cowbird parasitism on nesting Brewer's sparrows throughout the project area and reduce nesting success compared to Alternative 1.

Overlap of Cattle Capable and Suitable Rangeland with Brewer's Sparrow Habitat
The analysis under Alternative 2 shows that, of the lands capable for cattle grazing within the Upper Green River Project Area, there are no areas that are not suitable for cattle grazing in regards to meeting the needs of Brewer's sparrows. Similarly, there are no areas identified that are outside of capable cattle grazing lands that are not suitable in regards to meeting the needs of Brewer's sparrows. Although the analysis for Alternative 2 shows that changes in cattle grazing management within the Upper Green River project area could negatively impact sagebrush canopy cover and herbaceous species composition, cattle grazing would not be unsuitable in regard to meeting the needs of Brewer's sparrows because cattle grazing can readily be managed to avoid or sufficiently mitigate negative impacts.

Cumulative Effects

See discussion of Cumulative Effects for All Alternatives under Alternative 1

Alternative 3 - Modified Grazing Management and Alternative 4 – Modified Grazing Management with Riparian Emphasis

Direct and Indirect Effects

The effects of Alternative 3 and 4 are the same. Alternative 4 includes emphasis on riparian areas but does not change the effects determination for Brewer's sparrow because it is an upland species.

Negative short-term direct and long-term indirect effects to Brewer's sparrows under these alternatives would be anticipated at the project level as compared to Alternative 1. Direct effects would result from the potential for livestock to crush and disturb nests; while indirect effects from cattle herbivory, trailing, and trampling would negatively impact Brewer's sparrow nesting and foraging habitat. However, impacts associated with Alternatives 3 and 4 would be less than those associated with maximum allowable use under Alternative 2, and would therefore result in a slight beneficial impact to Brewer's sparrow populations at the project level and a negligible beneficial effect at the Forest level. Beneficial effects stem from a reduction in maximum utilization limits, reduction in livestock numbers, and incorporation of design features that are intended to reduce livestock impacts on herbaceous vegetation throughout the Upper Green River project area. A reduction in maximum allowable use on key forage species to 50 percent in the uplands would minimize the downward trend in herbaceous vegetation and would likely result in a stable or upward trend in some areas. A stable or upward trend in the plant community would allow for Alternatives 3 and 4 to meet the rangeland health resource objective for herbaceous species composition and would provide more suitable nesting and foraging habitat for Brewer's sparrows when compared to Alternative 2.

Cowbirds are greatly associated with livestock and large ungulates and feed on insects that are attracted to these animals. Cowbirds are nest parasites that typically lay their eggs within the nest of host species, such as Brewer's sparrows. The intrusion of grazing land into sagebrush appears to provide a large contact zone where cowbirds have access to the breeding birds of the sagebrush habitat (Rich 1978). Cowbirds may be limited by the distance they will fly in search of a host, but the continued alteration of sagebrush habitat for livestock grazing would provide opportunities for parasitism of species otherwise isolated from cowbirds. Cowbird parasitism decreases the nesting success of Brewer's sparrows and the presence and proximity of cattle to adjacent nesting habitat reduces the reproductive success rate for nesting sparrows.

Under Alternative 2, 3 and 4, the presence of livestock would increase cowbird parasitism on nesting Brewer's sparrows throughout the project area and reduce nesting success compared to Alternative 1. Under Alternatives 3 and 4, the negative impacts associated with cowbird parasitism would be similar to those associated with Alternative 2, because the reduced number of livestock under Alternatives 3 and 4 would not be sizable enough to influence the amount of cowbirds present.

Overlap of Cattle Capable and Suitable Rangeland with Brewer's Sparrow Habitat
The analysis under Alternatives 3 and 4 shows that, of the lands capable for cattle grazing within the Upper Green River Project Area, there are no areas that are not suitable for cattle grazing in regards to meeting the needs of Brewer's sparrows. Similarly, there are no areas identified that are outside of capable cattle grazing lands that are not suitable in regards to meeting the needs of Brewer's sparrows. Although the analysis for Alternative 3 shows that changes in cattle grazing management within the Upper Green River project area could, to a lesser degree than Alternative 2, negatively impact sagebrush canopy cover and herbaceous species composition, cattle grazing would not be unsuitable in regard to meeting the needs of Brewer's sparrows because cattle grazing can readily be managed to avoid or sufficiently mitigate negative impacts.

Cumulative Effects

See discussion of Cumulative Effects for All Alternatives under Alternative 1

Migratory Birds

Information provided in this section was summarized from the Migratory Bird Specialist Report (D. DeLong 2016).

Many species of migratory birds are of international concern due to naturally small ranges, loss of habitat, observed population declines, and other factors. The BTNF recognizes the ecological and economic importance of birds, and approaches to bird conservation at several levels by implementing: 1) Forest Plan objectives, standards and guidelines, 2) a Forest-wide bird monitoring program, and 3) site-specific mitigation and effects analyses for identified species of concern.

Affected Environment

Species of concern "…refers to those species listed in the periodic report 'Migratory Nongame Birds of Management Concern in the United States," priority migratory bird species as documented by established plans (such as Bird Conservation Regions in the North American Bird Conservation Initiative or Partners in Flight physiographic areas), and those species listed in 50 C.F.R. 17.11 (Executive Order 13186, section 2). The definition does not limit the list of species of concern to those of 'management concern,' and it points to birds listed in the The Wyoming Bird Conservation Plan (Wyo. Partners in Flight 2003) and other bird conservation plans. Additionally, the MOU (USFS and USFWS 2008) also requires that birds on the U.S. Fish and Wildlife Service's current list of Birds of Conservation Concern (USFWS 2008) and on state lists be considered for inclusion as species of concern. The list of migratory birds analyzed were not limited to the 22 species listed as birds of conservation concern in BCR 10 (USFWS 2008) (15 of which likely occur on the Upper Green allotments). Of the bird species listed in Table 38, trumpeter swans, bald eagles, goshawks, peregrine falcons, sage grouse, great gray owls, and Brewers sparrows were addressed as sensitive species or management indicator species, and are not addressed in this section.

Rather than attempting to individually analyze effects on all potentially-affected migratory bird species or even a wide range of individual migratory bird species, a two-tier approach was used in the analysis:

1. Six habitat groups were identified that encompass the major types of migratory bird habitat (see "Habitat Groupings" at the top-right in Table 38). This best ensures that the full range of potential

effects of migratory birds are analyzed. Open conifer stands are not included as a habitat grouping in Table 38.

2. Representative species from Table 38 were identified for each habitat grouping, with an emphasis on "species of concern" addressed in Executive Order 13186.

Table 38. A range of migratory bird species (and three grouse species) that likely occur on the Upper Green Allotments, several status designations, and several habitat associations, based on Dobkin (2002), Wyo. Partners in Flight (2003), Orabona et al. (2009), birds identified at three Rocky Mountain Bird Observatory breeding bird surveys in the project area during 2010-2014 (RMBO; http://rmbo.org/v3/avian/Home.aspx), and a bird list for Seedskadee National Wildlife Refuge. The purpose of this list is not to fully represent bird species on the allotments, but rather to show a representation of species that occur on the allotments so that the range of habitat needs are addressed in the analysis. Sensitive species and MIS are presented in italics.

		Migratory Bird Designations			Habitat Groupings				
Bird Species	Known Cowbird host?	**USFWS Spp. of Mgt. Concern and USFWS Birds of Conserv. Concern (BCR 10)**	**Lists and Conservation Plans (Wyoming Partners in Flight, Intermountain West Joint Venture), and U.S. Shorebird Plan**	**USFS Sensitive Species**	**Willow Habitat**	**Wet/Moist Meadow, Silver Sagebr. Habitats**	**Mtn. Big Sagebrush and Grassland Habitat***	**Aspen Habitat**	**Beaver Ponds, Other Wetlands, and Streams**
Great blue heron									X
Trumpeter swan		M	W-1, I	X		X			X
Canada goose			I			X			X
Mallard			I		X	X			X
Gadwall			I		X	X			X
Northern pintail			I			X			X
Northern shoveler			I			X			X
Green-winged teal			I		X	X			X
Cinnamon teal			I		X	X			X
Ring-necked duck			I						X
Harlequin duck			W-2	X					X
Barrow's goldeneye			I					X	X
Common goldeneye								X	X
Osprey									X
Bald eagle		C	W-1	X					X
Northern harrier		M	W-3		X	X			
Sharp-shinned hawk								X	
Cooper's hawk								X	
Northern goshawk		M	W-1	X				X	
Red-tailed hawk						X	X	X	
Swainson's hawk		C	W-1			X	X		
Ferruginous hawk		M, C	W-1				x		
American kestrel						X	X	X	
Merlin			W-2					X	
Peregrine falcon		M, C	W-1	X	X	X			X
Ruffed grouse[A]					X			X	
Blue grouse[A]			W-3					X	
Greater sage grouse[A]			W-1	X		X	X		
Sora						X			
Sandhill crane					X	X			X
American avocet			W-3, S						X
Spotted sandpiper			S						X
Long-billed curlew		M, C	W-1, S			*x*			
Willet			W-3, S						
Common snipe			S		X	X			X

Bird Species	Known Cowbird host?	Migratory Bird Designations			Habitat Groupings				
		USFWS Spp. of Mgt. Concern and USFWS Birds of Conserv. Concern (BCR 10)	**Lists and Conservation Plans (Wyoming Partners in Flight, Intermountain West Joint Venture), and U.S. Shorebird Plan**	**USFS Sensitive Species**	**Willow Habitat**	**Wet/Moist Meadow, Silver Sagebr. Habitats**	**Mtn. Big Sagebrush and Grassland Habitat***	**Aspen Habitat**	**Beaver Ponds, Other Wetlands, and Streams**
Wilson's phalarope			W-1, S			x			X
Franklin's gull			W-1			X			X
Forster's tern			W-1						X
Great horned owl					X	X	X	X	
Great gray owl			W-2	X		X[B]			
Short-eared owl		M	W-1		X	X	X[C]		
Saw-whet owl								X	
Broad-tailed hummingbird			W-2		X	X	X	X	
Calliope hummingbird		C	W-2		X	X			
Rufous hummingbird		M	W-2		X	X	X	X	
Lewis's woodpecker		M, C	W-2					x	
Northern flicker								X	
Red-naped sapsucker			W-2		X			X	
Downy woodpecker								X	
Hairy woodpecker								X	
Western wood pewee	x							X	
Olive-sided flycatcher		M, C	W-2				X	X	
Willow flycatcher	x	C	W-2		X				
Hammond's flycatcher			W-2		X			X	
Dusky flycatcher	x		W-2		X			X	
Cordilleran flycatcher			W-2					X	
Loggerhead shrike		M, C	W-2				*x*		
Horned lark	x						X		
Tree swallow					X	X		X	X
Violet-green swallow					X	X		X	X
N. rough-winged swallow			W-3		X	X			X
Black-billed magpie					X				
Black-capped chickadee								X	
Red-breasted nuthatch								X	
American Dipper									X
House wren								X	
Mountain bluebird						X	X	X	
Veery	x		W-3		X			X	
Swainson's thrush					X			X	
Hermit thrush								X	
American robin					X			X	
Gray catbird	x				X				
Sage thrasher		C	W-2				X		
Warbling vireo	x							X	
Orange-crowned warbler								X	
Yellow warbler	x				X				
Northern waterthrush					X			X	
MacGillivray's warbler	x		W-2		X			X	
Wilson's warbler	x		W-2		X			X	
Common yellowthroat	x				X				
Yellow-breasted chat	x				X				
Ovenbird	x		W-3					X	
Western tanager	x							X	
Green-tailed towhee	x						X		

Bird Species	Known Cowbird host?	Migratory Bird Designations			Habitat Groupings				
		USFWS Spp. of Mgt. Concern and USFWS Birds of Conserv. Concern (BCR 10)	**Lists and Conservation Plans (Wyoming Partners in Flight, Intermountain West Joint Venture), and U.S. Shorebird Plan**	**USFS Sensitive Species**	**Willow Habitat**	**Wet/Moist Meadow, Silver Sagebr. Habitats**	**Mtn. Big Sagebrush and Grassland Habitat***	**Aspen Habitat**	**Beaver Ponds, Other Wetlands, and Streams**
Brewer's sparrow	x	M, C	W-1				X		
Lark sparrow	x		W-2				X		
Sage sparrow	x	M, C	W-1				X		
Fox sparrow	x				X				
Savannah sparrow	x				X				
Lincoln's sparrow	x				X				X
Song sparrow	x				X				X
Vesper sparrow	x		W-2				X		
White-crowned sparrow	x				X				
Black-headed grosbeak	x							X	
Lazuli bunting	x		W-3		X			X	
Western meadowlark	x					X	X[C]		
Red-winged blackbird	x				X	X			X
Yellow-headed blackbird						X			X
Brewer's blackbird	x				X	X		X	
Brown-headed cowbird					X				
Bullock's oriole	x							X	
Black Rosy Finch		C	W-3				X		
Cassin's finch	x	C				X	X	X	
American goldfinch	x				X	X		X	
Totals[D]					42	36	22	48	32

* Some of the non-sagebrush-obligate bird species also use forbland communities, but the grouping does not identify forbland communities because they typically receive little use by cattle.

[A] Grouse are included in the "Migratory Bird" section because, although they are not "migratory birds," they are the only bird species in this area not classified as migratory birds. With their inclusion, this section covers all bird species.

[B] Within forestland habitat.

[C] Typically early successional (herbaceous) communities.

[D] Totals do not accurately reflect the total number of species in each habitat grouping on the Upper Green allotments because not all bird species are listed.

The indicators used to analyze each alternative and its impact on migratory birds are found in the table below.

Table 39. Indicators for analyzing effects on migratory birds on the Upper Green River project area

Indicator	Habitat Grouping					
	Willow	Non-Willow Riparian	Upland Rangeland	Aspen	Conifer / Open Conifer	Beaver Ponds, other Wetlands, and Streams
Extent of Riparian and Aquatic Habitats Across Valley Bottoms	X	X				X
Mix of Succession and Shrub Canopy Cover	X	X	X			
Herbaceous Species Composition	X	X	X	X	X	
Cowbird Nest Parasitism Potential	X	X	X	X	X	X
Herbaceous Retention *(as a habitat element and proxy for nest depredation)*	X	X	X	X	X	
Nest Trampling Potential	X	X	X	X	X	
Nest Loss due to Flooding *(Noble Pastures Allotment only)*	X	X				
Fence Mortality Potential	X	X	X	X	X	X
Water Quality						X

Environmental Consequences

Alternatives 1, 2, 3, and 4

Detailed analyses on the impact of each alternative is provided in the Migratory Bird Specialist Report. In summary, and when compared across the range of alternatives, the overall degree of impact on migratory birds is as shown in box below.).

Relative degree of impact by alternative on Migratory Birds			
Higher Impact ←		→ Lower Impact	
Alt. 2	Alt. 3	Alt. 4	Alt. 1

The actions and conditions that favor habitat improvement for migratory birds in Alternatives 3 and 4 over the actions and condition in Alternative 2 include:

- Riparian habitat recovery - A reduction in allowable maximum key forage utilization levels would favor maintenance and recovery of riparian habitat. Alternative 2 allows up to 65% utilization in riparian areas while Alternative 3 allows up to 50% and Alternative 4 up to 35% utilization. Application of a minimum 6-inch stubble height on the green-line in focus areas, along with the application of a minimum 4-inch stubble height on the green-lines and adaptive management that would further reduce maximum key forage utilization levels if needed in both Alternatives 3 and 4

would also contribute to riparian habitat maintenance and recovery. Improved willow habitat would reduce predation rates and levels of nest predation.

- Mix of successional stages and shrub canopy cover – Forage utilization limits in Alternatives 3 and 4 provide a small increase in the amount of fine fuels remaining in meadows and shrub lands which would contribute to the opportunity to restore the role of fire in the landscape to maintain a mix of successional stages that favor migratory bird habitat. Alternative 4 would result in the most fine fuels. Shifts toward late-seral status results in higher amounts of herbaceous canopy cover, taller herbaceous structure, seed resources, and invertebrate diversity and abundance. This would have the potential to increase nest densities for some species. It may also have the potential to result in increased microtine vole densities, which would benefit a range of birds of prey species.
- Cowbird nest parasitism – The reduced opportunity for a seven day shift in early season grazing in Alternatives 3 and 4, as well as the change from season-long grazing to deferred or rotational grazing in some allotments would reduce the distribution of cattle, which would expose slightly fewer host birds to cowbird nest parasitism than would occur under current management.
- Herbaceous retention - Under Alternative 4, herbaceous nesting cover would remain suitable in a large majority of most vegetation types within each first-grazed pasture and subsequent pastures due to the maximum key-forage utilization limit of 35%. This would maintain suitable cover for fledglings and adults, and would satisfactorily provide habitat for prey, including a wide range of invertebrate species, microtine voles, other small mammals, amphibians, and birds. The key forage utilization limit of 50% in Alternative 3 is not expected to maintain suitable nesting cover.
- Nest trampling potential - Trampling potential is related to the maximum forage utilization rates, therefore Alternative 3 has a higher potential than Alternative 4, but both are less than Alternative 2.
- Water quality - Suitable water quality is already being provided in most streams of the project area, and after several years of implementing design features in Alternatives 3 and 4 (e.g., minimum of 6-inch stubble height in focus areas), the remaining streams are expected to meet water quality standards.

Cumulative Effects for All Alternatives

Factors that affect migratory birds to the south of the project area and other parts of the Upper Green River basin (i.e., above the town of Big Piney, but only for birds associated with habitat groupings in this analysis) are applicable to this cumulative effects analysis because (1) this is where the majority of willow, wet meadow, moist meadow, silver sagebrush, and shrubby cinquefoil habitat naturally existed in the Upper Green River basin, and (2) many of the bird species using these habitats in the project area naturally used/use this habitat south of the project area. Habitat conversions, reductions in habitat quality, and other impacts across the larger area where these habitats exist make the quality of habitat all the more important to pertinent bird species within the project area.

In summary, Alternative 1 would contribute to offsetting habitat loss, reduced habitat quality, and artificially elevated mortality rates of migratory birds in the Upper Green River basin, compared to existing conditions. Alternative 2 would continue to contribute to these negative impacts, albeit to a lesser degree than what occurs south of the project area. Alternative 3 would contribute to offsetting the impacts by a small degree, compared to existing conditions and Alternative 2, and some effects of Alternative 3 would continue to contribute substantively to them. Alternative 4 would contribute to offsetting the impacts by a larger degree than Alternative 3, compared to existing conditions and Alternative 2, and only cowbird nest parasitism (similar rates as Alternatives 2 and 3) would contribute substantively to migratory bird nest losses in the greater area.

Socio-Economic Resources

Information provided in this DEIS about the socio-economics of the project area was summarized from the Social and Economic Resource Report (Booth 2016). Adaptive management was referred to as "progressive design features" in this specialist report. The term "progressive design features" is synonymous with "adaptive management" and is described in this DEIS beginning on page 71 and 112 for Alternatives 3 and 4, respectively.

Overview of Issues Addressed

Issue 3: Social and Economic Impacts

Permitted livestock grazing contributes to the economic well-being of local communities. Continuing to authorize livestock grazing in the project area would support the custom and culture in surrounding communities and contribute to the achievement of Forest Plan goals.

Indicators Used for Comparison of Alternatives

- Whether livestock grazing is authorized and animal unit months permitted
- Employment and income information at the county level
- Traditional uses of the project area

Affected Environment

Desired Conditions

Manage grazing programs to support economic diversity in local communities, and as a tool in meeting resource objectives.

Existing Condition

Human uses within the project area play a role in the economic vitality of the surrounding communities. In Sublette County, where 95 percent of the project area is located, approximately 17.7 percent of the land area is under private ownership, approximately 78.3 percent is federal land, and about 3.9 percent is owned by the state. All 21 permittees that graze livestock on allotments in the project area have base property associated with their grazing permit in Sublette County.

The high proportion of federal ownership and the rural nature of the area reduces the opportunity for industry and reduces the tax base for local governments. This, in turn, increases the dependence on products and services derived from National Forest System lands. The FEIS for the Forest Plan and the Forest Plan itself (U.S. Forest Service 1990) provide a discussion of the social and economic environment for the Bridger-Teton National Forest.

Domestic livestock grazing within and adjacent to the project area has played a key role in maintaining the vitality of Pinedale, Big Piney, and the surrounding communities since the early 1900s when the first significant numbers of non-native people in the county were associated with the cattle and sheep industry. Federal land grazing has been an integral part of many ranching operations in Wyoming (Taylor 2003).

The petroleum industry has added to the primary economic base of Sublette County. Oil and gas development has played a substantial role in the regional economy since the 1920s. For the past 50 years, the oil and gas industry has provided a majority of the tax base and has been a principal industry affecting the economy of Sublette County. The County has experienced several boom and bust cycles and has realized an increased population tied to this industry. Currently, the industry has developed a balance of exploration, development and production and is no longer associated with the heavy influx of new people common to

early exploration (Sublette County 2005). Historically, most of the oil and gas activity has occurred in southwestern Sublette County and neighboring Lincoln County.

While agriculture makes up a relatively small percent of employment in Sublette County (approximately 7 percent), it is the 6th largest sector of employment following mining, government, construction, accommodation and food service, and retail sectors (Taylor and Foulke 2008). Sublette County is lacking in terms of manufacturing, management service, finance and insurance, and wholesale sector employment. Thus, Sublette County has a low level of economic diversity (Taylor and Foulke 2008). Agriculture has contributed a relatively stable source of economic base to the County and therefore is important enough to warrant consideration in this analysis and by the decision maker.

Local industry reliance on outputs from National Forest System lands within the project area is greatest for livestock production, outfitting and the tourist-related industry, and removal of forest products. While the bulk of industry in the County (the analysis area) is related to energy development, there is currently no energy development within the project area. The project area, however, is important to people for recreation opportunities, hunting, and amenity values that are discussed below.

Sublette County has experienced increased population growth for the last decade. By 2011, the population of Sublette County had increased 64.8 percent from the year 2000 (9,758 versus 5,920 people). During the same time period the population of the United States increased by 8.9 percent (Headwaters.org 2013).

Approximately 19.2 percent of the private property in Sublette County is owned and managed as ranches. These ranches provide year round wildlife habitat as well as critical winter ranges and migration corridors for Sublette County's migratory mule deer and pronghorn antelope herds. Sublette County is ranked 13th among 263 counties in seven western states in the Rocky Mountain region in terms of the potential for conversion of prime ranchland to residential development (AFT 2002).

Even when agriculture is a small component of the economy, the industry can represent a large portion of the land base. Farms and ranches on private lands can also have important implications for the management of public lands. For example, agricultural operations often rely on public lands for summer grazing pasture and irrigation water (Headwaters.org 2013).

Many areas are experiencing the conversion of private agricultural lands to other uses, including residential development. This shrinks the farm and ranch land base, and can change the relationship between agricultural operations and public lands. The conversion of farm and ranch land is important to public land managers for a number of reasons: (1) the growth of the wildland-urban interface and the cost of protecting homes from wildfires; (2) the spread of weeds onto public lands; (3) the loss of access to public lands for recreation; (4) the loss of wildlife habitat and wildlife movement corridors that cross private-public land boundaries; and (5) the potential for conflict among user groups (Headwaters.org 2013).

In places where agriculture increasingly operates alongside a larger, non-agricultural economy and greater range of adjacent land uses, farms and ranches continue to be important. They contribute to local economic diversity, the scenery they provide can be part of the mix of amenities that attract and retain people and businesses across a range of industries, and they are often an important part of local culture and community vitality (Headwaters.org 2013).

Economic Activity in the Project Area

Timber Harvest

Timber harvesting has occurred in the project area from 1901 to the present. In 1901, an estimated 2.6 million railroad ties were replaced, and the effect of the associated logging operations on the local landscape

was significant. Composition of the forest cover was changed by removing lodgepole pine and leaving spruce and fir, because lodgepole pine was the most suitable timber type for railroad ties. In addition, floating a large number of ties down the Green River and its tributaries resulted in scouring of the riparian areas and alterations to the river bed and channel; the effects of this activity can still be seen today. From 1950 to 1980, a number of sales were conducted both to supply timber mills with lumber and to attempt to control bark beetle epidemics (see Socio-Economic Report for details, Booth 2016).

The most recent timber harvest activities have been two sales in the Moose and Gypsum Creek drainages. These harvests were undertaken to control the major epidemic of mountain pine beetle and to salvage burnt timber from the Battle Mountain Fire. The Bend in the River Sale consisted of the salvaging of lodgepole pine sawtimber and house-logs on 216 acres of beetle hit trees and was sold in 2007. The total volume of the sale was 4,700 centum cubic feet (ccf). The Battle Mountain Sale was part of the Battle Mountain Fire which occurred in 2007 and the sale was sold later that year. It consisted of 248 acres and included the salvaging of burnt and dying spruce and lodgepole pine for sawtimber. The total volume of this sale was 7,100 ccf.

Also, cutting activities have occurred in the Green River Lake Campground since 2004 in an effort to rid the campground of beetle infested lodgepole pine trees. Other harvesting activities have been limited to personal use products, predominantly firewood.

Livestock Grazing

During the early 1900s, the Forest Service developed a grazing allotment system in the project area. The probable purpose of this allotment system was to fairly allocate forage between the local users, to derive a financial return to the public for use of this public land, and to limit overuse of the forage resource. The allotment system set geographic boundaries for various users or groups of users (livestock grazing associations) and limited the season of use for livestock grazing.

Livestock grazing is a traditional use in the project area. Historically, the number of animals grazed in this area was higher than current numbers. The following is a brief summary that highlights historic and current domestic livestock grazing on the six grazing allotments in the project area.

Upper Green River Allotment – Historic Use

The Yellowstone Park Timber Land Reserve was created in 1891. After the creation of the Yellowstone Forest Reserve in 1902, the Upper Green River Allotment became part of the Wind River Division, then part of the Wyoming National Forest in 1908. In 1910, it became part of the Wind River and Bonneville National Forests and that year the current northern and western boundaries of the allotment were fenced. In addition to livestock use originating from livestock operations in the Upper Green River Valley, cattle from Dubois trailed through the allotment to graze the Elk Ridge area. Prior to and including the 1924 season, 10,977 head of cattle and horses were permitted to graze on this allotment, which included what is now the Elk Ridge Grazing Allotment Complex. In 1924 the Upper Green River Allotment was reduced to an approved use of 10,000 head.

Beginning in 1930, the approved season of use was from June 16 through October 15. Approved use for the allotment was reduced to 8,000 head of cattle and permitted sheep grazing (after the conversion of the Teepee Creek area to sheep grazing) and permitted numbers were held within this authorization by 1935. From 1930 through approximately 1956 sheep were grazed in the Teepee Creek area of the allotment. In 1957, the Upper Green River Cattle Association agreed to exchange their permitted cattle grazing use on Klondike Creek for the permitted sheep grazing use in the Teepee Creek area.

Livestock Grazing – Existing Condition Summary

The project area includes six domestic cattle grazing allotments with 21 individual permit holders currently authorized to graze domestic cattle and horses on the six allotments. Current total grazing authorizations for these allotments are for 9,089 cattle (cow/calf pairs, bulls, and/or yearlings) and pack or saddle horses for a total of 46,148 animal unit months. Grazing seasons for each of the six allotments vary, but fall between mid-June and mid- October. The Beaver-Twin, Badger Creek, Wagon Creek, and Noble Pastures allotments do not have current allotment management plans, but the Upper Green River and Roaring Fork allotments do have allotment management plans. Most of the grazing allotments have been further subdivided into smaller units or pastures in order to confine the livestock into smaller areas and rotate use of the pastures. Alternative 2 in Chapter 2 describes in detail the livestock grazing management as currently permitted and under current management for the six allotments in the project area.

The Forest Service manages grazing programs in such a way as to support economic diversity in local communities and as a tool in meeting resource objectives.

Environmental Consequences

Methodology and Assumptions

For the two alternatives that authorize livestock grazing, the assumption was made that it is possible to implement all of the design features associated with the alternatives, and graze for the full permitted season of use, provided enough time, financial resources and labor are expended by the permittees. This assumption is supported by grazing capacity information that indicates enough forage is produced on the allotment for livestock, wildlife, and watershed needs (please refer to the Capacity heading in the Rangeland Vegetation section). Examples of variables that might change this assumption would include severe drought, wildfire, or large increases in wildlife populations.

Spatial and Temporal Context for Effects Analysis

The spatial context for this analysis is limited to Sublette County and some relatively small portions of the project area outside of Sublette County. Economic information about the County suggests that while agriculture (specifically ranches that are associated with the allotments in the project area) is important to the County, it is less important to the state's economy, which is much larger and more diverse and thus less affected by permitted use in the project area. The economic effects of this action are discussed in the short-term as indicated by the relative feasibility of implementing design features of the alternatives. Longer term effects are discussed in terms of whether livestock grazing will be authorized, the employment and income changes that could be expected, and the degree to which traditional uses could be expected to persist. The temporal context would be limited to ten years in the future for a variety of reasons: first, because ten years is the term of a grazing permit, and second, because it would be increasingly speculative to attempt to predict the effects of these limited economic changes outside this timeframe. Analysis of past actions is also limited to ten years, with the exception of the issues of traditional and cultural uses of the area, which have taken place since the area was settled.

Alternative 1 – No Livestock Grazing (No Action Alternative)

Direct and Indirect Effects

Implementation of Alternative 1 would phase-out commercial livestock grazing in the project area. Agriculture related employment, spending, and other parameters of the local community may decline as a result of discontinuing livestock grazing as described in this alternative. The potential decline would comprise a small percentage of a small, but important sector of the economy. On the other hand, other sectors

of the economy that rely on tourism, hunting, and other recreational activities provided in the project area may benefit from implementation of this alternative.

Some changes in local customs and culture due to the elimination of domestic livestock grazing on National Forest System lands in the project area would be expected; however livestock grazing would continue on other Federal lands in Sublette County as they would not be affected by this project. Other features of custom and culture, such as hunting, fishing, and logging would be unaffected or marginally enhanced if Alternative 1were implemented.

Local communities within the County would continue to be influenced by a number of dynamic factors. The effects of implementing this alternative could impact local communities if a number of the permittees were unable to continue raising livestock on their private land as a result of no longer being able to use the forage resources on National Forest System lands in the project area.

Cumulative Effects

The interdisciplinary team identified approximately 40 past and present management activities and a number of reasonably foreseeable future activities (Appendix A) which were considered for this analysis. Given the nature of these activities, the primary cumulative impacts to employment and income, traditional uses, and amenity values can be summarized into the following categories:

- Agriculture's past, present and future influence on local economy and culture;
- Logging's past, present and future influences on local economy and culture, and;
- Recreational activities' past, present, and future influence on local economy and culture.

Direct and indirect effects of implementing this alternative are discussed above. Those effects related to economic considerations are discussed primarily in terms of agriculture, because that is the segment of the economy affected by this livestock grazing decision. The sector of the economy associated with timber harvest may be declining, as well. However, recreation related segments of the economy are generally stable. When you add the effects of past, present and reasonably foreseeable logging and recreational activities to potential declines in local agriculture, you are still considering a small part of the County economy.

This alternative would not cause changes in the local economy that will result in losses that render the economy unable to recover because the relative contribution of the project to the total economy is small. In addition, there exists a potential for increased recreational use by visitors who do not approve of cattle grazing in the Forest. The traditional uses, custom, and culture of Sublette County may be affected by implementing this alternative, but the effect would not result in the loss of those values.

Alternative 2 - Grazing as Currently Permitted and Current Management

Direct and Indirect Effects

Alternative 2 would not change livestock grazing as currently authorized. Agriculture related employment, spending, and other impacts to the local community would not change as a result of continuing to authorize livestock grazing as described in this alternative (see Chapter 2). No changes in the local custom and culture in local communities from domestic livestock grazing would result due to implementing this alternative.

Local communities, agriculture, and local customs would continue to be influenced by a number of dynamic factors such as fuel costs, labor costs, feed costs, and cattle prices. These changes may alter many of the current conditions that are outlined in the Affected Environment; however, the effects of implementing this alternative would not change the local communities due to the relatively small portion of the economy that is comprised in the agriculture sector.

The traditional uses, custom, and culture of Sublette County may be affected positively by implementing this alternative because the traditional “cowboy” culture would continue to be encouraged by allowing grazing on the Forest.

Negative effects on recreational users that object to cattle on the Forest would remain but would have a very slight effect on the total county economy. This effect would be slight because the number of recreational users that would refrain from recreating on the National Forest in Sublette County because of cattle grazing is likely very small. Additionally, the relative portion of the project area that is expected to decline in condition as a result of grazing impacts is small in scale, and unlikely to be noticed by the average recreational user.

Cumulative Effects

See Cumulative Effects section under Alternative 1 and Appendix A for a list of activities and a summary of the effects of past, present and foreseeable future human activities that in addition to the effects of Alternative 2 could impact the local communities and the economy.

Agriculture’s influence on the local communities would not change as a result of implementing Alternative 2 because this alternative continues current management. Adding the effects of past, present and reasonably foreseeable logging and recreational activities to the effects of implementing this alternative results in an overall benefit to the local economy. However, agriculture still represents a relatively small part of the County economy; so the benefit is very minor.

Environmental Justice Disclosure

Executive Order 12898 (Environmental Justice) - This executive order requires the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.

Implementation of any project alternative is not anticipated to cause disproportionate adverse human health or environmental effects to minority or low-income populations.

Alternative 3 - Modified Grazing Management (Proposed Action)

Direct and Indirect Effects

Alternative 3 authorizes grazing for 270 fewer cows than under Alternative 2 for a total of 8,819 cow/calf pairs and horses (versus 9,089 cow/calf pairs and horses under Alternative 2). This difference in cattle numbers is not likely to affect the local economy or culture. Agriculture related employment, spending, and other impacts to the local community would not change measurably as a result of continuing to authorize livestock grazing as described in this alternative (see Chapter 2). Changes in the local custom and culture related to domestic livestock grazing would not be expected, as livestock grazing would still be authorized on National Forest System lands.

Local communities, agriculture, and local customs would continue to be influenced by a number of dynamic factors such as fuel costs, labor costs, feed costs, and cattle prices. These changes may alter many of the current conditions that are outlined in the Affected Environment section. However, the effects of implementing this alternative would not change the local communities.

The traditional uses, customs, and culture of Sublette County may be affected positively by implementing this alternative because the traditional “cowboy” culture would continue to be encouraged by allowing grazing on the Forest.

Negative effects on recreational users that object to cattle on the Forest would remain but would have a very slight effect on the total county economy. This effect is slight because the number of recreational users that would refrain from recreating on the National Forest in Sublette County because of cattle grazing is likely very small.

Cumulative Effects

See the Cumulative Effects section under Alternative 1 and Appendix A for a list of activities and a summary of the effects of past, present and foreseeable future human activities that in addition to the effects of Alternative 3 could impact the local communities and the economy.

Agriculture’s influence on the local communities would not change as a result of implementing Alternative 3. Adding the effects of past, present and reasonably foreseeable logging and recreational activities to the effects of implementing this alternative results in an overall benefit to the local economy. However, agriculture still represents a relatively small part of the county economy; so the benefit is very minor.

Environmental Justice Disclosure

Executive Order 12898 (Environmental Justice): Implementation of any project alternative is not anticipated to cause disproportionate adverse human health or environmental effects to minority or low-income populations.

Alternative 4 - Modified Grazing Management with Riparian Emphasis

Direct and Indirect Effects

Implementation of Alternative 4 would not change the permitted livestock numbers or duration of grazing as currently authorized (see alternative descriptions in Chapter 2). Alternative 4 is similar to Alternative 3 with the primary difference being a reduction in the maximum forage utilization of key forage species in riparian and meadow areas for four allotments (Badger, Beaver-Twin, Roaring Fork, and Upper Green River allotments). Alternative 4 proposes a maximum of 35 percent forage utilization of key forage species in riparian and meadow areas across four allotments compared with Alternative 3 which proposes a maximum of 50 percent forage when meeting desired conditions.

Alternative 4 brings the maximum utilization level permitted in riparian and meadow areas in line with actual livestock use of the six allotments as described in Alternative 2-Current Management. Implementing a 35 percent maximum forage utilization level in riparian and meadow areas would promote healthy streams and meadows and provide an adequate amount of suitable habitat for wildlife while providing livestock grazing opportunities. Alternative 4 is designed to balance livestock grazing with the habitat needs for a variety of wildlife species as directed in the Bridger-Teton National Forest Land and Resource Management Plan (Forest Plan, U.S. Forest Service 1990) management direction for Desired Future Condition (DFC) 10 and 12.

Other than a maximum 35 percent forage utilization of key forage species in riparian and meadow areas, Alternative 4 is identical to Alternative 3. Under Alternative 4, livestock numbers, season of use, management systems, more conservative prescriptions for areas of concern, structural improvements and adaptive management are as described above for Alternative 3.

Permitted forage utilization levels would remain the same in Alternative 3 and Alternative 4 for Noble Pastures Allotment (maximum of 40 – 50 percent utilization) and Wagon Creek Allotment (maximum of 50

percent utilization). Likewise, a maximum of 50 percent forage utilization on key forage species in the uplands and a 4-inch stubble height minimum would be retained at the greenline of streams across the project area where rangeland and riparian objectives are being met under both Alternative 3 and Alternative 4.

Agriculture related employment, spending, and other impacts to the local community would not be expected to change measurably as a result of continuing to authorize livestock grazing as described in this alternative (see Chapter 2). Changes in the local custom and culture related to domestic livestock grazing would not be expected, as livestock grazing would still be authorized on National Forest Service lands.

Local communities, agriculture, and local customs would continue to be influenced by a number of dynamic factors such as fuel costs, labor costs, feed costs, and cattle prices. These changes may alter many of the current conditions that are outlined in the Affected Environment section. However, the effects of implementing this alternative would not be expected to change the local communities.

Permittees would continue to conduct domestic livestock grazing and associated activities on the National Forest. The permittees would need to monitor the vegetation and move cattle away from natural congregation areas more frequently than under Alternatives 2 and 3, because most riparian use limits are more restrictive under Alternative 4. They may be required to pay for additional structural range improvements necessary to meet desired conditions. Implementation of this alternative would be expected to increase the level of effort that is required of permittees, thereby reducing the “feasibility”, in order to meet the additional grazing management requirements as outlined in Chapter 2.

The financial success of businesses such as ranching operations is affected by a multitude of factors. Those ranches that are in danger of financial failure would be expected to be most affected by the increased level of effort that would be necessary to comply with the mitigation measures outlined in this alternative. It would be difficult, if not impossible to determine whether this is the case for any of the permittees that graze their livestock on the allotments considered in this analysis. It is assumed that there is the possibility that these additional requirements, when added to the other financial challenges inherent in a small business operation, may contribute to the failure of the individual ranch. The likelihood of individual ranch failures may be greater under Alternative 4 than under Alternative 3 because, while Alternative 3 requires financial and personal efforts to stay in compliance with management requirements, most riparian use limits are more restrictive under Alternative 4 as compared to Alternative 3. Effects to local communities and agriculture would be limited because of the limited numbers of ranchers directly affected by this alternative; however the level of risk to communities would be greater under this alternative than under Alternatives 2 and 3 since ranch failure has a greater potential under Alternative 4.

Cumulative Effects

See the Cumulative Effects section under Alternative 1 and Appendix A for a list of activities and a summary of the effects of past, present and foreseeable future human activities that in addition to the effects of Alternative 4 could impact the local communities and the economy. When you add the effects of past, present and reasonably foreseeable logging and recreational activities to potential declines in local agriculture caused by Alternative 4, you are still considering a small part of the county economy.

This alternative is not expected to cause changes in the local economy that will result in losses that render the economy unable to recover, due to the small relative contribution to the total economy, and to a lesser degree the potential interplay of enhancement of amenity values and those positive effects on recreational uses. In turn, the traditional uses, custom, and culture of Sublette County may be affected by implementing this alternative, but the effect would not be expected to result in the loss of those values.

Soil Resources

Information provided in this DEIS about the soil resources of the project area was summarized from the Soil Resources Report (Winthers 2015). Adaptive management was referred to as "progressive design features" in this specialist report. The term "progressive design features" is synonymous with "adaptive management" and is described in this DEIS beginning on page 71 and 112 for Alternatives 3 and 4, respectively.

Overview of Issues Addressed

Issue 4: Rangeland Function

Livestock grazing may affect vegetation and soils, which are the components of overall rangeland function. Vegetation communities and watersheds that are not functioning properly provide less than optimum conditions for wildlife, rangeland health and productivity and soil stability.

Issue: Livestock grazing may negatively affect soil quality by causing detrimental soil conditions that can increase soil erosion due to reduced ground cover and soil compaction from trampling and trailing.

Indicators Used for Comparison of Alternatives

- Soil quality assessment
- Effective ground cover
- Detrimental soil disturbance
- Erosion and compaction potential

Indicators are evaluated in the context of an "activity area" (U.S. Forest Service 2011). The activity areas for the purposes of this analysis are the suitable and capable grazing acres within each pasture. Changes in the indicators are used as estimates of the potential direct, indirect, and cumulative effects of the alternatives on the soil resource for the temporary, short term, and long term.

Methodology

Consideration of material for analysis in the Soil Resources section and the collection and interpretation of field data used best available science. This section is based on the review of the complete project record for the Upper Green River Rangeland Project, on Region 4 guidelines and protocols, soil quality assessments, range studies, and the references cited. Valuable additional information was obtained by personal communication with specialists in Range Management, Hydrology and Fisheries on the Bridger-Teton National Forest.

Soil Quality Assessment

Soil quality is defined as the capacity of soil to function within natural or managed ecosystem boundaries, sustain plant and animal productivity, maintain or enhance the quality of water and air, and support human activities (Natural Resource Conservation Service 2001). Livestock grazing has the potential to degrade soil quality directly by trampling soils and indirectly by consuming or trampling vegetation that otherwise protects and helps form soils (Reid 1993, Natural Resource Conservation Service 2001). Soil compaction may reduce water infiltration and storage, physically restricts root growth, and reduces nutrient availability (Natural Resource Conservation Service 2001). The loss of vegetation results in bare ground, which is more susceptible to water and wind erosion, has increased precipitation runoff, and has less organic matter available for nutrient cycling (Natural Resource Conservation Service 2003).

A soil quality assessment was completed at sites within each pasture based on indicators of soil hydrologic and physical properties from site observations. Indicators include soil structure, compaction, active erosion including presence of rills and gullies, effective ground cover, soil displacement, and soil deposition. After

these indicators are assessed a soil health rating of satisfactory, impaired or unsatisfactory is determined. For the purpose of the soils analysis, an unsatisfactory rating is considered to have detrimental disturbed soils. When areas greater than five acres are found to be in unsatisfactory condition, they are mapped and recommendations are made for improvements and monitoring. Areas less than five acres with unsatisfactory conditions may be represented spatially by points on the map and specific site recommendations are often made for improvements and/or monitoring.

Ground Cover

Ground cover consists of vegetation, litter and rock fragments larger than 3/4-inch in diameter. Effective ground cover is expressed as the percentage of material, other than bare ground, covering the land surface and includes live vegetation, dead vegetation, litter, cobble, gravel less than 3/4-inch, stones and bedrock (U.S. Forest Service 2011). Effective ground cover is measured using either the 'line-intercept method' or by ocular estimate. For the line intercept method, a 100-foot tape is laid out along the length of the transect, then at each foot marker, two measurements are taken; the first "hit" is referred to as foliar cover and the second "hit' is the basal cover or the ground cover at the soil surface. The basal cover measurement is used for the effective ground cover value. With the ocular estimate, the observer estimates the amount of bare ground visually.

Recommended thresholds for minimum ground cover amounts to maintain soil quality and rangeland function vary. For example, a threshold of 60 percent effective ground cover is commonly used to determine when unsatisfactory ground cover conditions exist that could lead to detrimental soil disturbance. This threshold is supported by research conducted by Robichaud (2000) who concluded that sediment production is inversely related to ground cover, that is, runoff and sediment production decreases with increasing ground cover and levels off at 60 percent cover. Previous studies by Noble (1965) and Orr (1970) also found that 60 percent cover reduced sediment movement to negligible amounts, and 30 percent cover reduced erosion by about half compared to 100 percent bare ground (Robichaud 2000).

The Intermountain Region (Region 4) of the U.S. Forest Service recommended minimum ground cover thresholds for upland plant communities in 2005. These ground cover thresholds are used to indicate proper functioning rangeland (watershed) condition. Functionality was defined as keeping soil/watershed physical components intact to provide for long-term sustainability and recoverability (U.S. Forest Service 2005). Another study conducted by the Intermountain Research Station known as GTR-104, recommended higher ground cover thresholds by cover type for providing adequate watershed protection (O'Brien et al. 2003). Table 22 displays ground cover values by cover type recommended by the 2005 Region 4 and the 2003 GTR-104 publications.

Existing conditions were verified by ground cover data collected in the project area for soil quality assessments by the Forest Soil Scientist, by measurements conducted by the Range Conservationist, and by the use of the Bridger-East Ecological Unit Inventory (U.S. Forest Service 1997). The 60 percent ground cover threshold (Robichaud 2000) is used to indicate when detrimental disturbance to the soil has occurred. This threshold represents the minimum amount of ground cover necessary to limit soil erosion and maintain soil productivity (U.S. Forest Service 2005).

Tables 1 through 26 in Appendix A of the Soils Specialist Report (Winthers 2015) display the ground cover values by pasture, plot identifications, and related ecological map units. Appendix 5 of the Rangeland Vegetation Resource Report (Booth and Hayward 2015) available in the project record summarizes existing ground cover and desired conditions throughout the analysis area.

Detrimental Disturbance

Detrimental disturbance (DD) can occur when soil erosion rates exceed those acceptable for the soil type, or soils are compacted to a point that root growth is restricted, and/or effective ground cover is reduced to a point where protection against erosion by wind and water is reduced significantly (U.S. Forest Service 2011). The resulting detrimental disturbance can reduce the overall soil productivity within a pasture.

The amount of detrimental disturbance acceptable within a pasture is dependent on many different soil and vegetation characteristics and our ability to detect a change in soil productivity. Research by Powers and others (1998) concluded that the uncertainty surrounding a productivity estimate is due to climatic variables and limits to our knowledge. This uncertainty leads to uncertainty about how much change a soil can undergo before productivity is affected. Recognizing this, and based on collective judgment, the Forest Service estimates that a true productivity decline would need to be as great as 15 percent to be detectable by modern monitoring methods. Thus, soil quality thresholds are generally set to detect a decline in potential productivity of at least 15 percent, a value judged to be the smallest change detectable statistically at operational levels of monitoring (Powers et al. 1998). This does not mean that the Forest Service tolerates productivity declines of up to 15 percent, but merely that it recognizes problems with detection limits (Powers 1990).

For the purpose of this soils analysis, the amount (acres) of detrimental disturbance soil is estimated within each pasture on lands determined to be capable and suitable for livestock grazing. Table 3 and Figure 39 present the capable and suitable rangelands within each allotment and pasture. Maps depicting capable rangelands within each pasture and allotment are shown in Appendix A of the Soils Specialist Report (Winthers 2015). Tables 1 through 26 in Appendix A of the Soils Specialist Report (Winthers 2015) show the amount of capable rangelands by pasture and the estimated amount of detrimental disturbance occurring in a pasture. The 15 percent detrimental disturbance threshold is used to indicate a significant decline in soil productivity.

Potential Soil Compaction and Erosion Hazard Ratings

The rating criteria were adopted from the Region 4 Soil Interpretive Guide (U.S. Forest Service 2010) and the Natural Resource Conservation Service National Forestry Manual (Natural Resource Conservation Service 1998). The delineations used to calculate acres of each rating by soil type are from the map units developed during the Bridger East Ecological Unit Inventory conducted in the area from 1993 through 1997. The rating is based on the dominant soil type within the map unit. A map unit may have up to three or more different types of soil and therefore different ratings. The ratings are used to describe the relative risk of damage that could occur to the soil and to stratify the project area when assessing existing conditions. The relative percent of each pasture for the potential to be compacted or eroded is presented in Tables 1 through 26 in Appendix A of the Soils Specialist Report (Winthers 2015).

The potential compaction hazard rating describes the potential risk of inducing soil compaction through timber harvest, livestock grazing, or recreation activities. Soil compaction decreases the macropore space, increases bulk density, and results in damaged soil structure. Decreased porosity reduces infiltration and percolation, increases surface runoff, and encourages erosion. The physical, chemical and biological effects of compaction can restrict plant growth and reduce soil productivity (U.S. Forest Service 2003b).

The ratings are based on the soil textural class, coarse fragment content and shape, O horizon thickness, and soil structure, and use a weighted average of the top 12 inches of mineral soil. This rating assumes moist or wet soils. Dry soils are not as easily compacted as moist or wet soils. Frozen ground also tends to minimize the effects of compaction. Areas with high or moderate compaction hazard ratings may require restrictions on use during high moisture conditions (U.S. Forest Service 2010).

As a result of intensive use by cattle, wildlife, and/or wheeled off-road vehicles, soils with a slight limitation rating will generally not suffer an irreparable reduction in their long-term natural productivity. Soils with a moderate limitation rating could suffer a significant reduction in their long-term natural productivity capability. However, soils with a moderate rating can be managed for sustained natural productivity by controlling the timing and intensity of use, and their natural productivity can be restored through the application of relatively simple soil compaction amelioration treatments. Soils with a severe limitation rating could generally suffer a reduction in their long-term natural productivity level, even with limited grazing (U.S. Forest Service 2010).

Soils within capable rangelands on each pasture are rated for the potential to become compacted. This does not mean that they are currently compacted, but rather the soils have the potential to be compacted under certain conditions and intensive use. Compaction hazard and the relative ratings are displayed in tables presented in Appendix A of the Soils Specialist Report (Winthers 2015).

The potential erosion hazard rating describes the probability that damage will occur as a result of disturbance activities that expose the soil surface. Disturbance activities may include overgrazing, fire, fire lines, and off-road and off-trail travel. Potential erosion hazard ratings are based on slope, K-factor, and rock fragments on the surface layer. "Slight" refers to soils where erosion is unlikely under ordinary climatic conditions. "Moderate" refers to soils where some erosion is likely and control measures may be needed. "Severe" refers to soils where erosion is very likely and control measures for vegetation re-establishment on bare areas and structural measures are advised (U.S. Forest Service 2010).

Ratings assess sheet and rill erosion that result from exposed soil surfaces caused by various management practices such as grazing, mining, fire, or fire lines. These are activities that may disturb the soil, resulting in 50 to 75 percent bare-ground in the affected area. Ratings assume a 50 to 75 percent exposed, roughened mineral surface layer (U.S. Forest Service 2010). This does not mean that they are currently eroded, but rather the soils have the potential to be eroded under certain conditions when ground cover is less than 50 to 75 percent. Potential erosion hazard and the relative ratings are displayed for each pasture in tables presented in Appendix A of the Soils Specialist Report (Winthers 2015).

Capable Rangelands

For the purposes of the soils analysis, project level verification of the soil and ground cover criteria used in the determination of capable range for livestock was conducted by intersecting the capable range map with soils that have a high or severe soil potential soil erosion hazard rating and reviewing the ground cover data and soil quality assessments conducted throughout the project area. Each soil type has been rated for potential erosion hazard and potential compaction hazard. Soil map units, associated potential erosion hazard and potential compaction hazard ratings and acres of capable rangelands in each allotment are provided in the Soils Specialist Report Appendix A (Winthers 2015). In addition ground cover data are shown in relationship to the dominant soil type in each pasture.

After review of the areas of high or severe potential soil erosion hazard and associated ground cover data, soil erosion was determined not to be occurring at levels of concern in the areas of intersection. Ground cover data ranges from 60 to 100 percent across the majority of the project area. Although some capable grazing lands have areas of high erosion hazard potential, the absence of erosion concerns and the fact that ground cover is greater than 60 percent throughout the majority of the project area indicate that the majority of the acres meet criteria 3 and 4 and no acres are recommended to be removed. However, as described in Appendix A of the Soils Specialist Report (Winthers 2015), there are a few sites where ground cover is less than 60 percent. These sites occupy about 153 acres in the River Bottom pasture adjacent to the stock driveway and about 237 acres in the Rock Creek pasture along the ridgeline adjacent to a sheep allotment. While these sites have less than 60 percent ground cover, they all have the potential for greater than 60

percent ground cover according to the ecological types described in the Ecological Unit Inventory and range production data cited in the Rangeland Vegetation Resource Report (Booth and Hayward 2015).

Affected Environment

Soil and vegetation information collected as part of the Bridger East Ecological Unit Inventory and the Teton Soil Survey are available in the project record and are used to describe the affected environment on the capable rangelands within each allotment. The potential hazard of each soil type to be compacted or eroded is also displayed for capable rangelands by map unit. Tables and text presented in Appendix A of the Soils Specialist Report (Winthers 2015) indicate each soil map unit's ratings and their relative distribution on the lands capable of grazing for each pasture; ground cover measurements; soil quality assessments; and the amount of detrimental disturbance (DD) are disclosed for each pasture. Ecological map unit descriptions and maps filed in the project record provide detailed information about the soil and vegetation types found in each allotment. Table 40 provides a summary of soil quality assessment, detrimental disturbance, and capable acres by pasture.

Compaction

Soil quality assessments for compaction revealed that some compaction was evident in areas where cattle tend to congregate, such as near water sources, fence corners, and along the stock driveway. Specific areas where compaction was observed is discussed by pasture in Appendix A of the Soils Specialist Report (Winthers 2015). Overall, compaction caused by grazing was not found to be a significant problem throughout the project area. Compaction occurring at dispersed campsites along the Green River corridor and near the elk feedground contributes to the acres of detrimental disturbance described in the Roaring Fork South, Mud Lake East, and Upper Gypsum pastures (Table 40).

Table 40. Soil quality assessment, detrimental disturbance, and capable acres by pasture

Allotment	Pasture	Soil Quality Assessment	Detrimental Disturbance (Acres)	Capable Acres	Notes
Badger Creek	Badger Creek	Satisfactory	0	1217	
Beaver-Twin	North Beaver	Satisfactory	0	1207	
Beaver-Twin	Rock Creek	Satisfactory	0	2478	
Beaver-Twin	Rock Creek	Unsatisfactory	237		Occurs in map unit 3851 along ridge next to allotment boundary of sheep allotment. Impacts likely from a sheep bed ground.
Beaver-Twin	Twin Creeks	Satisfactory	0	2652	
Noble Pastures	Pasture 1	Satisfactory	0	192	
Noble Pastures	Pasture 2	Satisfactory	0	173	
Noble Pastures	Pasture 3	Satisfactory	0	239	
Noble Pastures	Pasture 3	Impaired	0	3	Soil displacement and compaction caused by trampling on wet soils.
Noble Pastures	Pasture 4	Satisfactory	0	136	
Noble Pastures	Pasture 4	Unsatisfactory	0	1	Low ground cover in old holding pen.
Roaring Fork	East	Satisfactory	0	1858	

Allotment	Pasture	Soil Quality Assessment	Detrimental Disturbance (Acres)	Capable Acres	Notes
Roaring Fork	South	Satisfactory	10	360	DD occurs in outfitter camp and at dispersed campsites along main road.
Roaring Fork	West	Satisfactory	0	2231	
Wagon Creek	Wagon Creek	Satisfactory	0	186	
Upper Green River	Mud Lake East	Satisfactory	0	5688	
Upper Green River	Mud Lake East	Impaired	4	100	Compaction and soil displacement near confluence of Roaring Fork and Green River near elk feed ground. 4 acres of this considered DD.
Upper Green River	Mud Lake East	Impaired	0	10	Near pasture boundary at Crow Creek.
Upper Green River	Mud Lake West	Satisfactory	0	4721	
Upper Green River	Mud Lake West	Impaired		1	Low ground cover near fence line between Mud Lake West and Fish Creek pastures.
Upper Green River	Fish Creek	Satisfactory	0	13437	
Upper Green River	Mosquito NE	Satisfactory	0	2448	
Upper Green River	Mosquito NE	Impaired	0	5	
Upper Green River	Mosquito NW	Satisfactory	0	3458	
Upper Green River	Mosquito SE	Satisfactory	0	2946	
Upper Green River	Mosquito SW	Satisfactory	0	2777	
Upper Green River	Lower Tepee	Satisfactory	0	3591	
Upper Green River	Lower Tepee	Impaired	0	5	Low ground cover and trampling in Tepee Creek focus area.
Upper Green River	Upper Tepee	Satisfactory	0	2596	
Upper Green River	Tosi Creek	Satisfactory	0	2388	
Upper Green River	Kinky Creek	Satisfactory	0	2458	
Upper Green River	Lower Gypsum	Satisfactory	0	3626	
Upper Green River	Upper Gypsum	Satisfactory	15	6373	5 acres of DD occurs at dispersed campsites and 10 acres at elk feed ground.
	River Bottom	Satisfactory		5123	
	TOTAL		**266**	**74,263**	**266 acres of DD and 125 acres of impaired soil conditions**

Erosion

Soil quality assessments revealed that some erosion was occurring near areas where stock congregate, such as watering areas and fence lines along slopes. Specific areas where erosion was observed is discussed by pasture in Appendix A of the Soils Specialist Report (Winthers 2015). These small areas of localized erosion were less than 1/10 of an acre and are not significant in extent. Overall, soil quality as indicated by erosion appears to be satisfactory.

Ground Cover

Ground cover data was collected at 47 range plots across the project area from 1992 through 2013. Upland sites accounted for approximately 79 percent of the range plots in the project area, while the remaining 21 percent were willow or riparian sites. Range monitoring results indicate that 41 of 47 sites sampled met the ground cover objective (Booth and Hayward 2015). Six monitoring sites were near the ground cover objective or did not meet the objective (see discussion in the Rangeland Vegetation section). According to rangeland data, 41 of the 47 sites sampled met, or were within the range of the established percentages needed for proper functioning condition according to GTR-104 (O'Brien et al. 2003). Six sites do not met the ground cover percentages established by GTR-104 to be in proper functioning condition. These sites occur in the Mosquito Southwest (SWMP-4), North Beaver (NBC-1), Twin Creeks (ULT-1, ULT-2), and Wagon Creek (WG-1) pastures. However, all of the 47 range sites were above the 60 percent threshold for determining when detrimental disturbance has occurred.

Ground cover data from 208 Bridger-East Ecological Unit Inventory plots collected in areas capable of grazing were reviewed by soil type (Winthers 2015). Ground cover values typically ranged from 60 to 100 percent across the pastures in the project area. Ground cover values below 60 percent occurred on one site in the Rock Creek Pasture and on three sites in the River Bottom Pasture. In the Rock Creek Pasture, the Bridger-East Ecological Unit Inventory plot was located near the boundary of an adjacent sheep allotment and given its location is not known to be used by cattle. In the River Bottom pasture, Bridger-East Ecological Unit Inventory plots located on about 150 acres of a sandy terrace adjacent to the Green River and on a three acre site in the adjacent upland have low ground cover. The potential for ground cover to be greater than 60 percent on these soils is likely if rested from grazing. The fact that the terraces are fairly level reduces the risk of water erosion significantly.

Therefore, soil quality, as indicated by ground cover, appears to be in satisfactory condition throughout the majority of the project area.

Soil Quality

Soil quality assessments conducted throughout the project area show that soil quality throughout the majority of the pastures is satisfactory. Based on ground cover data from the Bridger-East Ecological Unit Inventory plots, unsatisfactory conditions occur in the Rock Creek and River Bottom pastures as discussed above. Impaired soil conditions occur in Noble 3, Noble 4, Mud Lake East, Mosquito Northeast, and the Lower Tepee pastures. A total of 125 acres is considered impaired. Table 40 displays the soil quality assessment ratings, detrimental disturbance, and capable acres by pasture.

Detrimental Disturbance

Detrimental disturbance (DD) occurs on about 237 acres or about 9.5 percent of the capable acres in the Rock Creek Pasture of the Beaver-Twin Allotment. This is based on a Bridger-East Ecological Unit Inventory plot that was located on a limestone ridge near the boundary of an adjacent sheep allotment and given its location is not known to be used by cattle. An adjustment to the Rock Creek Pasture boundary is recommended. Ten acres or 2.7 percent of the Roaring Fork South Pasture is considered detrimental disturbance. This is due to compaction in and around the outfitter camp. Four acres or 0.07 percent is

considered detrimental disturbance due to compaction and soil displacement near confluence of Roaring Fork and Green River near the elk feedground. Fifteen acres or 0.23 percent of the Upper Gypsum Creek Pasture is considered detrimental disturbance due to compaction and soil displacement at the elk feedground and compaction occurring at dispersed campsites. As shown in Table 40. A total of 266 acres of detrimental disturbance and 125 acres of impaired soil quality conditions exist throughout the entire 74,263 acres of capable rangelands across the project area. This relatively small amount of detrimental disturbance and is considered to be insignificant.

Environmental Consequences

Spatial and Temporal Context for Effects Analysis

The temporal effects of reduced ground cover, which leads to soil erosion can last anywhere from 5 to 500 years depending on how much soil is lost and how fast the soil organic matter is replaced from the vegetation it supports. Severely compacted soils that limit root penetration can permanently reduce soil productivity if not treated. Light to moderately compacted soils (not root limiting) can recover overtime with natural freeze/thaw cycles and reduced use.

The spatial effects of reduced ground cover and soil erosion can be highly variable depending on the inherent erodibility of the particular soil types found within an allotment. Soils can vary spatially within short distances depending on the type of parent material in which they are derived. The pasture boundary generally is used as the ‘analysis area’ but effects may vary from soil type to soil type within a pasture. Effects on soil resources were analyzed for the six allotments in the project area.

Alternative 1 – No Livestock Grazing (No Action Alternative)

Direct and Indirect Effects

Compaction

Under Alternative 1, the effects of livestock grazing on compaction would dissipate over time. Specific areas, such as the area in and around the elk feedground would continue to have compacted soils due to the continued use by elk. Soils in and around dispersed campsites would continue to be compacted.

Erosion

Erosion caused by trampling by livestock near fence lines and corners, watering areas, and trailing areas would cease. As the fences are removed there would be short term impacts from equipment required for removal, but in the long term the areas would recover. Erosion in and around the elk feedground would continue. Erosion in and around dispersed campsites would continue.

Ground Cover

Ground cover would improve overtime as livestock are removed. Areas with naturally low ground cover would improve slightly over time. Specific areas, such as the area in and around the elk feedground would continue to have low ground cover due to the continued use by elk.

Soil Quality

Overall, soil quality would improve over time. Specific areas, such as the area in and around the elk feedground would continue to have impaired soil quality due to the continued use by elk. Impaired conditions noted in Noble Pastures 3 and 4, Mud Lake East and West, Mosquito NE and Lower Tepee would improve over time.

Detrimental Disturbance

The 237 acres of detrimental soil disturbance (DD) identified in the Rock Creek Pasture in the Beaver-Twin Allotment would likely continue as this area would continue to be used by domestic sheep and is outside the scope of this analysis. The areas of detrimental disturbance in and around the elk feedground would remain detrimentally disturbed. Areas with detrimental disturbance at dispersed campsites would remain.

Cumulative Effects for Alternatives 1, 2, 3 and 4

Past, present and reasonably foreseeable future activities (Appendix A) were considered for this cumulative effects analysis. The following past and present actions would continue to contribute negatively to cumulative effects on soil resources under all alternatives.

- Past timber harvest in the Upper Green River Area has led to some erosion and compaction along roads and in clear-cut units. Typically, these effects occur on lands not identified as capable of grazing.
- Dispersed camping along major roads has led to detrimental soil disturbance around the camping areas. This is mainly caused by vehicle and foot traffic around these areas.
- Off-road vehicle use on user created roads has caused erosion and compaction throughout the project area.
- Grazing of recreational stock at and around dispersed campsites contributes to detrimental soil disturbance.
- Soil compaction and detrimental disturbance are present on the elk feedground in the Upper Green. About 4 percent of the feedground area was found to be detrimentally disturbed (Winthers 2007).
- Several wildfires in the project area have contributed to soil erosion in the past, these include: 2013 Packer Miner Fire; Green Fire (2013); Kinky Fire (1991); Salt Lick Fire (2007), North Gypsum Creek Fire (1961), South Gypsum Creek Fire (1971), Battle Mountain Fire (2006) and the Jim Creek WFU Fire (2006). Soil erosion from these fires typically occurs within the first one to two years then stabilizes. Typically, timber is burned and rarely capable grazing lands.

The following reasonably foreseeable future activities would contribute negatively to cumulative effects on soil resources under all alternatives.

- Pinyon Osborn Vegetation Treatments is a prescribed burning project that may cause some localized erosion.
- Green River Corridor Recreation Planning Project may result in a reduction in dispersed campsites and unauthorized roads which would reduce soil erosion and compaction.

The cumulative effect of these activities combined with each alternative would fall below the 15 percent detrimental disturbance threshold used to indicate a significant decline in soil productivity. Cumulatively, the negative effects of the activities mentioned above on soil resources would be partially offset by positive effects of implementing the Green River Corridor Recreation Project and removing livestock grazing as proposed under Alternative 1. This cumulative effect would have the smallest negative cumulative effect compared to the cumulative effects associated with Alternative 2, 3 or 4. Likewise, the negative effects of the activities mentioned above on soil resources would be partially offset by the positive effects of implementing the Green River Corridor Recreation Project and the modified livestock grazing management proposed under Alternative 3 and Alternative 4. The cumulative effects associated with Alternatives 3 and 4 would be smaller than the cumulative effects associated with Alternative 2.

Alternative 2 – Grazing as Currently Permitted and Current Management

Direct and Indirect Effects

Compaction

The effects of livestock grazing on soil compaction would continue on soils prone to compaction (see Potential Soil Compaction Hazard Rating). At the described maximum utilization proposed under Alternative 2 - Grazing as permitted, compaction may increase on soils with severe compaction potential ratings. Specific areas, such as the area in and around the elk feedground would continue to have compacted soils due to the continued use by elk. Soils in and around dispersed campsites would continue to be compacted.

Erosion

The effects of livestock grazing on soil erosion would continue and may increase on soils with severe erosion hazard potential and in high use areas such as along fence lines, near fence corners, around watering areas, and along trailing areas. Erosion in and around the elk feedground would continue. Erosion in and around dispersed campsites would continue.

Ground Cover

Ground cover would be reduced in some areas at the maximum utilization levels. Specific areas, such as the area in and around the elk feedground would continue to have low ground cover due to the continued use by elk.

Soil Quality

The effects of continued livestock grazing at maximum utilization levels on soil quality are expected to cause an increase in impaired and unsatisfactory soil quality ratings. Specific areas, such as the area in and around the elk feedground would continue to have impaired soil quality due to the continued use by elk. Identified impaired areas would remain impaired and may trend toward unsatisfactory.

Detrimental Disturbance

The 237 acres of detrimental disturbance (DD) identified in the Rock Creek Pasture in the Beaver-Twin Allotment would likely continue as this area would continue to be used by domestic sheep and is outside the scope of this decision. The areas of detrimental disturbance in and around the elk feedground would remain detrimentally disturbed. Areas with detrimental disturbance at dispersed campsites would remain.

Cumulative Effects

See discussion of cumulative effects under Alternative 1

Alternative 3 – Modified Grazing Management (Proposed Action)

Direct and Indirect Effects

Compaction

Alternative 3 would decrease soil compaction by implementing the 30 to 50 percent maximum forage utilization standard on upland and riparian areas and the 4 or 6-inch stubble height minimum requirement along the greenline of streams. Since livestock would be spending less time in a particular pasture, there would be less opportunity for trampling that could lead to soil compaction. In addition, by reducing the number of cattle in Mosquito pastures by 15 percent, and implementing rotational grazing systems in Badger Creek, Roaring Fork and Beaver-Twin allotments would decrease the potential for compaction in these pastures as well. Adding the Kinky Creek pasture into the Tosi/Tepee deferred rotation grazing system decreases the potential for compaction by reducing use on these pastures. Rehabilitating the two-track

unauthorized road off of Forest Road 691 in the Fish Creek pasture would ameliorate compaction along this route.

While Alternative 3 reduces overall soil compaction compared with the existing condition, compaction would continue in high use areas such as along fence lines, near fence corners, around watering areas, and along trailing areas, as these effects are unavoidable. Compaction in and around the elk feedground and by dispersed campsites would continue.

Erosion

Alternative 3 would decrease erosion by implementing a maximum of 30 to 50 percent forage utilization standard on uplands and riparian areas and the 4 or 6-inch stubble height minimum requirement along the greenline of streams. Since livestock would be spending less time in a particular pasture, there would be less opportunity for trampling that would expose the mineral soil surface causing erosion. In addition, by reducing the number of cattle in Mosquito Pastures by 15 percent, , and implementing rotational grazing systems in Badger Creek, Roaring Fork and Beaver-Twin allotments would decrease the erosion in these pastures as well. Adding the Kinky Creek Pasture into the Tosi/Tepee deferred rotation grazing system would decrease erosion by reducing use on other pastures in the system.

<u>Range improvements planned in this alternative would reduce erosion in several locations:</u>

- Rock Creek Pasture – fence reconstruction to improve distribution.
- North Beaver – construct pasture fence between North Beaver and Twin Creeks pasture to implement rotational grazing system and improve distribution.
- Noble Pasture 3 – harden irrigation ditch crossing.
- Noble Pasture 4 – construct exclosure fence along Klondike Creek, harden crossing and construct livestock holding pen on the southwest corner.
- Mud Lake – re-align the fence at the boundary of the east and west pastures, to the east away from Crow Creek. Cattle tend to congregate in the southwest corner of the Mud Lake East Pasture because they are headed home. This fence realignment would move Crow Creek out of this southwest corner of Mud Lake East and place it in the southeast corner of Mud Lake West where livestock use is expected to be substantially less.
- Mosquito Southeast pasture – construct hardened stream crossing at upper end of exclosure in the Wagon Creek focus area.
- Tepee Creek – build a permanent exclosure along Tepee Creek Focus area to reduce stream bank and upland erosion occurring at this site.
- Fish Creek Pasture - - Rehabilitate unauthorized two-tract road off of Forest Road 691 in the Fish Creek focus area.
- Kinky Creek Pasture – construct fence to add Kinky Creek South Pasture to the Tosi Creek/ Tepee Creek rotation to implement deferred rotation grazing system and improve livestock distribution.

While Alternative 3 addresses areas of concern and reduces overall erosion, soil erosion would continue in high use areas such as along fence lines, near fence corners, around watering areas, and along trailing areas, as these effects are unavoidable, however, the extent would be similar to or less than under existing conditions, and is an acceptable level. Some erosion would occur when implementing range improvements, but these effects are temporary. Erosion in and around the elk feedground and around dispersed campsites would continue.

Ground Cover

Alternative 3 would increase ground cover through implementing 30 to 50 percent utilization standard on uplands and riparian areas and the 4 or 6 inch stubble height requirement along the greenline of streams in pastures and focus areas. Since livestock would be eating less, more plant material would be left at the end of the grazing season, adding organic material to the soil surface. In addition, by reducing the number of cattle in Mosquito pastures by 15 percent, and implementing rotational grazing systems in Badger Creek, Roaring Fork and Beaver-Twin allotments would increase the ground cover in these pastures as well. Adding the Kinky Creek Pasture into the Tosi/Tepee deferred rotation grazing system would increase ground cover by increasing the amount of available forage while reducing use on other pastures. Within the Tepee Creek exclosure, ground cover would be increased overtime because grazing would be excluded, allowing vegetation to re-establish. Impaired ground cover conditions noted in the Mud Lake East Pasture at Crow Creek would improve after re-aligning the fence to the east of the disturbed area.

While this alternative increases overall ground cover, areas of low ground cover would still occur in high use areas such as along fence lines, near fence corners, around watering areas, and along trailing areas, as these effects are unavoidable but minor in extent. Sites with low ground cover in and around the elk feedground and by dispersed campsites would continue.

Soil Quality

Alternative 3 maintains and improves overall soil quality by reducing utilization levels, changing grazing systems and implementing range improvements. Identified impaired areas would be expected to trend toward satisfactory in the next 10 to 20 years. Specific areas, such as the area in and around the elk feedground would continue to have impaired soil quality due to the continued use by elk.

Detrimental Disturbance

No additional acres of detrimental disturbance are expected in this alternative as design features are implemented. The 237 acres of detrimental disturbance identified in the Rock Creek pasture would likely continue as this area would continue to be used by domestic sheep and is outside the scope of this decision. The areas of detrimental disturbance in and around the elk feedground would remain detrimentally disturbed. Areas with detrimental disturbance at dispersed campsites would remain.

Cumulative Effects

See discussion of cumulative effects under Alternative 1

Alternative 4 – Modified Grazing Management with Riparian Emphasis

Direct and Indirect Effects

Compaction

Alternative 4 would further decrease soil compaction or the potential for compaction in riparian and meadow areas by implementing a 35 percent maximum forage utilization standard for Badger, Beaver-Twin, Roaring Fork and Upper Green River allotments. Since livestock would be spending less time in riparian and meadow areas there would be less opportunity for trampling that could led to soil compaction. In addition, by reducing the number of cattle in Mosquito pastures by 15 percent and implementing rotational grazing systems in Badger Creek, Roaring Fork and Beaver-Twin allotments, this alternative would decrease the potential for compaction in these pastures as well. Adding the Kinky Creek pasture into the Tosi/Tepee deferred rotation grazing system would decrease the potential for compaction by reducing use on these pastures. Rehabilitating the two-track unauthorized road off of Forest Road 691 in the Fish Creek pasture would ameliorate compaction along this route.

While this alternative reduces overall soil compaction compared with the existing condition, compaction would continue in high use areas such as along fence lines, near fence corners, around watering areas, and along trailing areas, as these effects are unavoidable and acceptable. Some compaction would occur when implementing range improvements, such as those associated with motor vehicles traveling off-road and along fence lines, but these effects are temporary and limited in extent. Compaction in the holding area, proposed to the south of Noble Pasture 4, would result from confining the herd in a small area (< 1 acre) for a short period of time (several days). These impacts are unavoidable and acceptable. Compaction in and around the elk feed ground and by dispersed campsites would continue.

Erosion

Alternative 4 would further decrease soil erosion or the potential for erosion in riparian and meadow areas by implementing a 35 percent maximum forage utilization standard for Badger, Beaver-Twin, Roaring Fork and Upper Green River allotments. Since livestock would be spending less time in a particular pasture, there would be less opportunity for trampling that would expose the mineral soil surface causing erosion. In addition, by reducing the number of cattle in Mosquito pastures by 15 percent, and implementing rotational grazing systems in Badger Creek, Roaring Fork and Beaver-Twin allotments would decrease the erosion in these pastures as well. Adding the Kinky Creek pasture into the Tosi/Tepee deferred rotation grazing system would decrease erosion by reducing use on other pastures in the system.

<u>Range improvements planned in this alternative would reduce erosion in several locations:</u>

- Rock Creek Pasture – fence reconstruction to improve distribution.
- North Beaver – construct pasture fence between North Beaver and Twin Creeks pasture to implement rotational grazing system and improve distribution.
- Noble Pasture 3 – harden irrigation ditch crossing.
- Noble Pasture 4 – construct exclosure fence along Klondike Creek, harden crossing and construct livestock holding pen on the southwest corner.
- Mud Lake – re-align the fence at the boundary of the east and west pastures, to the east away from Crow Creek. Cattle tend to congregate in the southwest corner of the Mud Lake East Pasture because they are headed home. This fence realignment would move Crow Creek out of this southwest corner of Mud Lake East and place it in the southeast corner of Mud Lake West where livestock use is expected to be substantially less.
- Mosquito Southeast pasture – construct hardened stream crossing at upper end of exclosure in the Wagon Creek focus area.
- Tepee Creek – build a permanent exclosure along Tepee Creek Focus area to reduce stream bank and upland erosion occurring at this site.
- Fish Creek Pasture - - Rehabilitate unauthorized two-tract road off of Forest Road 691 in the Fish Creek focus area.
- Kinky Creek Pasture – construct fence to add Kinky Creek South Pasture to the Tosi Creek/ Tepee Creek rotation to implement deferred rotation grazing system and improve livestock distribution.

While Alternative 4 addresses areas of concern and reduces overall erosion, soil erosion would continue in high use areas such as along fence lines, near fence corners, around watering areas, and along trailing areas, as these effects are unavoidable; however the extent would be similar to – or less than under existing conditions, and is an acceptable level. Some erosion would occur when implementing range improvements, but these effects are temporary. Erosion in and around the elk feedground and around dispersed campsites would continue.

Ground Cover

Alternative 4 would further increase ground cover in riparian and meadow areas by implementing a 35 percent maximum forage utilization standard for Badger, Beaver-Twin, Roaring Fork and Upper Green River allotments. Since livestock would be eating less, more plant material would be left at the end of the grazing season, adding organic material to the soil surface, thus increasing ground cover. In addition, by reducing the number of cattle in Mosquito pastures by 15 percent, and implementing rotational grazing systems in Badger Creek, Roaring Fork and Beaver-Twin allotments, an increase in ground cover can be expected as a result. Adding the Kinky Creek Pasture into the Tosi/Tepee deferred rotation grazing system would increase ground cover by increasing the amount of available forage while reducing use on other pastures. Within the Tepee Creek focus area proposed exclosure, ground cover would be increased overtime because grazing would be excluded, allowing vegetation to re-establish. Impaired ground cover conditions noted in the Mud Lake East Pasture at Crow Creek would improve after re-aligning the fence to the east of the disturbed area.

While this alternative increases overall ground cover, areas of low ground cover would still occur in high use areas such as along fence lines, near fence corners, around watering areas, and along trailing areas, as these effects are unavoidable but minor in extent. Sites with low ground cover in and around the elk feedground and by dispersed campsites would continue.

Soil Quality

Alternative 4 maintains and improves overall soil quality by reducing utilization levels, changing grazing systems and implementing range improvements. Identified impaired areas would be expected to trend toward satisfactory in the next 10 to 20 years. Specific areas, such as the area in and around the elk feedground would continue to have impaired soil quality due to the continued use by elk. Identified impaired areas would be expected to trend toward satisfactory.

Detrimental Disturbance

No additional acres of detrimental disturbance are expected in this alternative as design features are implemented. The 237 acres of detrimental disturbance identified in the Rock Creek pasture would likely continue as this area would continue to be used by domestic sheep and is outside the scope of this decision. The areas of detrimental disturbance in and around the elk feedground would remain in detrimental disturbance. Areas with detrimental disturbance at dispersed campsites would remain.

Cumulative Effects

See discussion of cumulative effects under Alternative 1

Botany: Sensitive and Management Indicator Species

Information provided in this DEIS about the sensitive and management indicator plant resources of the project area was summarized from the Botany Report (Johnson 2014). Adaptive management was referred to as "progressive design features" in this specialist report. The term "progressive design features" is synonymous with "adaptive management" and is described in this DEIS beginning on page 71 and 112 for Alternatives 3 and 4, respectively.

Overview of Issues Addressed

Issue 1: Effects on Threatened, Endangered, and Sensitive Species, as well as Other Species of Concern

The concern is that livestock grazing may affect the recovery of threatened, endangered, proposed, candidate and sensitive species, in addition to viability and habitat objectives for other species in the project area. The Forest Plan provides direction for threatened, endangered, sensitive species and management indicator species. Species conservation is directed by laws, regulations, and policies.

Indicators Used for Comparison of Alternatives

- Presence of livestock grazing
- Construction of structural improvements

Affected Environment

Desired Conditions

The desired conditions as they relate to sensitive and management indicator plant species are: for the alternatives to not lead a sensitive species towards listing as threatened or endangered; for the alternatives to not lead management indicator species to listing as sensitive; and for aspen to reach or maintain ≥ 95 percent ground cover and the presence of certain species in the community.

Species Evaluated

All Bridger-Teton National Forest management indicator species and all Region 4 sensitive plant species known or suspected to occur on the Bridger-Teton National Forest (U.S. Forest Service 2011) were reviewed for their relevancy to the action alternatives. Relevancy was determined if there is evidence of species occurrence and/or suitable habitat present in the project area. Local Forest Service records and GIS data, as well as occurrence data from the Wyoming Natural Diversity Database (2011) was consulted. The Bridger-Teton National Forest has worked with the Wyoming Natural Diversity Database to assemble information on sensitive species since 1989 as directed in the Monitoring section of the Bridger-Teton National Forest Land and Resource Management Plan (as amended, U.S. Forest Service 1991). Additionally, point occurrence data was obtained from the Rocky Mountain Herbarium Specimen Database (Rocky Mountain Herbarium 2012) for sensitive species.

There are five species with analysis requirements which are known to be present in the analysis area. One management indicator species (aspen) and four sensitive species (Payson's milkvetch, Payson's bladderpod, naked-stemmed parrya, and whitebark pine) have known populations in the analysis area. In addition, 14 other species with analysis requirements have potential habitat present in the analysis area with no known occurrences, two of which are management indicator species. All species were analyzed for the presence of their potential habitat in the project area. Species without potential habitat in the project area are considered to have a lack of suitable habitat and the activities would have no impact to those species, there are two species which meet the criteria for no impact. The species carried forward in the analysis are listed below in Table 41. For this analysis the species are grouped according to habitat because effects would be similar.

Table 41. Region 4 sensitive and management indicator species that have known occurrences or potential habitat in the project area

Name	Habitat Description	Manage-ment Type	Known Occurrences in Project Area	Habitat in project area	Likelihood of effects from grazing and trampling
pink agoseris	This species is found in mid-montane to subalpine wet meadow, saturated soils at 8,500 to 10,600 feet in elevation (Fertig et al. 1994).	Sensitive	No	Yes- wet meadows are present within the elevation range of this species.	High - wet meadows are highly likely to be grazed.
sweet-flowered rock jasmine	This species is known in the east slope of the Wind River Range, eastern Absaroka Mountains and the Owl Creek Mountains. Preferred habitat is on exposed settings of rocky ridge crests, slopes with rock outcrops and thin soils of limestone or dolomite substrate at 8,500 to 10,800 feet elevation. (Fertig 2001a)	Sensitive	No	Yes- the rocky habitat of this species is present in the project area within the elevation envelope of this species.	Low - the rocky habitat of this species is unlikely to have grazing or even the presence of livestock.
Payson's milkvetch	This species occurs primarily in disturbed areas on sandy soils that have a low cover of forbs and grasses at elevations of 5,850 to 9,600 feet (Heidel 2008.)	Sensitive	Yes	Yes - a known population exists in the Beaver-Twin Unit.	Low - This species occupies sparsely vegetated areas, as such little grazing is likely but livestock may move through these areas.
seaside sedge	This species occurs primarily in alpine and subalpine moist tundra and wet rock ledges 10,000 to 12,200 elevation (Fertig 2000c).	Sensitive	No	Yes - the rocky alpine habitat of this species is present in the project area.	Low - the rocky and barren habitat of this species is unlikely to have grazing or even the presence of livestock.
black and purple sedge	This species is found in subalpine wet meadows and stream sides at 10,000 to 10,600 feet elevations (Mills and Fertig 2000).	Sensitive	No	Yes- the sub-alpine habitat of this species is present in the project area within the elevation envelope of this species.	Moderate - the sub-alpine meadow habitat of this species is likely to be grazed.
Wyoming tansymustard	Wyoming tansymustard is restricted to the southern Absaroka Range and the Rock Springs Uplift. Habitat is sandy soil at the base of cliffs composed of volcanic breccia or sandstone, under slight	Sensitive	No	Yes - The rocky habitat of this species is present in the project area within the elevation	Low - the rocky and barren habitat of this species is unlikely to have grazing or even the presence of livestock.

Name	Habitat Description	Manage-ment Type	Known Occurrences in Project Area	Habitat in project area	Likelihood of effects from grazing and trampling
	overhangs, in cavities in the volcanic rock, or on ledges. It is found at elevations of 7,700 to 10,500 feet (Fertig 2000d).			range of this species.	
rockcress draba	Rockcress draba is found in moist, gravelly alpine meadows and talus slopes, often on limestone-derived soils. Found from 8,100 to 12,400 feet (Handley 2008).	Sensitive	No	Yes - The rocky and wet habitat of this species is present in the project area within the elevation range of this species.	Low - the rocky and barren habitat of this species is unlikely to have grazing or even the presence of livestock.
narrowleaf goldenweed	This species is typically found in semi-barren, whitish clay flats and slopes, gravel bars, and sandy lakeshores at elevations of 7,700 to 10,300 feet (Fertig 2000e).	Sensitive	No	Yes - The habitat for this species exists within the project area within the species' elevation envelope.	Low - the barren habitat of this species is unlikely to have grazing or even the presence of livestock.
woolly daisy	This species is found on alpine or subalpine limestone talus slopes at 11,000 feet elevation (Fertig 2001).	Sensitive	No	Yes - the rocky alpine habitat of this species is present in the project area.	Low - the rocky and barren habitat of this species is unlikely to have grazing or even the presence of livestock.
Payson's bladderpod	This species is endemic to the carbonate mountain ranges of west-central Wyoming, eastern Idaho, and southwestern Montana. It is found on rocky, sparsely-vegetated slopes, often calcareous substrates at elevations of 5,500 to 10,600 feet (Heidel 2008a).	Sensitive	Yes	Yes - There are multiple known occurrences of this species within the project area in the Lower Gyp Pasture, Kendall Warm Springs area and in the river bottom pasture and the livestock driveway.	High - Several populations of this species exist in areas where cattle would be intentionally driven and there is a high risk that trampling would occur.
naked-stemmed parrya	This species is found on alpine talus, often on limestone substrates at 10,700 to 11,400 feet elevation (Fertig 2000b).	Sensitive	Yes	Yes- there is a known occurrence in the Upper Gyp Pasture.	Low - the rocky and barren habitat of this species is unlikely to have grazing or even the presence of livestock.

Name	Habitat Description	Manage-ment Type	Known Occurrences in Project Area	Habitat in project area	Likelihood of effects from grazing and trampling
creeping twinpod	Found on barren, rocky, calcareous hills and slopes at 6,500 to 8,600 feet elevation (Fertig et al. 1994).	Sensitive	No	Yes - the barren and rocky habitat of this species is present within the analysis area.	Low - the rocky and barren habitat of this species is unlikely to have grazing or even the presence of livestock.
whitebark pine	This species grows in pure stands near the treeline and in mixed stands in subalpine forests from under 8,000 to over 10,000 feet in Wyoming.	Sensitive	Yes	Yes - whitebark pine exists in pure and mixed stands across the project area.	Low - livestock are unlikely to directly interact with this species, since pines are generally not palatable and are unlikely to be trampled.
Greenland primrose	This species is found in wet meadows along streams and calcareous montane bogs from 6,600 to 8,000 feet (Fertig et al. 1994).	Sensitive	No	Yes - The wet habitat of this species is present within the project area within the elevation envelope of the species.	Moderate - the meadow habitat of this species is likely to be grazed.
Weber's saussurea	Restricted to the Gros Ventre and northern Wind River ranges. Habitat is on alpine talus slopes and gravel fields. 9,600 to 11,500 feet (Fertig 2000a).	Sensitive	No	Yes - the rocky alpine habitat of this species is present in the project area	Low - rocky /barren habitat of this species is unlikely to have grazing or even the presence of livestock.
soft aster	In Wyoming, this species has been found in the Big Horn Mts and Hoback Canyon. It prefers sagebrush grasslands and mountain meadows in calcareous soils at 6,400 to 8,500 feet elevation (Fertig et al. 1994).	Sensitive	No	Yes - the sagebrush and grassland habitat of this species is present in the project area within the elevation envelope of the species.	High - most of the areas in the project area likely to have livestock grazing are in sagebrush grasslands.
Not Sensitive – Management Indicator Species					
aspen	Aspen can be found throughout the Bridger-Teton. It occurs in pure stands, or mixed with subalpine fir, lodgepole pine, Douglas-fir, whitebark pine, or Engelmann spruce. In lower elevations, it forms a mosaic with shrublands.	Ecological Manage-ment Indicator Species	Yes	Yes - aspen exists in pure stands as well as in stands mixed with conifers across the project area.	High - aspen suckers, seedlings and saplings are highly susceptible to cattle grazing.

Name	Habitat Description	Manage-ment Type	Known Occurrences in Project Area	Habitat in project area	Likelihood of effects from grazing and trampling
boreal draba	Known in Wyoming from the southwestern Absaroka, western Wind River, Gros Ventre, Salt and Wyoming ranges, Jackson Hole and the Yellowstone Plateau. North-facing limestone, dolomite or volcanic slopes, cliffs and riparian areas at 6,200-8,500 (Fertig 1999).	Ecological Manage-ment Indicator Species	No	Yes - The rocky and wet habitat of this species is present in the project area within the elevation range of this species.	Moderate - the riparian component of this species' habitat may have impacts from grazing and trampling.
Shultz's milkvetch	Distribution is centered in Wyoming in the Teton, Salt and Wind River ranges. Found primarily in subalpine forb communities on shallow, rocky, calcareous soils at elevations 8,800 to 11,500 feet (Heidel and Fertig 2008).	Ecological Manage-ment Indicator Species	No	Yes- the sub-alpine habitat of this species is present in the project area within the elevation envelope of this species	Moderate - the meadow forb community is likely to have some grazing, but not as much as adjacent grasslands

Species Information – Species Known to Occur in the Project Area

Rocky and Barren Habitats and Have Individuals Present

- **Payson's milkvetch** (*Astragalus paysonii*) – Sensitive species and individuals present in project area. There is one known occurrence of Payson's milkvetch in the project area. This occurrence is near 'The Rim' at the southern tip of the Beaver-Twin Allotment. Payson's milkvetch is a disturbance adapted species which grows in sandy soils with a low cover of potentially competing vegetation (Heidel 2008).
- **Payson's bladderpod** (*Lesquerella paysonii*) - Sensitive species and individuals present in project area. There are eight known occurrences of Payson's bladderpod in the project area, four of which are in the Kendall Warm Springs area, two or three occurrences in the River Bottom Pasture, one in the Lower Gyp Pasture in the Upper Green River Allotment, and one in the Upper Tepee Pasture in the Upper Green River Allotment.
- **Payson's bladderpod** (*Lesquerella paysonii*) - Sensitive species and individuals present in project area grow in open and sparsely vegetated areas and is typically associated with sagebrush grasslands within a fairly broad elevation envelope (5,500 – 10,600 feet) (Fertig and Heidel 2008). The occurrences in the project area all fall within this general habitat description and include several road-side populations in the Kendall Warm Springs area. While Payson's bladderpod occupies sparsely vegetated areas it is unclear if the species is disturbance adapted. Recent surveys for Payson's bladderpod have shown that it occupies areas that are naturally low in vegetative cover, such as talus slopes, but also grows in pipeline corridors and on exposed ridge-tops which have been recently bladed (Heidel 2012). The open and barren nature of this species' habitat and its possible interaction with disturbance means that invasive plants may be a threat.

- **Naked-stemmed parrya** (*Parrya nudicaulis*) – Sensitive species and individuals present in project area. One occurrence of naked-stemmed parrya is in the project area in the Upper Gyp Pasture in the Upper Green River Allotment on the slopes of Gypsum Mountain. This occurrence barely reaches into the mapped project area and is not within an area identified as capable for livestock grazing. Naked-stemmed parrya grows on limestone talus slopes (Fertig 2000b) which are largely not capable for livestock grazing.

Forested Habitats with Known Individuals Present

- **Whitebark pine** (*Pinus albicaulis*) – Sensitive species and individuals present in project area. Whitebark pine grows in pure and mixed stands at high elevations throughout the project area. The Bridger-Teton vegetation layer identified almost 15,000 acres of whitebark pine forest in the project area, 4,945 acres of pure whitebark pine and 9,964 acres of whitebark pine mixed with other conifers. The areas where whitebark pine grows are largely forested and are not in areas identified as capable for livestock grazing. The areas that were mapped as capable for livestock grazing are areas where whitebark pine does not grow. It is highly unlikely that livestock grazing or trampling would affect this species. The major threats to this species, as identified by Tomback et al. (2001 and references therein) and the U.S. Fish and Wildlife Service (2011), are successional replacement by shade-tolerant conifers resulting from fire suppression, as well as an exotic fungal infection and native beetle epidemics, none of which have any direct or indirect link to livestock grazing.
- **Aspen** (*Populus tremuloides*) – Management indicator species and individuals present in project area. Aspen grows in both pure stands as well as stands which are mixed with conifers in the project area. The Bridger-Teton vegetation layer identified around 9,800 acres of aspen forest in the project area, 9649 acres of pure aspen and 155 acres of aspen mixed with conifers. Areas with aspen are largely within areas identified as capable for livestock grazing and aspen is preferred forage for livestock (DeByle 1985). Direct effects from grazing include the removal of aspen biomass as well as physical damage to aspen as a result of livestock seeking shade in aspen groves. There is also an indirect effect which operates through the alteration of the unique plant community associated with the aspen ecosystem.

The data available on aspen in the project area indicates that aspen stands are in a functioning condition as a whole. Range plot data shows that ground cover exceeds the ≥95 percent threshold for all range plots in the project area which had aspen listed as the forest type. Additional data gathered in the project area shows that 17 of 21 aspen sites were of a community type where one of the species associated with a functioning aspen stand were present ≥5 percent of cover. Taken together, the information available on aspen in the project area indicates that aspen is in a functioning condition as a whole, despite the presence of an artificially large population of wild ungulates and continued livestock grazing in the area.

Species with possible habitat present in project area but with no known occurrences

Rocky and Barren Habitat But No Known Individuals Present

Species in this group have habitat which is rocky and barren and often found at high elevations in an alpine or sub-alpine setting. The potential habitat of these species is often found in areas which are classified as devoid of vegetation and as such have little interaction with livestock grazing. While some of these sparsely vegetated areas could be used by livestock moving between grazing areas it is unlikely that individual plants would be physically damaged because of the rocky nature of their habitat. Species in this group include sweet-flowered rock jasmine (*Androsace chamaejasme ssp. carinata*), seaside sedge (*Carex incurviformis*), Wyoming tansymustard (*Descurainia torulosa*), rockcress draba (*Draba globosa*), narrowleaf goldenweed (*Ericameria discoidea* var. *linearis*), woolly daisy (*Erigeron lanatus*), creeping twinpod (*Physaria integrifolia* var. *monticola*), Weber's saussurea (*Saussurea weberi*), and boreal draba (*Draba borealis*).

Meadow and Riparian Habitat but No Known Individuals Present

Species in this group include: pink agoseris (*Agoseris lackschewitzii*), black and purple sedge (*Carex luzulina* var. *atropurpurea*), Greenland primrose (*Primula egalikensis*), and Shultz's milkvetch (*Astragalus shultziorum*).

Sagebrush Habitat

Soft aster (*Symphyotrichum molle*) - Sensitive species and habitat present in project area. Soft aster is endemic to the Bighorn Mountains and Hoback Canyon in Wyoming. There is one occurrence in Hoback Canyon, which is the only record known outside the Bighorn Range (Fertig 2000f). There are no occurrences in the project area. It is unlikely that unknown occurrences of soft aster are in the project area, however, the sagebrush areas cannot be ruled out as habitat. Fertig (2000) stated that while data are lacking for most populations, trend is probably stable and the species appears to tolerate low levels of disturbance.

Environmental Consequences

Methodology

Indicators

As stated in the significant issue statements in Chapter 1, there is concern that livestock grazing may affect the recovery of threatened, endangered, proposed and sensitive species, in addition to viability and habitat objectives for other species in the project area. To differentiate between alternatives this analysis will use a graze/no-graze dichotomy combined with associated activities such as fencing and construction. Permitted grazing or non-grazing along with associated activities in each alternative is the indicator of the potential impacts to sensitive plant species. The three action alternatives have roughly the same proposed density of grazing (46,148 animal unit months in Alternative 2 and 44,722 in Alternative 3and Alternative 4), but differ in their associated activities. The three action alternatives also differ slightly in the timing and utilization level of grazing. The timing and intensity of grazing and the density of livestock are similar enough that it is appropriate to present the three action alternatives together since their effects to rare plants would be similar. Animal unit months are the amount of forage required for an animal unit for one month. An animal unit for this analysis is a cow/calf pair or a horse. The indicator of grazing versus no grazing was chosen because it represents the proposed intensity of livestock grazing. Thus the possibility of physical damage to rare plants from hoof action or alteration of habitat is analyzed as a simple graze/no-graze dichotomy as opposed to the level of utilization or a timing restriction with the same animal unit months. Forage utilization standards, which differ between Alternatives 2, 3and 4, are not a good indicator of potential impacts to rare plants because a blanket utilization is too broad a metric to analyze impacts at a very local scale, such as a plant which is rare on the landscape.

There are some differences between Alternatives 2, 3and 4. Included in Alternative 3 and Alternative 4 are specific management actions which are designed to move range conditions towards desired conditions. Alternative 3 and Alternative 4 addresses resource concerns in specific areas (focus areas and other areas of concern) with changes to allowable use standards, structural improvements, and specific changes to management. The allowable use specifications under Alternative 3 and Alternative 4 are stated as percent maximum utilization for uplands and riparian areas and as stubble heights along the greenline of streams. Alternative 2 has maximum utilization for both upland and riparian areas. Alternative 3 and Alternative 4 also include some specific proposed structures, improvements, and maintenance requirements, some of which would occur in sensitive or management indicator species' habitat. The proposed structures and maintenance are not numerous or large but because they might affect sensitive or management indicator species which would not be affected by Alternative 2, the effects of Alternatives 2, 3and 4 will be analyzed separately but presented together, because they have roughly the same indicator (the presence of grazing)

with minor differences in fencing and construction. The locations where the proposed structures would be placed are analyzed for their potential effect to sensitive and management indicator plants and their habitat.

Alternative 1 – No Livestock Grazing (No Action Alternative)

Direct and Indirect Effects

The removal of 62 miles of fence in Alternative 1 would occur in various habitats, some of which are potential habitat for sensitive or management indicator species plants. Removal of fence could impact individuals or their habitat in the short term.

Rocky and Barren Habitats and Have Individuals Present

- **Payson's milkvetch** – Sensitive species and individuals present in project area. The lack of grazing in Alternative 1 would have mixed effects to Payson's milkvetch. A lack of grazing has the potential to alleviate the possible direct loss of plant biomass and possibility of trampling individuals. Conversely, a lack of grazing would eliminate the possible creation of habitat for this disturbance adapted species. Thus the potential direct (browse and trample) and indirect (no creation of habitat) effects associated with this alternative results in a mixed net effect. The removal of 62 miles of fence could remove or damage individuals, if present, or create disturbed habitat for this species.
- **Payson's bladderpod** - Sensitive species and individuals present in project area. The lack of grazing in Alternative 1 alleviates the possible direct effect of livestock trampling plants in the Kendall Warm Springs area. The indirect effects of no-grazing could arise from a cessation of disturbance, which may or may not benefit the species. At the Kendall Warm Springs area the lack of disturbance could result in habitat not being created for Payson's bladderpod. Conversely, there is a possibility that with a cessation of grazing in the project area there would be a reduction in invasive plant vectors and thus a reduction in the probability of habitat loss from invasive plants. The removal of 62 miles of fence could remove or damage individuals, if present, or create disturbed habitat for this species.
- **Naked-stemmed parrya** – Sensitive species and individuals present in project area. While naked-stemmed parrya is present in the analysis area, its habitat is extremely unlikely to experience any influence from livestock grazing. As such, it is unlikely that a lack of grazing would be beneficial or detrimental to the species or its habitat, since there is no interaction with this species' habitat and livestock grazing.

Determination: Based on the analysis and information that is available, a determination of "may impact individuals but is not likely to cause a trend to federal listing or loss of viability" is made for Payson's milkvetch and Payson's bladderpod for Alternative 1. Based on the analysis and information that is available a determination of "no impact" is made for naked-stemmed parrya for Alternative 1. These determinations are supported by the following rationale:

- Both Payson's milkvetch and Payson's bladderpod either rely or capitalize on disturbance and the lack of competing vegetation. The cessation of livestock grazing in this alternative may allow successional processes to alter the habitat such that these species can no longer survive. The removal of fences under this alternative could damage individuals in the short term and/or create the open habitat these species require in the long term.
- None of these potential effects are large enough (direct, indirect, or cumulative) to arise to the level of moving any species towards federal listing.
- Naked-stemmed parrya is mapped as present in the project area but this population is in an area which is largely inaccessible to livestock because of the rocky and barren nature of the talus slopes where this species lives. Since there is no interaction with livestock grazing there are no effects expected from the lack of grazing.

Forested Habitats with Known Individuals Present

- **Whitebark pine** – Sensitive species and individuals present in project area. Whitebark pine exists in the project area. Its habitat does not interact in any meaningful way with livestock grazing. As such there are no direct or indirect effects from Alternative 1 and the proposed structures and improvements in Alternative 3 and Alternative 4 which would occur in this species' habitat are not present in these alternatives. The removal of fences in Alternative 1 would not likely interact with this species.
- **Aspen**–Management indicator species and individuals present in project area. Aspen is present in the project area and has an interaction with livestock grazing. Aspen, when it can be reached by livestock, is preferred forage. As such Alternative 1 would reduce the possibility of direct effects from livestock grazing and would allow aspen regeneration to occur in the presence of wild ungulates only. The indirect effect of the No Livestock Grazing Alternative would result in the reduction of habitat alteration of both aspen and the understory species associated with it. The proposed structures and improvements in Alternative 3 and Alternative 4 which would occur in this species' habitat are not present in these alternatives. The removal of fences in Alternative 1 would not likely interact with this species.

Determination: Based on the analysis and information that is available a determination of "no impact" is made for whitebark pine for Alternative 1. This determination is supported by the following rationale:

- Whitebark pine and its habitat are unlikely to interact with livestock grazing. The lack of grazing in this alternative would have no impact since there would be no action and natural processes would prevail.
- The decline of whitebark pine across its range has little, if anything, to do with livestock grazing.

Aspen is an ecological management indicator plant species. The lack of grazing in this alternative would have no impact since there would be no action and natural processes would prevail. The indicators for aspen would be left to interact with the environment independent of livestock grazing.

Rocky and Barren Habitats But No Known Individuals Present

The plant species (both management indicator species and sensitive) sweet-flowered rock jasmine, seaside sedge, Wyoming tansymustard, rockcress draba, narrowleaf goldenweed, creeping twin-pod, woolly daisy and Weber's saussurea have potential habitat in the project area, with no known individuals, but their habitat has no interaction with livestock grazing. The habitat of these species is rocky and sparsely vegetated and as a result does not interact to any meaningful degree with livestock grazing. Some of the proposed structures and improvements in Alternative 3 and Alternative 4 would occur in the habitat of these species, with the exception of seaside sedge, woolly daisy, and creeping twin-pod. The specific habitat of each species is described in the direct and indirect effects section under Alternatives 2, 3 and 4.

Determination: Based on the analysis and information that is available, a determination of "no impact" is made for sweet-flowered rock jasmine, seaside sedge, Wyoming tansymustard, rockcress draba, narrowleaf goldenweed, woolly daisy, creeping twin-pod, and Weber's saussurea for Alternative 1. These determinations are supported by the following rationale:

- These species grow in habitats which are unlikely to have an interaction with livestock grazing. Their habitats are typically barren and rocky at high elevation. Livestock are unlikely to graze in these areas. As such no impacts are expected from a lack of grazing. The removal of fences in Alternative 1 would not likely interact with this species.

Determination for management indicator species and habitat present in project area: The habitat of boreal draba is generally described as rocky. However, the species has some component of its habitat which may interact with livestock grazing. The portions of this species' habitat which could interact with livestock are expected to have no impacts from the lack of grazing.

Meadow or Riparian Habitats but No Known Individuals Present

Determination for sensitive species and habitat present in project area: Based on the analysis and information that is available a determination of "no impact" is made for pink agoseris, black and purple sedge, and Greenland primrose for Alternative 1. These determinations are supported by the following rationale:

- The habitat of these species could interact with livestock grazing. The lack of grazing in this alternative would have no impact since there would be no action and natural processes would prevail.

D*etermination for management indicator species and habitat present in project area*: The habitat of Shultz's milkvetch is generally described as rocky. However, the species has some component of its habitat which may interact with livestock grazing. The portions of this species' habitat which could interact with livestock are expected to have no impacts from the lack of grazing. The removal of fences in Alternative 1 would not likely interact with this species.

Sagebrush Habitats but No Known Individuals Present

Determination for sensitive species and habitat present in project area: Based on the analysis and information that is available a determination of "no impact" is made for soft aster for Alternative 1. This determination is supported by the following rationale: The habitat of this species could interact with livestock grazing. The lack of grazing in this alternative would have no impact since there would be no action and natural processes would prevail. The removal of fences in Alternative 1 would not likely interact with this species.

Cumulative Effects for All Alternatives

Spatial and Temporal Context

The cumulative effects analysis area for this project are the areas of potential habitat for any of the sensitive or management indicator species, which have effects in the present analysis within the project area. This potential habitat includes areas identified as alpine, aspen, aspen/conifer mix, barren / rock, grassland / forbland, mountain big sagebrush, mountain shrubland, riparian herbland, sparse vegetation, spiked big sagebrush, tall forbland, whitebark pine or whitebark pine mix in the forest-wide vegetation data. The temporal boundary for this analysis is ten years into the past and future. This temporal boundary was selected because ten years is the life of a typical term grazing permit. Within this analysis area past, present and reasonably foreseeable future activities that have the potential to impact the plants included in this analysis include supplemental feeding of wild ungulates, invasive plant control, timber harvest and fuels reduction projects, wildfire suppression, insect and disease management and road maintenance.

Cumulative Effects

Species which have no effects from the action and no action alternatives have no effects to add to the past, present, and reasonably foreseeable actions. As such, no cumulative effects' analysis or determination is necessary for those species. For the present analysis the following species have no effect from the action and no action alternatives: starveling milkvetch; meadow milkvetch; seaside sedge; woolly daisy; creeping twin-pod; and naked-stemmed parrya. Therefore, there are no cumulative effects on these species as a result of Alternatives 1, 2, 3, and 4.

For sensitive species there are policies and mitigation measures in place that reduce or eliminate impacts from these management activities. Because of these policies, the cumulative effects expected from the alternatives proposed for this project, when combined with the effects from the other management activities, are not expected to contribute to any change in status or viability of sensitive plants. Nor are the cumulative effects expected to contribute to an increase in any current or predicted downward trend in population numbers or habitat capability that would reduce the existing distribution of any of the other Region 4 sensitive plant species discussed in this analysis, under any of the alternatives. This conclusion was reached by using the indicators for direct and indirect effects (grazing versus no-grazing and grazing with or without construction of structural improvements) from the proposed activities and adding them to the following expected effects from other management activities:

- Supplemental feeding of elk to maintain their populations above the carrying capacity of the ecosystem can increase the probability that any one individual sensitive or management indicator plant would be browsed or trampled by elk. Aspen as a management indicator species is particularly susceptible to direct effects from an artificially high elk population. Additionally, the indirect impact of a supplemented elk population is the possible habitat alteration or conversion away from or towards the potential habitat of a sensitive or management indicator species.
- Future actions in the project area include the Pinyon-Osborn Vegetation Treatments specifically designed to promote aspen age-class diversity and re-initiate a more natural disturbance regime to areas where aspen is reaching the end of its successional cycle and is being replaced by conifers. The potential negative effects (although below the threshold for significance) from the action alternatives would be partly mitigated by the intended beneficial effects from the Pinyon-Osborn Vegetation Treatments project. This assumes that aspen regeneration in the Pinyon-Osborn Vegetation Treatments project would be protected from ungulate browsing.
- Road maintenance can create or alter potential habitat for sensitive or management indicator species. Road maintenance can remove or kill individual sensitive or management indicator plants.
- The Green River Lakes Road (#37-600/650): This road is in critical need of resurfacing when funding allows. The existing condition of this road is poor, with multiple washboards, which effectively reduces visitor access. Forest visitor use of this road is believed to have been reduced by approximately 20 percent over the past five years due to the poor condition of this road. Forest Service funding for road maintenance and reconstruction continues to decline. Through partnership grants, it is possible this road could be resurfaced within the next five years, which would be expected to increase visitor use of all areas accessed by this road. This road in particular passes through known populations of Payson’s bladderpod and construction there could be additive to the effects of the three action alternatives, although this would not push the species towards listing.
- Herbicide, grazing or bio-control efforts to control invasive plants can have direct and indirect effects to sensitive and management indicator plants. Herbicide application can be misapplied, bio-control agents can move to non-target species and grazing animals can damage non-target species. Removal or control of invasive plants can also alter the habitat away from or towards the potential habitat of a sensitive or management indicator species.
- Natural and prescribed fire can directly affect sensitive species by burning individual plants. The same fires can indirectly affect sensitive plants by changing the habitat type (which is sometimes the goal of the project). In addition, fire suppression has led to increased fuel loading, canopy closure, and higher intensity wildfire. Fire is a natural disturbance in the ecosystem. In some areas, habitat succession and fire could possibly create or improve habitat for select plant species by opening up meadows or reducing the litter accumulation and competition from other plants. In other areas, wildfires or controlled fires would create high ground temperatures that could sterilize the soil and

eliminate fungal species that are necessary for the survival of others. Fire also tends to favor post-fire germination of non-native species in environments where non-natives are abundant and/or native species are stressed.

- Aspen in particular is declining across its range due in part to altered fire regimes and climate change. Projects in the foreseeable future in the cumulative effects analysis area are designed to mimic a natural fire regime and are specifically designed to promote aspen regeneration and reduce conifer encroachment.
- The prevalence of insect and disease outbreaks in the analysis area has altered the forest character which has indirect effects to the potential habitat of some sensitive species. The loss of canopy species changes the biotic and abiotic character of the habitat by increasing the amount and duration of sunlight and increasing the amount of fine and course woody debris.

The actions and effects described above can be both additive and interactive to each other and to the direct and indirect effects described for all alternatives. Because current management and mitigation is designed to eliminate or reduce negative cumulative impacts by protecting sensitive and management indicator plants from direct and indirect impacts, the cumulative effects to all species discussed in this analysis, under all alternatives, are expected to be minimal and would not push any species past it's threshold (trend towards listing for sensitive species, moving an management indicator species toward re-listing as sensitive, or failing to meet the two indicators for aspen).

Alternatives 2, 3 and 4 – Livestock Grazing Permitted

As described in Chapter 2 of this DEIS, Alternative 2 (Grazing as Currently Permitted), Alternative 3 (Modified Grazing Management) and Alternative 4 (Modified Grazing Management with Riparian Emphasis) have grazing at similar density (9,089 cows/horses and 46,148 animal unit months in Alternative 2; 8,819 cows/horses and 44,722 animal unit months in Alternative 3 and Alternative 4) and as such would have similar effects on the plant species analyzed here. Presenting Alternatives 2, 3 and 4 together is reasonable because the graze versus no-graze dichotomy portion of the indicator does not change with the differences in utilization and temporal pasture rotation for Alternatives 2, 3 and 4. The temporal rotation influences seed set and phonology of grazed plants and the utilization standard limits the level of grazing in any one place. The effects to rare plants would not be changed by the differences in the limits and timing of utilization because rare plants are unlikely to be truly saved or damaged by a change in a utilization threshold since they are rare on the landscape.

Effects Unique to Alternative 3 and Alternative 4

Alternative 3 and Alternative 4 have specific management actions associated with them which are described under Alternative 3 and Alternative 4 in Chapter 2 of this DEIS. These actions include the building of fences and structures (mostly culverts and hardened crossings). Several of these structures would occur in areas of potential habitat for sensitive or management indicator species, or would occur in areas of known individuals of whitebark pine (sensitive) or aspen (management indicator species). The effects to sensitive and management indicator plant species would be the same or similar for all action alternatives from the perspective of utilization and grazing density. The differences in specific structure construction and maintenance will be noted in the determinations section and in some cases would lead to a different call for Alternative 2 and Alternatives 3 and 4.

Direct and Indirect Effects

Rocky and Barren Habitats and Have Individuals Present

- **Payson's Milkvetch** – Sensitive species and individuals present in project area. The potential direct effects from the interaction of Payson's milkvetch and livestock grazing are the removal of biomass

of individual plants as well as trampling. The indirect effects include the creation of habitat by livestock disturbance and the alteration of the plant community associated with Payson's milkvetch. The net effect to Payson's milkvetch from livestock grazing is difficult to predict. This is because the species is disturbance adapted and the plant grows in areas with little vegetation, so trampling and other disturbance is likely to create some habitat for the species. However, this species is fairly robust (up to 20 inches tall) and leafy and as one of the few species that grows in its habitat (sparsely vegetated areas in sandy soil), if livestock are present near individual plants, they are likely to be targeted and as such may be damaged or lost. Some of the proposed structures and improvements in Alternative 3 and Alternative 4 would occur in this species' habitat, such activities could result in the introduction of invasive plants and disturbance of habitat while construction was taking place. There are no known individuals in any of the proposed Alternative 3 and Alternative 4 activity areas. Such activities may create the barren habitat that this plant uses. Similarly, if the construction activities promote or introduce invasive plants, the effect could be detrimental.

- **Payson's bladderpod** - Sensitive species and individuals present in project area. Payson's bladderpod grows on sparsely vegetated slopes across a wide elevation gradient. There are eight known occurrences of Payson's bladderpod in the project area. Several of the known occurrences are at the Kendall Warm Springs area, and grow next to the road used as the livestock driveway. The other occurrences are in areas that are naturally free of vegetation. The plants that grow next to the cattle driveway are likely to be directly impacted by trampling because the livestock which are moved through the area are intentionally herded on and around the road where Payson's bladderpod lives. The livestock are kept moving (as per the direction in the design features) so direct browse is unlikely.

The indirect effects of grazing in the project area on Payson's bladderpod are more difficult to surmise. Payson's bladderpod grows in areas which are free of vegetation from both natural and artificial causes. It is unclear if Payson's bladderpod is truly disturbance adapted or if it is just an opportunist. The area around Kendal Warm Springs is naturally free of vegetation because the warmth of the soil may be inhibitory to many species, especially those which are otherwise adapted to the cold temperature of the upper Green River area. The area around Kendall Warm Springs may also be free of vegetation because of the influence of the natural alluvial processes of the upper Green River and by Forest Road 650. The Green River in this area has clearly meandered and braided in the past, as evidenced by the many ox-bow lakes in the area. Rivers which have an active alluvial history are sometimes naturally free of vegetation because of unusual or non-existent soil development. In addition Forest Road 650 has served as the livestock drive way for the upper Green River allotments for many years and carries a high volume of vehicular traffic. The road is maintained as needed, but the section near Kendall Warm Springs is maintained with the intention of not impacting the springs and the endangered fish that live there.

The net effect of the indirect effects to Payson's bladderpod from permitting grazing is mixed. The possibility that Payson's bladderpod is somewhat disturbance adapted (regardless of the source of disturbance) indicates that trampling from livestock movement could create habitat near Kendall Warm Springs. However, given that livestock and roads are well known vectors of invasive plants there is possibility that the sparsely vegetated habitat of Payson's bladderpod could become densely vegetated with invasive plants, thereby altering the habitat for the species. This possibility is increased by the fact that the livestock and vehicular traffic are intentionally concentrated in the habitat at Kendall Warm Springs and the initial density of invasive species' seeds directly influences the likelihood of invasion. However, currently invasive plant species are not abundant at the Kendall Warm Springs. For plants outside the Kendall Warm Springs area there is little chance of direct or indirect effects from grazing. The rocky and sparsely vegetated habitat of this species, outside Kendall Warm Springs, is unlikely to have any interaction with livestock grazing because of a lack of vegetation and the difficulty of the terrain.

Some of the proposed structures and improvements in Alternative 3 and Alternative 4 would occur in this species' habitat, such activities could result in the introduction of invasive plants and disturbance of habitat while construction was taking place. There are no known individuals in any of the proposed Alternative 3 and Alternative 4 activity areas. Such activities may create the barren habitat that this plant uses. Similarly, if the construction activities promote or introduce invasive plants the effect could be detrimental.

Naked-stemmed parrya – Sensitive species and individuals present in project area. Naked-stemmed parrya is mapped as present in a small portion of the project area on the slopes of Gypsum Mountain. The habitat of this species is talus slopes which are largely unavailable to livestock due to the rocky nature of the habitat. Aerial imagery shows that the population which exists in the project area is on a rocky slope on a sparsely vegetated mountain peak. There is very little chance that livestock would be present in the vicinity of this population and if they were, there is very little chance that individuals would be impacted by grazing or trampling. None of the proposed activities in Alternative 3 and Alternative 4 would occur in this species' habitat (rocky areas above 10,500 feet).

Determination: Based on the analysis and information that is available a determination of "may impact individuals but is not likely to cause a trend to federal listing or loss of viability" is made for Payson's milkvetch and Payson's bladderpod for Alternatives 2, 3and 4. Based on the analysis and information that is available a determination of "no impact" is made for naked-stemmed parrya for Alternatives 2, 3and 4. These determinations are supported by the following rationale:

- Both Payson's milkvetch and Payson's bladderpod are known to occur in the project area where livestock may be present. These livestock may browse or trample individual plants. Conversely grazing and trampling may create habitat for these species which grow in habitats that are largely free of other vegetation and these species may rely or capitalize on disturbance.
- Both Payson's milkvetch and Payson's bladderpod occupy habitat where fencing and structure construction would take place under Alternative 3 and Alternative 4, these activities may create habitat for these species and may also act as a vector for the introduction of invasive species.
- Payson's bladderpod is known to occur where large volumes of livestock are intentionally driven. This increases both the likelihood that individuals would be trampled and invasive plants would become established. Livestock are well known vectors of invasive plant seeds and the open and disturbed habitat of this species is susceptible to the establishment and spread of invasive plants.
- None of the expected effects (direct, indirect or cumulative) for Payson's milkvetch or Payson's bladderpod are large enough to arise to the level of moving either of these species towards listing. Both species have multiple other occurrences on the Bridger-Teton National Forest and on other National Forests.
- Naked-stemmed parrya is mapped as present in the project area but this population is in an area which is largely inaccessible to livestock because of the rocky and barren nature of the talus slopes where this species lives.

Forested Habitats with Known Individuals Present

- **Whitebark pine** – Sensitive species and individuals present in project area. Whitebark pine is present in the project area. Its habitat is in mixed conifer forest and in pure stands near treeline. Whitebark pine is not preferred forage for livestock and seedlings and adults are unlikely to be impacted by trampling. Livestock may use forests with whitebark pine as cover at night and for

shade during the day but their presence is unlikely to impact individual whitebark pine or their habitat. Livestock use may occur in the habitat of this species, but whitebark pine is not preferred forage and individuals are not susceptible to trampling, as such no direct or indirect effects are expected. Some of the proposed structures and improvements under Alternative 3 and Alternative 4 would take place in whitebark pine forests. It is likely that both live and dead whitebark pine would be cut and removed during the construction of fences that pass through whitebark pine forests. Live individuals may be cut to make straight fence lines (such that the fences last longer) and dead or dying whitebark may be removed to ensure they do not fall on the fence. There are a total of around 0.8 miles of fence that would pass through mapped whitebark pine forest (0.4 miles in the Beaver-Twin Allotment and 0.4 miles in the Upper Green Allotment to create the South Kinky Creek Pasture). There are nearly 15,000 acres of mapped whitebark pine in the project area; the loss of individuals on 0.8 miles of fence construction would result in direct impacts to whitebark pine in an extremely small part of this area.

- **Aspen**–Management indicator species and individuals present in project area. Aspen stands are present in the project area and are likely to have impacts from livestock grazing. Aspen are preferred forage for livestock (DeByle 1985) and wildlife. The direct effects from livestock grazing include the removal of biomass by grazing and the trampling of suckers and seedlings. The indirect effects from livestock grazing include the compaction of the soil which can influence the regeneration rate of aspen and an alteration of the understory plant community associated with aspen. There are 0.4 miles of mapped aspen forest that would have fences constructed through them under Alternative 3 and Alternative 4. This fence construction may result in the cutting of individual ramets (above-ground parts of the aspen clone). Such cutting is unlikely to kill the entire clone. There are 9,800 acres of aspen mapped in the project area; the loss of some ramets due to fence construction on 0.4 miles represents a direct impact to aspen on a very small part of the total area.

Determination: Based on the analysis and information that is available a determination of No impact is made for whitebark pine for Alternative 2. A determination of “may impact individuals but is not likely to cause a trend to federal listing or loss of viability” is made for whitebark pine for Alternative 3 and Alternative 4. This determination is supported by the following rationale:

- Whitebark pine and its habitat are unlikely to interact with livestock grazing. Whitebark pine is a component of subalpine mixed conifer forests and grows in pure stands near treeline. Whitebark pine is not preferred forage and even as a seedling is not likely to receive any physical damage from trampling or grazing.
- Two of the proposed fences under Alternative 3 and Alternative 4 would pass directly through 0.8 miles of whitebark pine forest. It is likely that individual whitebark pine would be cut to make room for those fences.
- Approximately 15,000 acres of whitebark pine are mapped within the project area, the loss of individuals associated with 0.8 miles of fence is not large enough to push this species towards listing.

Aspen is an ecological management indicator plant species. Aspen is preferred forage for livestock and is highly likely to be impacted by livestock grazing. The direct effects from livestock grazing include the removal of biomass by grazing and the trampling of suckers and seedlings. The indirect effects from livestock grazing include the compaction of the soil which can influence the regeneration rate of aspen and alter the understory plant community for which aspen is the ecological indicator. These effects however, are unlikely to reduce the ground cover of aspen stands to less than 95 percent or create a condition where at least one of the predominant species associated with aspen would not account for 5 percent of cover. The action alternatives are unlikely to move beyond the 95 percent ground cover indicator for aspen because litter

accounts for a large portion of the ground cover and this is unlikely to be influenced by livestock grazing because once aspen leaves are beyond the reach of livestock they are unavailable to be browsed and would become litter in the fall. The indicator of at least one predominant species ≥ 5 percent would also not be violated with the action alternatives because many of the predominant species are shrubs, forbs and grasses which have low palatability to livestock and as such would either stagnate or increase with livestock grazing. Taken together, the analysis indicates that while individual aspen ramets and the associated plant community could be impacted by livestock grazing, the effects would not move beyond the indicators of significance for aspen. Additionally, the loss of individual aspen ramets during the construction of 0.4 miles of fence under Alternative 3 and Alternative 4 would not move beyond the indicators of significance for aspen.

Rocky and Barren Habitats But No Known Individuals Present

Determination: Based on the analysis and information that is available, a determination of "no impact" is made for sweet-flowered rock jasmine, seaside sedge, Wyoming tansymustard, rockcress draba, narrowleaf goldenweed, creeping twin-pod, woolly daisy and Weber's saussurea for Alternative 2. A determination of "may impact individuals but is not likely to cause a trend to federal listing or loss of viability" is made for sweet-flowered rock jasmine, Wyoming tansymustard, rockcress draba, narrowleaf goldenweed, and Weber's saussurea for Alternative 3 and Alternative 4. A determination of "no impact" is made for seaside sedge, creeping twin-pod, and woolly daisy for Alternative 3 and Alternative 4. These determinations are supported by the following rationale:

- These species grow in habitats which are unlikely to have an interaction with livestock grazing under any action alternative. Their habitats are typically barren and rocky at high elevation. Livestock are unlikely to graze in these areas. Thus, no impacts are expected.
- Some of the proposed structures and improvements under Alternative 3 and Alternative 4 would occur in potential habitat for sweet-flowered rock jasmine, Wyoming tansymustard, rockcress draba, narrowleaf goldenweed, and Weber's saussurea. While no individuals are known from these areas, impact to their habitat cannot be ruled out. Seaside sedge, creeping twin-pod, and woolly daisy occur at elevations which are outside those where construction activities would take place under Alternative 3 and Alternative 4.
- None of the expected effects (direct, indirect, or cumulative) for sweet-flowered rock jasmine, Wyoming tansymustard, rockcress draba, narrowleaf goldenweed, or Weber's saussurea are large enough to arise to the level of moving any of these species towards listing. These species have multiple other occurrences on the Bridger-Teton National Forest and on other National Forests.

Meadow or Riparian Habitats but No Known Individuals Present

Determination: Based on the analysis and information that is available, a determination of "may impact individuals but is not likely to cause a trend to federal listing or loss of viability" is made for pink agoseris, black and purple sedge, and Greenland primrose for Alternatives 2, 3 and 4. These determinations are supported by the following rationale:

- These species grow in habitat types which are highly likely to interact with livestock and as such individuals or their habitat are expected to be impacted by the presence of livestock. The presence of livestock could directly impact individuals (if present) by browsing or trampling individual plants. Indirect effects to these species include the loss or conversion of habitat.

- Some of the proposed structures and improvements in Alternative 3 and Alternative 4 would occur in the potential habitat of pink agoseris and Greenland primrose. These activities could alter habitat and introduce invasive species.
- None of these potential effects are large enough (direct, indirect or cumulative) to arise to the level of moving any species towards federal listing

Shultz's milkvetch and boreal draba are management indicator plant species which have habitat present in the project area but have no known individuals present. The habitat of these species is generally described as rocky. However, both species have some component of their habitat which could interact with livestock grazing. The portions of their habitat which could have an interaction with livestock may be altered by the presence of livestock but their potential interaction with livestock grazing would not lead to re-listing either of the species as sensitive. Additionally, some of the proposed structures or improvements under Alternative 3 and Alternative 4 would occur in the potential habitat of these species, such activities could alter that habitat or introduce invasive species. These effects would not contribute to a change in the species' status, because there are numerous occurrences of both of these species on the Bridger-Teton and other National Forests.

Sagebrush Habitats but No Known Individuals Present

Determination: Based on the analysis and information that is available, a determination of "may impact individuals but is not likely to cause a trend to federal listing or loss of viability" is made for soft aster for Alternatives 2, 3 and 4. This determination is supported by the following rationale:

- This species grows in a habitat type which is highly likely to interact with livestock and as such individuals or their habitat are expected to be impacted by the presence of livestock. The presence of livestock could directly impact individuals (if present) by browsing or trampling individual plants. Indirect effects to these species include the loss or conversion of habitat.
- Some of the proposed structures and improvements in Alternative 3 and Alternative 4 would occur in the potential habitat of soft aster. These activities could alter habitat and introduce invasive species
- None of these potential effects are large enough (direct, indirect, or cumulative) to arise to the level of moving any species towards federal listing

Cumulative Effects

See discussion of Cumulative Effects for All Alternatives under Alternative 1

Recreation and Related Resources

The Recreation and Related Resources section presents the indicators addressed in this analysis, provides the existing condition of the affected environment and discusses the environmental effects of each alternative on recreation resources. Livestock management activities proposed for each alternative were evaluated to determine their potential effects on recreation, visual quality, access, Wilderness and Wilderness Study Areas, Wild and Scenic Rivers, Research Natural Areas, and Inventoried Roadless Areas. Information in this section was summarized from the Recreation and Related Resources Report (Stein 2016). Adaptive management was referred to as "progressive design features" in this specialist report. The term "progressive design features" is synonymous with "adaptive management" and is described in this DEIS beginning on page 71 and 112 for Alternatives 3 and 4, respectively.

Analysis of the Research Natural Areas and Inventoried Roadless Areas were not brought forward into this document because they did not differ substantially among alternatives and effects were minimal. For more detail, refer to the Recreation and Related Resources Report (Stein 2016).

Overview of Issues Addressed

No significant issues were identified regarding recreation or related resources.

Indicators Used for Comparison of Alternatives

The existing condition and impacts of each alternative were discussed for the following resource areas.

- Visual Quality: Forest Plan visual quality objectives
- Developed and Dispersed Recreation and Special Uses
- Access (Roads and Trails)
- Wilderness and Wilderness Study Areas
- Wild and Scenic Rivers

Affected Environment

A variety of recreation activities occur within the six allotments throughout the year. Summer/fall activities include: scenic driving, camping, fishing, horseback riding, hiking and backpacking, big game hunting, rafting, off-highway vehicle and 4-wheel drive activities, bicycling, and firewood gathering. Winter activities include snowmobiling, cross-country skiing, dog sledding, and Christmas tree cutting.

The Upper Green River area contributes greatly to the Bridger-Teton National Forest's recognition as a nationally significant recreation forest. The Upper Green's rich cultural heritage and outstanding opportunities for camping, hunting, fishing, and wildlife viewing make this area popular to Forest visitors, particularly from June through November. Peak campground and Wilderness use occurs from July through mid- September. Dispersed recreation use occurs from July through October, with peak use during holiday weekends and fall big game hunting seasons of September and October.

Visual Quality

Desired Condition: Visual Quality Objectives

Visual quality objectives as defined in the Forest Plan (U.S. Forest Service 1990) are met. Visual quality objectives serve as a classification system used to set objectives for facility planning and resource management. Visual quality objectives within the project area are defined below:

- Preservation (P): This visual quality objective allows ecological changes only. Management activities, except for very low visual impact recreation facilities, are prohibited.

- Retention (R): This visual quality objective dictates that management activities are not evident to the average viewer. Much of the analysis area falls under this category for scenery management.
- Partial Retention (PR): This visual quality objective dictates that management activities are visually evident but subordinate to the characteristic landscape.
- Modification (M): This visual quality objective dictates that management activities may visually dominate the original characteristic landscape. However, alterations of vegetation and landform must borrow from naturally established form, line, color, or texture so completely and at such a scale that visual characteristics of natural occurrences within the surrounding area or character type are retained.

Existing Condition

Visual quality objectives apply within the entire project area. Most of the Upper Green River and surrounding area is exceptionally scenic and wild, and human-caused impacts to the natural landscape are minor and few. The existing road system, areas of past timber harvest, firewood cutting along roads, dispersed camping, off-highway vehicle impacts, and livestock grazing are the primary human-induced causes of impact to visual quality within the project area; cumulative impacts from these uses, (primarily adjacent to the Green River and along the Union Pass/Green River Lakes Road #37-600/650) have caused conditions that do not completely meet scenic management objectives.

The recent mountain pine beetle epidemic within the analysis area has dramatically changed the landscape throughout this analysis area over the past ten years. This disturbance is a natural occurrence and therefore does not adversely affect visual quality objectives. However, an indirect result of this epidemic is an increase in firewood cutting for personal use within the project area, which is adversely affecting the visual quality along the Green River Lakes Road (FS Rd 37-650) due to numerous high stumps and heavy slash-piling along this corridor.

Other human-caused disturbance to visual quality occurs in isolated sites within the project area as a result of dispersed camping, off-highway vehicle impacts in violation of Travel Management Regulations, and past livestock congregation. The Green River Corridor, from the Forest boundary north to Lower Green River Lakes, is the highest-used dispersed recreation area and most challenging area for visual quality retention within the project area. Retention is not being met at several sites along this corridor, including the Forest boundary, Kendall Bridge, Dollar Lake, and feedground. This is primarily a result of recreation use and elk feeding impacts rather than from livestock use.

Areas within the project area where livestock grazing and associated practices, in combination with recreation impacts, have, or could in the future, affect visual resource conditions are listed below:

- **Union Pass Road #37-600– South Fork Fish Creek Bridge** (Upper Green River Allotment-Fish Creek Pasture): Retention objective. In the past, salt has been placed near trails or riparian areas, resulting in barren core areas (areas of compacted soil denuded of vegetation). This practice has been corrected and is addressed in the annual operating instructions, which requires that salt be placed a minimum of 200 yards from system trails and ¼ mile from streams. This area is now meeting visual quality objectives.
- **Bridger Wilderness - Roaring Fork Trail #7146** (Roaring Fork Allotment): Retention objective. Erosion and multiple trails from recreation use exist within the riparian corridor of the Roaring Fork River inside the Bridger Wilderness along the Roaring Fork Trail #7146.This area is minimally meeting the visual quality objectives of Preservation. This portion of the allotment is not commonly used by livestock and additional livestock use is not anticipated.

- **Green River Corridor** (including Forest boundary, Kendall Bridge, and Dollar Lake): Retention objective. Retention is not being met in several portions of the Green River corridor where riparian and stream conditions are not meeting objectives. Cumulative impacts within these areas are primarily from dispersed recreation, off-highway vehicle use off designated roads, elk congregation, past tie-hack timber harvest, and firewood cutting activities, with minor influence from livestock use. No salting is authorized and livestock are currently herded from the Forest boundary, Kendall Bridge, Dollar Lake, and the elk feed ground.

Developed and Dispersed Recreation and Special Uses

Desired Condition

Recreation on the Bridger-Teton National Forest provides the full range of recreation opportunities, managed to create a balance of public and private uses responsive to local, regional, and national demand. The Recreation Opportunity Spectrum (ROS) classification system includes settings from highly developed, roaded to primitive and semi-primitive settings and is used for facility planning and to direct management. Management of recreation and livestock use meets resource objectives while minimizing conflict between these uses.

Existing Condition

Developed Recreation Sites and Forest Service Administrative Sites

Three developed recreation sites, three administrative sites, and one minor developed site lie within the project area (Figure 81).

- **Green River Lakes Developed Site** contains the Green River Lakes Campground, trailhead, a rudimentary boat launch site, and an administrative site. The Green River Lakes developed site is located near the southeastern boundary of the Roaring Fork Allotment. The Green River Lakes Trailhead, which ranks 3rd highest used access point for total visitors entering the Bridger Wilderness, accommodates up to 120 vehicles during the peak season of July and August. The Green River Lakes developed site is partially fenced, and cattle seldom enter this site during the managed season (July through mid-September). An increase in grizzly bear sightings and increased potential for human-bear conflict has likely contributed to this decline in overall recreation use at this site.
- **Kendall Administration Site** and associated administrative horse pasture is located within the Upper Green Allotment. The guard station and associated buildings are fully fenced to exclude cattle.
- **Whiskey Grove Campground**, located within the Upper Green Allotment, contains nine campsites and its peak season of July, August, and October. This campground is fenced to exclude cattle.
- **Green River Forest boundary** serves as a snowmobile trailhead during the winter and an assembly/parking area, interpretive site and unimproved boat launch site for the Green River during the summer. This site, including the riparian area and stream bank of the Green River, is impacted by recreation use (winter and summer parking, dispersed camping, boat launching) and occasional livestock congregating along the boundary fence, particularly in the fall. Active herding and livestock management have been effective in keeping cattle from congregating at this site over the past five years.
- **Strawberry developed site** is a minimally developed site located on Union Pass Road (Forest Service Road #600) at Strawberry Creek. Although this site is not fenced, there are no known issues or conflicts between recreation and livestock, primarily because the main recreation activities occur during the winter months at this site.

- **Fish Creek Guard Station** is located in Fish Creek Park, east of the Strawberry site. This site contains several administrative cabins and an administrative horse pasture. This administrative site is adequately fenced to exclude cattle, and the horse pasture is surrounded by electric fence when in use. This site is also used as temporary housing during the summer and fall by Forest Service and Wyoming Game and Fish Department employees in performance of livestock/predator monitoring and control duties.
- **Union Pass**, which contains a historic site and short interpretive trail, is located north and outside of the project area. This site is partially fenced and is not affected by livestock.

Dispersed Recreation:

Dispersed recreation includes day and overnight recreation activities located outside of developed campgrounds. Popular dispersed recreation sites outside Wilderness within the project area include the entire Green River corridor, Dollar Lake, Water Dog Lake, Mosquito Lake, Fish Creek, and the Continental Divide National Scenic Trail. Several dispersed campsite inventories have been conducted within the Green River corridor and other locations within the project area in the past twenty years. As a result of these inventories, over 50 commonly used dispersed campsites have been inventoried and mapped in the Upper Green River corridor (Figure 81). An estimated 300 other campsites are found elsewhere throughout the project area. The majority of dispersed campsites are located within 100 feet of lakes, streams, or rivers. The Green River corridor along Forest Service Road #37-600/650 is the primary dispersed recreation use area, with week-long use from June through October.

Throughout the project area, dispersed camping peaks on weekends and holidays from 4th of July through Labor Day weekend, and then again during the September and October big game hunting seasons. The Union Pass Road (#37-600) also provides scenic access from State Highway 352 (at the Green River Forest boundary) north over Union Pass to State Highway 26/287, northwest of Dubois, Wyoming.

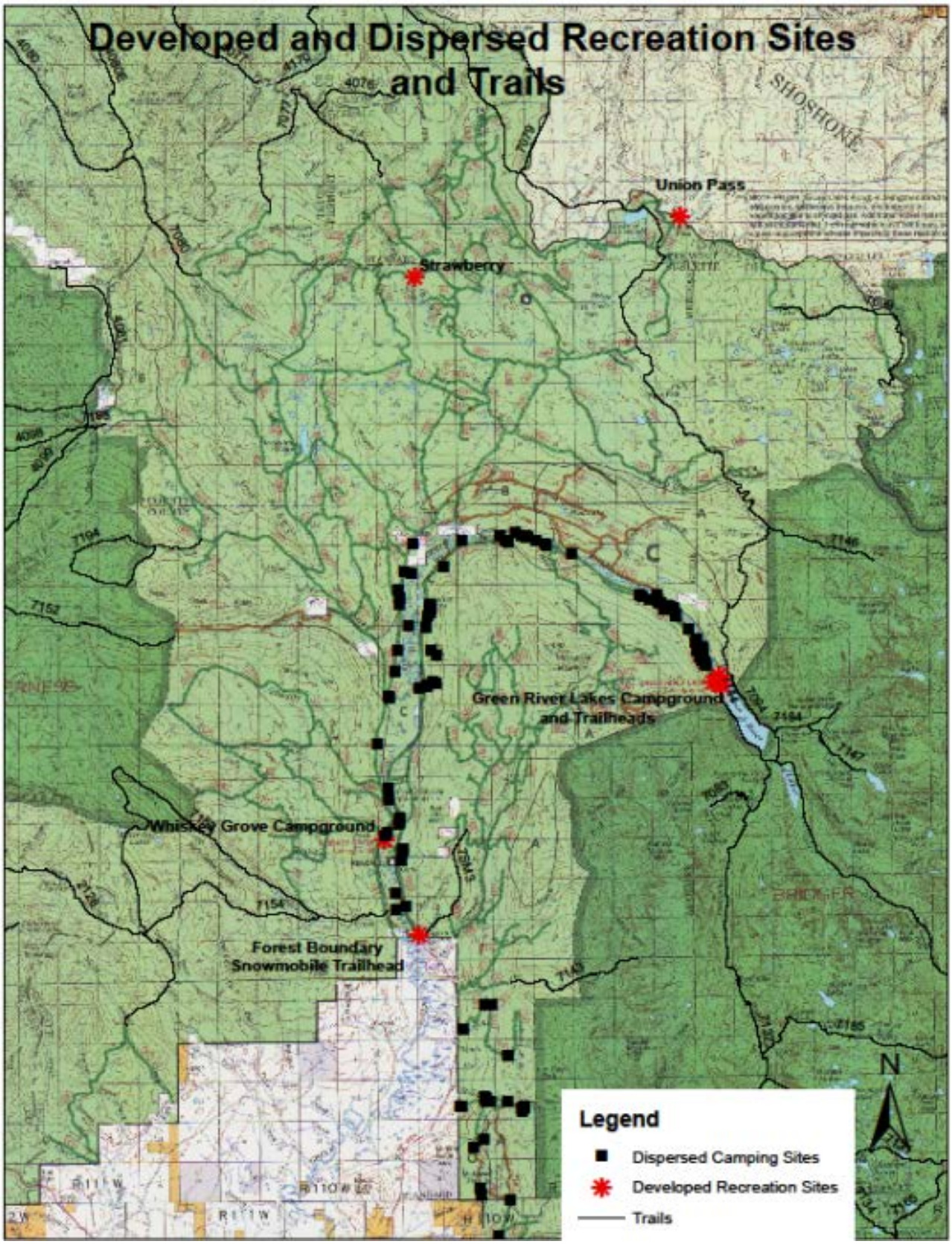

Figure 81. Developed and dispersed recreation sites and trails in the Upper Green River project area

Potential range-related concerns for dispersed recreation:

- Conflict between dispersed camping and livestock within the project area is rarely reported. It is likely that dispersed camping occasionally interferes with late season cattle movement, but this has not been reported in the project area. Aggressive cattle are not common, primarily related to the non-aggressive breed of cattle stocked, and active herding by permittees keep stock from popular dispersed sites such as the Forest boundary, Kendall Bridge, and Dollar Lake.
- Livestock use of the south side of the Upper Green River on the Roaring Fork Allotment has been light in past years, and conflict between livestock grazing and recreation use is not common. Increased livestock use of this portion of the allotment during July and August would likely lead to increased conflicts with recreational use (primarily fishing and sightseeing) along this segment of the Green River. No increase in stocking is planned in this area and seasonal restrictions are proposed to minimize the potential for human-livestock conflicts in this area.
- Livestock improvements (fences, corrals, pipelines, water troughs, and cabins) can displace Forest visitors from dispersed campsites, disrupt cross-country travel, impact visual quality, and/or pose safety concerns for visitors when not properly maintained. Currently there are approximately 76 miles of livestock fence within the project area and there are no specific fences currently known to disrupt or impact dispersed recreation use within the project area.
- Canada thistle, a noxious weed, is a concern within the project area and was primarily introduced and spread by wheeled vehicle use, and secondarily by recreation stock and domestic livestock. Areas of concern include Moose-Gypsum Road #37-680 and secondary roads leading off this road, and Green River Lakes Road #37-600/650. Canada thistle is also present in the Kendall Warm Springs Special Interest Area, although populations have not increased in this area. Canada and musk thistle are present in Whiskey Grove Campground, Kendall and Green River Lakes Recreation /Administrative Site. Small infestations of Canada thistle have been found and successfully treated within the Bridger Wilderness along Highland Trail #7094, which is located outside the project area. Introduction and spread of invasive weeds within this portion of the Bridger Wilderness are primarily related to recreational equine stock, hikers, and wildlife. Cattle are effectively fenced out of this portion of the Bridger Wilderness.
- Livestock carcasses located near dispersed recreation sites, trails, and roads pose a safety concern for recreationists throughout the project area. Annual operating instructions require livestock carcasses be moved a minimum of ¼ mile from these sites to minimize the potential for human-bear encounters. In addition, food storage regulations are in place throughout the project area to prevent grizzly and black bears from obtaining human attractants, leading to human-bear conflicts.
- **Green River Corridor:** The Green River Corridor, including the Green River Lakes Road #37-600/650, is the highest-used recreation area and most challenging area for visual quality as well as dispersed recreation management within the project area. Potential impacts within the ¼ mile of either side of the Green River include impacts to visual quality, stream bank stability, riparian area vegetation, and water quality (see Hydrology and Soils sections). The primary source of impact within this corridor is unmanaged dispersed recreation use (day and overnight use, firewood cutting, and OHV use) and concentrated elk use. In 2004 and 2005, a dispersed campsite inventory was conducted within the Green River corridor from the Green River Lakes administrative site south to the Forest boundary. Campsites located within 100 feet of the Green River were identified as those most likely to continue to adversely affect riparian conditions within this corridor. In 2015 the Pinedale District plans to initiate an assessment of existing motorized routes and dispersed campsites within the Green River corridor from the Green River Lakes administrative site south to the Forest boundary. The District plans to complete an environmental assessment of this corridor within the

next five years in order to address resource and social concerns primarily related to dispersed recreation use and motorized access within this corridor.

Figure 82. Dispersed campsites in the Upper Green River corridor

Outfitter-Guides

Reported conflict between outfitted use and domestic livestock grazing is extremely rare, focusing primarily on temporary problems associated with cattle congregating at trailheads or related to dead livestock located near lakes or trails, which attracts bears and therefore poses a safety risk to outfitted clients. Livestock annual operating instructions and outfitter-guide operating plans provide specific direction relating to equine and bovine livestock carcass removal, as well as food storage requirements for permittees and their clients. Outfitters and herders generally work directly with each other if they locate dead livestock that require removal, or have issues related to domestic livestock congregation.

Potential range-related concerns for special uses**:**

- ***Water Dog Lakes Focus Area***: Within the past 20 years, only one outfitter-range related impact was identified. This conflict regards the Water Dog Lakes area of the Beaver-Twin Allotment, where recreational stock, cattle, and elk compete for limited forage. This has resulted in forage utilization beyond Forest Plan standards, which adversely affects visual quality, wildlife, and the recreational experience in this area. In addition, cattle deaths due to larkspur poisoning have occurred at this site in the past. Larkspur is considered an important component of the tall forb community, which is considered “at risk” on the Forest. Cattle carcasses that occasionally result from larkspur poisoning cause safety concerns for outfitters and the public due to increased grizzly bear activity around the carcasses. During the summer of 2002, three outfitters were prohibited from taking clients to this site for approximately four weeks due to increased grizzly bear activity on cattle carcasses at Water Dog Lakes. The cattle mortality was believed to be the result of larkspur poisoning. The Forest Service excludes commercial recreational stock grazing at Water Dog Lakes through outfitter-guide special use permits and operating plans to minimize grazing impacts in this area. This situation is not known to have reoccurred since 2002, but has potential to reoccur if cattle consume larkspur at this site and resulting carcasses are not moved from the immediate vicinity of the lakes or system trails in the area.

Green River Elk Feedground:

The Green River elk feedground is located near the confluence of the Roaring Fork River and the Green River. Authorized elk feeding operations extend across to the northern side of the Green River into the Mud Lake Pasture and Roaring Fork Allotment. The Wyoming Game and Fish Commission is authorized, through special use permit, to conduct elk feeding operations within the boundary of this feedground during the

winter months. The Commission is required to meet terms and conditions of its permit and the operating plan, which are reviewed annually and updated as needed. The interdisciplinary team has identified cumulative riparian impacts of grazing by elk, moose, and cattle along the Green River (PFC site #4, see the Riparian Areas section) within the elk feeding area. These riparian impacts are primarily related to wintering elk associated with the Green River elk feedground operation. This impact was analyzed and addressed through the 2008 FEIS addressing the elk feedgrounds (U.S. Forest Service 2008).

Darwin Ranch Special Use Pasture Permit:

Darwin Ranch is located on private property on the northwestern boundary of the project area, adjacent to the Kinky Creek Pasture. Surrounded by National Forest, Darwin Ranch holds an outfitter-guide permit allowing operations on the Pinedale District and adjacent Jackson Ranger District. A recreation livestock special use permit, which terminated in 2014, allowed horse pasture use within portions of the Kinky Creek Allotment in conjunction with private land at Darwin Ranch. This previously authorized recreation livestock pasture is fenced on portions of the National Forest and private property adjacent to the Kinky Creek Pasture. Darwin Ranch currently has a term grazing permit that authorizes grazing of horses within the Kinky Creek Pasture of the Upper Green Allotment. Darwin Ranch also holds special use permits for a small airstrip, a hydroelectric site, minor communication sites, and several water developments on the National Forest within the project area. There are no known effects to Darwin Ranch special uses from livestock grazing on adjacent National Forest System lands within the project area.

Private Property Inholdings:

There are several private inholdings located within the project area along the Green River Lakes Road, Moose-Gypsum Road, Union Pass Road, and on Pinyon Ridge. Varying types of access are authorized to private land owners within the project area, none of which appear to be adversely affected by livestock grazing or driveway activities. Wyoming is a “fence-out” state, meaning that private property owners are required to construct and maintain fences if they desire to keep livestock from entering their property. No known complaints regarding livestock have been received to date from these private landowners.

Access (Roads and Trails)

Desired Condition

Access (Roads and Trails) – A network of roads and trails reflects designs adapted to resource conditions and meets the needs of National Forest users. Management of roads and trails compliments livestock management objectives, including visitor safety and resource protection.

Existing Condition

The primary roads accessing the project area are Union Pass Road #37-600, Green River Lakes Road #37-650, and Moose-Gypsum Road #37-680. Numerous secondary and tertiary designated roads branch from these three main arteries, as identified in the current Pinedale District Motor Vehicle Use Map, which is based on the 1995 Motorized Travel Plan Decision Notice (U.S. Forest Service 1995) for the Pinedale Ranger District.

Roads within the project area are primarily used for recreational purposes, particularly during the fall elk hunting season, and firewood gathering, with incidental use by range permittees throughout the grazing period. Outside of designated Wilderness, several livestock permittees are authorized through annual operation instructions to use motorized vehicles on roads closed to the general public in order to maintain range structures. This access is granted for occasional use only, and is consistent with national range management direction.

The lowest standard road within the project area, and by far the most prevalent, is commonly referred to as a "two-track" road or route. The majority of these routes were "user-created" by continuous use of wheeled vehicles that were adopted as designated Level 2 motorized roads over time. These roads commonly lack imported surfacing and are usually poorly located, often winding through rocks and wet areas, leading to multiple, rutted roads, erosion of roadway tread, and sedimentation to streams within the project area.

Roads

Pinedale Ranger District Travel Management

In 1995, the Pinedale Ranger District completed a Motorized Travel Management Environmental Assessment that designated roads open to motorized travel and officially closed the entire district to off-road motorized vehicle travel. As part of the 1995 Travel Plan Decision, many user-created two-track routes were adopted and designated as open motorized vehicle routes. The remainder of these user-created routes and some constructed roads within the project area were identified as needing to be closed or "decommissioned" to reduce erosion, enhance wildlife security, and/or provide quality dispersed recreation opportunities. Since 1995, many unauthorized routes have been physically closed through signing, closure structures, and rehabilitation. However, new two-track routes continue to develop in this area annually, in violation of travel plan regulations.

Visitor education and enforcement of motor vehicle use regulations, as well as signing and physical closure of roads not open to motorized use, although a management challenge, are heavily emphasized throughout the project area. Several roads closed to motorized use by the public are open to range permittees using motor vehicles to maintain structures, which is allowed under national Motor Vehicle Use and Range Management direction. Use of motorized equipment by range permittees on routes closed to the public is an exception approved through annual operating instructions.

Road Density Standards

Forest Plan road density standards were analyzed through the 1995 Motorized Travel Plan Environmental Assessment for the Pinedale District. The 1995 Travel Plan Decision Notice identified total road densities for Desired Future Conditions 10 and 12 within the Forest Plan Management Area 72, which includes the majority of the Upper Green River Area Rangeland Project. The 1995 Decision Notice recognized that road density standards in Desired Future Condition 12 exceed Forest Plan standards within Management Area 72. Road density standards in Desired Future Condition 10 meet Forest Plan standards in Management Area 72, according to the 1995 analysis and Decision Notice. There is no change in road density within Desired Future Conditions 10 or 12 related to livestock grazing. No new roads are proposed to be opened or closed under any alternative.

Specific Range-Related Concerns for Roads

- All designated Forest Roads within the project area are gravel or unsurfaced roads; therefore speed traveled is not generally excessive. However, Forest visitors often drive at higher speeds (50 miles per hour or greater) on the Union Pass Road (Forest Service Road #37-600) and Green River Lakes Road (Forest Service Road #37-650). Cattle congregating along Forest Road #37-600 and Forest Road #37-650 can cause hazardous conditions for motorists and cattle. Cattle drives, which occur during the early summer and fall on the livestock driveway, also known as the Green River Drift Trail, are limited in duration and do not appear to be causing safety hazards or conflicts between Forest visitors because range riders and flaggers, as well as temporary signing along the driveway inform visitors and address safety concerns. Some Forest visitors report that observing cattle drives within the project area adds to their recreation experience, attributing to the fact that this activity is closely tied to Wyoming's cultural heritage. Cattle milling along the road, although a safety concern and annoyance, rarely result in complaints being lodged by the public. Cattle and wildlife injuries or

fatalities from motor vehicle accidents on the road are extremely rare within the project area, as are human-related injuries related to vehicle impacts with cattle or wildlife.

- Illegal off-highway vehicle use off of designated open routes occurs throughout the project area, particularly during the fall big game hunting season. This activity disrupts cattle distribution and gathering/herding operations, causes conflict between Forest visitors, and adversely impacts resources, particularly in riparian areas. Unauthorized use of motor vehicles off of designated motorized routes appears to be strongly influenced by visitors seeing fresh truck or all-terrain vehicle tracks off designated open roads, which encourages others to use the same illegal routes. Where special authorization has been granted to livestock permittees to drive motorized equipment on routes closed to the public to maintain structures, locked gates are commonly used to assist in enforcing motorized closures for the public to minimize impacts to wildlife, streams, and wetlands.
- ***Wagon Creek Focus Area***: A two-track route currently closed to the public through the 1995 Travel Plan is experiencing illegal motorized vehicle use across Wagon Creek within the Mosquito SE Pasture of the Upper Green Allotment. The Interdisciplinary team reviewed this route and recommended that it remain closed to the public, primarily to prevent further impact to Wagon Creek. The team further recommended that permittees continue to be allowed motorized access on this route to maintain fence structures necessary to further protect Wagon Creek. This is authorized in the allotment annual operating instructions.
- ***Fish Creek Focus Area****:* Forest Service Road #37-691 currently provides a short access from the Union Pass Road #37-600 to the Fish Creek area. An unauthorized user-created two-track road off of Road #37-691 is causing riparian impacts on Fish Creek. These impacts are a cumulative result of recreation use and livestock grazing. The interdisciplinary team has identified this site as part of the Fish Creek focus area, which requires a combination of management actions to improve riparian conditions.

Trails

There are eight Forest System trails within the project area traversing approximately 50 miles (Table 42 and Figure 81). Like the majority of two-track roads, many of the existing trails within the project area are user-created and have been adopted and maintained as Forest System trails over time. All of the Forest System trails identified in Table 42 are managed as non-motorized trails. There are no motorized trails located within the project area. There is one constructed trail bridge on the Continental Divide National Scenic Trail #7094 on the Roaring Fork River near the junction of Roaring Fork Trail #7146. This recreation stock bridge is in excellent condition and has eliminated stream bank impacts and sedimentation from recreation stock at this site. Cattle use of this area is rare, and no impacts from cattle have been identified for this bridge. During the summer months, recreation use of trails within the project area is generally moderate and off-trail use is light. During the fall big game hunting season, recreation use is moderate to heavy, on and off trail.

Table 42. Trails within the Upper Green River project area

Trail	Trail Number	Approximate Trail Length in the Project Area (Miles)	Existing Condition
Continental Divide National Scenic Trail	#7094	14	Good condition; appropriate gates where trail crosses through fences; plastic route marker posts often broken-off by cattle
Roaring Fork Trail	#7146	1.5	Trail portion within Bridger Wilderness along Roaring Fork River (eligible Wild River) is located within riparian and is heavily braided due to recreation use; no known livestock impacts as livestock don't normally use this portion of the allotment
Jim Creek Lake Trail	#7143	2.5	Trail has been removed from visitor maps to meet management objectives inside Bridger Wilderness; trail is used to move cattle within Bridger Wilderness portion of the Lower Gypsum Pasture
Kinky Creek Trail	#7195	0.25	Heavy downfall on trail annually, otherwise good condition; no known livestock concerns
Tosi Creek Trail	#7152	2.5	Trail width exceeds standards inside Gros Ventre Wilderness due to past OHV use prior to Wilderness designation in 1984; OHV trespass inside Gros Ventre Wilderness, especially during fall hunting season; no known livestock impacts
Tepee Creek Loop Trail	#7194	6.5	OHV trespass inside Gros Ventre Wilderness, especially during fall hunting season; no known livestock impacts
Beaver-Twin/Rock Creek Trail	#7153	15	Previous resource concerns at Little Twin Creek crossing due to livestock and recreation use; conditions have improved and currently meet resource objectives
Sawmill Meadows Trail	#7154	6	Illegal OHV trespass increasing annually on this trail, with OHV use extending well into Twin Creeks Semi-Primitive/Non-Roaded area; no known livestock impacts

Potential Range-related Concerns for Trails

- Potential livestock impacts to Forest System trails within the project area primarily concern stream crossings and problems with fence and gate design or location. In the past, Forest visitors occasionally left gates open, particularly when gates were not designed to be visitor-friendly. The fence along the eastern boundary of the Roaring Fork Allotment, which crosses the Continental Divide National Scenic Trail (#7094), was recently reconstructed and the new gate located on this trail is an excellent example of a user-friendly design that can easily be opened and closed by hikers and visitors with recreational stock. Reconstruction of this fence has also stopped cattle from entering the Green River Campground and Upper Green River Lake area within the Bridger Wilderness.
- Conflict between recreation use and cattle along trails within the project area has not been reported. Stream crossings on Forest System trails that have potential to be used by recreation and livestock, such as the Little Twin Creek crossing on the Beaver-Twin Creek Trail #7153, have been identified as needing monitoring to evaluate and manage impacts to stream banks, water quality, and sedimentation from range and recreation impacts.
- Approximately 1.5 miles of the Roaring Fork Trail #7146 are located within the Bridger Wilderness portion of the Roaring Fork Allotment-West Pasture. This portion of the Roaring Fork Trail, although lightly used by the public, is in poor condition, with a number of multiple recreation braided trails weaving throughout the riparian area. Roots within Engelmann Spruce stands along this trail within

the Wilderness boundary make the trail difficult to maintain and there is little opportunity to relocate this trail in this area. Cattle have not used this portion of the allotment in past years. Additional use of this area by cattle could add to the current effects of recreation use along this portion of the Roaring Fork Trail, which could add multiple braided trails and sedimentation entering the Roaring Fork River. This portion of the Roaring Fork River is eligible for Wild and Scenic designation and is managed as a "Wild" river. Additional use by cattle in this area is not planned in any of the alternatives in this analysis.

Wilderness and Wilderness Study Areas

The Bridger Wilderness and Fitzpatrick Wilderness were designated by Congress through the 1964 Wilderness Act. Section 4 (d) (4) (2) of the 1964 Wilderness Act (P.L. 88-577), states: "the grazing of livestock, where established prior to the effective date of this Act, shall be permitted to continue subject to such reasonable regulations as are deemed necessary by the Secretary of Agriculture." The 1964 Wilderness Act further mandates that Wilderness be managed so its community of life is untrammeled by man, its primeval character is retained, and its natural conditions are preserved. The Congressional Grazing Guidelines provide further direction regarding domestic livestock grazing inside designated Wilderness and Wilderness Study Areas.

Portions of the Upper Green range allotments lie within the Bridger Wilderness and Gros Ventre Wilderness, and adjacent to the Fitzpatrick Wilderness and Shoal Creek Wilderness Study Area (Figure 83). The Bridger Wilderness and Fitzpatrick Wilderness were designated by Congress through the 1964 Wilderness Act. The Gros Ventre Wilderness and Shoal Creek Wilderness Study Area were designated by Congress through the 1984 Wyoming Wilderness Act.

Forest Service policy is to maintain Wilderness in such a manner that ecological systems are unaffected by human manipulation and influences so that plants and animals develop and respond to natural forces. Livestock grazing within the Bridger Wilderness and Gros Ventre Wilderness was permitted well before either Wilderness was designated by Congress.

Approximately 10 percent of the project area is located within the Bridger Wilderness (5,271 acres) and Gros Ventre Wilderness (12,447 acres) (Figure 83). The Fitzpatrick Wilderness and Shoal Creek Wilderness Study Area lie outside and adjacent to the project area.

- **Bridger and Fitzpatrick Wilderness**: Portions of the Roaring Fork Allotment and Upper Green River (Upper and Lower Gypsum Creek Pastures) lie in Desired Future Condition 6B (Wilderness-Primitive) within the western boundary of the Bridger Wilderness. Portions of the Upper Green Allotment (Fish Creek Pasture) lie adjacent to the western boundaries of the Bridger Wilderness and Fitzpatrick Wilderness.
- **Gros Ventre Wilderness**: Portions of the Upper Green (Upper Tepee/Tosi and Kinky Creek Pastures) and Beaver-Twin Creek Allotment lie in Desired Future Condition 6B within the eastern boundary of the Gros Ventre Wilderness.
- **Shoal Creek Wilderness Study Area**: The Beaver-Twin Allotment lies adjacent to the eastern boundary of the Shoal Creek Wilderness Study Area.

Desired Condition

Management emphasis in Wilderness is to provide for the protection and perpetuation of natural biophysical conditions and a high degree of solitude for visitors but with some perceptible evidence of past human use.

Desired Future Condition 6A

Within the Bridger Wilderness, a portion of the Upper and Lower Gypsum Pastures of the Upper Green Allotment is misidentified in the Forest Plan as Desired Future Condition 6A. Forest Plan Standards exclude livestock grazing within Desired Future Condition 6A. This portion of the Upper Green Allotment was established well before the 1964 Wilderness Act designated the Bridger Wilderness, and livestock grazing in this portion of the Wilderness area is therefore consistent with 1964 Wilderness Act. This situation is recognized in the 1995 Bridger Wilderness Action Plan, as-well-as in a policy letter signed by Forest Supervisor Hamilton (March 24, 2004), as a mapping error. This portion of the Bridger Wilderness is therefore managed as Desired Future Condition 6B, which allows for livestock grazing in Wilderness, and is consistent with the Congressional Grazing Guidelines within designated Wilderness and Forest Plan direction. This and other similar mapping errors will be corrected with Forest Plan revision or amendment from Desired Future Condition 6A to Desired Future Condition 6B.

Desired Future Condition 6B

Forest Plan grazing management direction for Desired Future Condition 6B is as follows: Grazing is managed to maintain and enhance existing range and watershed conditions while providing forage for cattle, sheep, recreational stock, and wildlife. A natural mosaic of different ecological stages exists due to natural processes and livestock grazing. Grazing management activities ensure that livestock use remains within grazing capacity. Domestic livestock distribution is achieved through riding, herding, and salting. Improvements are maintained and built only to the extent needed to cost-effectively maintain stewardship of the range. Wildlife movement is not impeded by range structures and no wildlife displacement occurs in crucial areas. Visitors understand why grazing is permitted and know when and where they are likely to encounter domestic cattle or sheep.

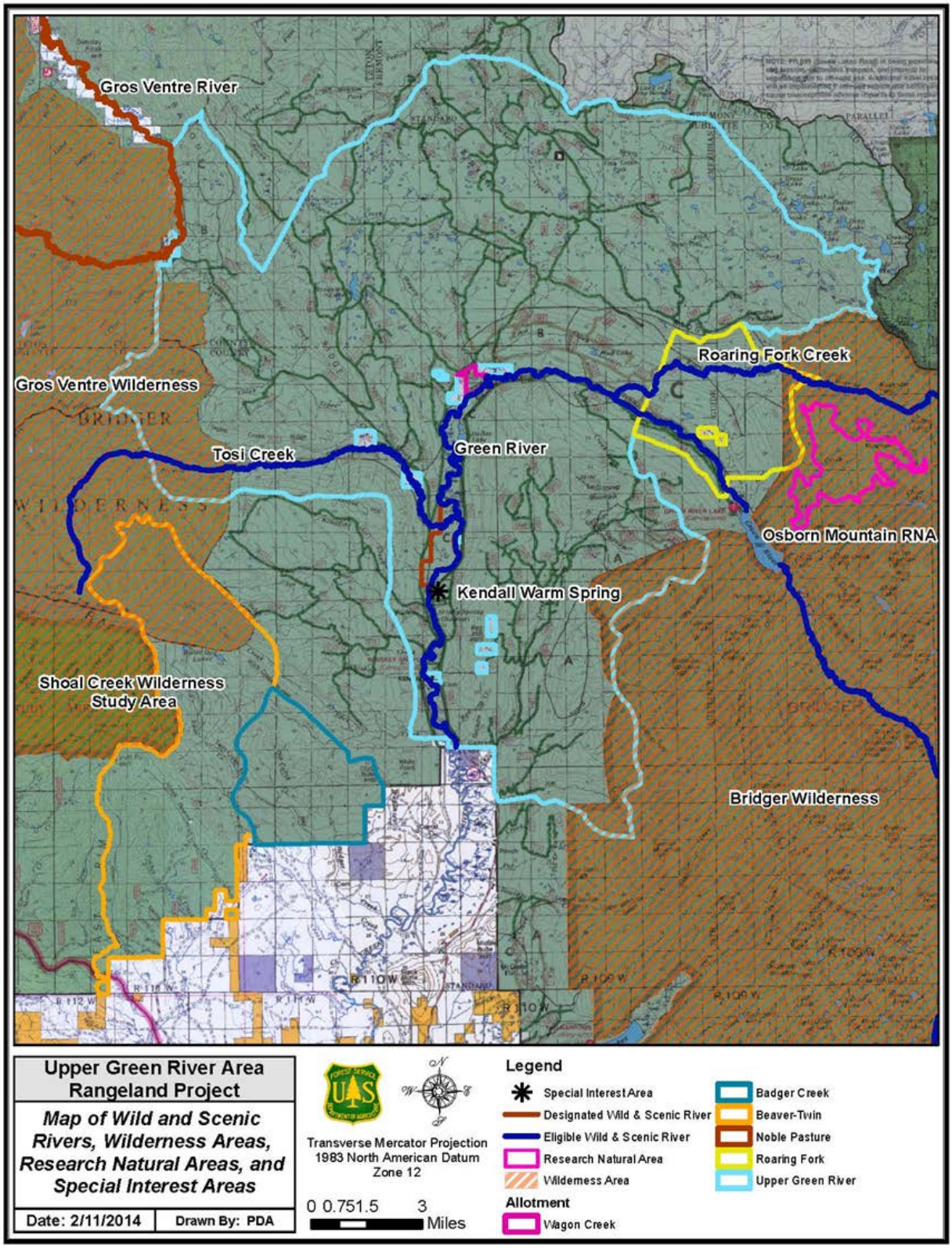

Figure 83. Designated Wilderness, Wilderness Study Area, Wild and Scenic Rivers, Research Natural Area, and Special Interest Area

Facilities determined necessary for resource protection, particularly those facilities constructed prior to Wilderness designation, are permitted within Wilderness. Such facilities are routinely evaluated to determine their effectiveness and monitored to ensure that they are properly maintained. When facilities are determined no longer necessary, they must be removed from Wilderness.

Existing Condition

Livestock grazing was established within the Bridger Wilderness and the Gros Ventre Wilderness well before these areas were designated by Congress as Wilderness, and is consistent with the 1964 Wilderness Act, the 1984 Wyoming Wilderness Act, Congressional Grazing Guidelines, and Forest Service Manual 2300, Chapter 2320 Wilderness Management direction.

There are no effects, including cumulative effects, to ecological or social conditions as a result of current livestock grazing within or adjacent to the Bridger, Gros Ventre, or Fitzpatrick Wilderness Areas or Shoal Creek Wilderness Study Area.

Bridger Wilderness

The Bridger Wilderness is one of the highest used and complex wilderness areas within the nation, with 75-80 percent of its annual use originating from out-of-state and 3 percent from out of country. Visitor use within the Bridger Wilderness is highest between July and August, moderate from September to October, and low throughout the remainder of the year due to lack of plowed access during the winter. The Green River Lakes Trailhead, which routinely ranks third highest-used trailhead for access to the Bridger Wilderness, accounts for approximately 20 percent of the total visitor use entering the Bridger Wilderness annually.

Current livestock management practices within the Bridger Wilderness are meeting desired conditions and are consistent with Forest Plan goals and objectives, standards and guidelines, as well as direction identified in the 1995 Bridger Wilderness Action Plan and 1964 Wilderness Act. No focus areas or site-specific livestock related resource concerns have been identified by the interdisciplinary team within the Bridger Wilderness and there are no existing or proposed structures, including fences, in the Bridger Wilderness in any alternative.

Potential Range-related Concerns within the Bridger Wilderness

- In the past, several salting sites were located within the Bridger Wilderness in the South Fork Gypsum Creek riparian area, which caused minor, site-specific impacts to vegetation and compacted soil in this area. These salt sites were removed and the areas are rehabilitated or are trending towards rehabilitation. Current annual operating instructions specifically prohibit salt sites within 200 yards of system trails or ¼ mile of streams and these requirements are strictly enforced.
- The Bridger Wilderness portion of the Roaring Fork Allotment has not historically been used heavily by livestock. The Roaring Fork Trail #7146 is heavily braided due to recreation use over the years, which is contributing sedimentation into the Roaring Fork River. Additional livestock use in this area would increase cumulative effects to the Roaring Fork River and Trail. Additional livestock use in this area is not planned in any alternative within this analysis.
- The South Gypsum Trail, located within the Bridger Wilderness, has been officially abandoned to allow for more challenging, trail-less opportunities within this portion of the wilderness and to help meet Wilderness management objectives for this area. This area is used lightly by locals. The Jim Creek Trail has been reduced to minimal management and is under study for possible abandonment for similar reasons. Livestock permittees are authorized to use both of these trails (using non-motorized methods) to distribute cattle, drop off salt, and for other management activities, and the portions they use are located outside of managed Desired Future Condition 6A areas. Occasional clearing of trees by the permittees (using non-motorized equipment) is authorized on portions of

these two trails to keep them open for livestock distribution. These authorized activities are not in conflict with Wilderness management objectives for this area or with livestock distribution needs. Increased use of these two trails by the general public is not anticipated due to the severely rough/rutted condition of the two-track access routes to these trails. In addition, neither of these trails is identified on the Pinedale Ranger District visitor maps.

- In the past, cattle occasionally entered the Green River corridor inside the Bridger Wilderness from the Roaring Fork Allotment, resulting in immediate complaints by Wilderness visitors. This situation was corrected when the Roaring Fork fence was recently reconstructed and the gate on the Continental Divide National Scenic Trail #7094 was replaced with a more user-friendly system that is easier for visitors to keep closed.
- Invasive weeds (Canada thistle, musk thistle) have been introduced into the Bridger Wilderness from the Green River Lakes Trailhead by Forest visitors. Other invasive weeds may have been, or have potential to be introduced by elk into the Bridger Wilderness associated with the Green River elk feedground. All hay and straw is prohibited within the Bridger Wilderness. Outside the Bridger Wilderness, only certified weed-free hay is allowed on the Bridger-Teton National Forest. This requirement is identified in the annual operating instructions and is strictly enforced for range and outfitter-guide permittees and members of the general public. Active invasive weed treatments within the project area over the past five years have been very effective in minimizing introduction and treating invasive weeds inside the Bridger Wilderness.
- Off-highway vehicle trespass occurs within portions of the Bridger Wilderness, (particularly within the South Fork Gypsum Creek and Big Sheep Mountain areas of the Upper Green Allotment), which adversely affects physical and social conditions within the Bridger Wilderness. This illegal activity may also affect livestock distribution within this portion of the project area. Livestock permittees are not authorized, and do not use motorized vehicles or equipment within the Wilderness.

Gros Ventre Wilderness

Of the three Wilderness Areas located on the Forest, the Gros Ventre Wilderness retains the highest degree of primitive character and challenge due to light visitor use and limited historic human influence. The majority of the use within the Gros Ventre Wilderness originates from within Wyoming, and peak use occurs during the fall big game hunting season.

Current livestock management practices within the Gros Ventre Wilderness are meeting desired conditions and are consistent with Forest Plan goals and objectives, standards and guidelines, as well as direction identified in the 1994 Gros Ventre Wilderness Action Plan, 1964 Wilderness Act, and 1984 Wyoming Wilderness Act.

Potential Range-related Concerns within the Gros Ventre Wilderness

- Approximately one mile of buck and pole drift fence is located inside the Gros Ventre Wilderness within the Upper Tepee Pasture of the Upper Green River Allotment. This fence was constructed in 1983, prior to this wilderness being designated in 1984. This fence is located inside the Wilderness, approximately two miles west of the Gros Ventre Wilderness boundary and is necessary to keep cattle from drifting west and further into the wilderness (see Figure 7, structural improvements). The existing fence is well maintained and no additional fences or structures exist or are proposed within the Gros Ventre Wilderness in any alternative. Continued maintenance of this fence complies with Forest Service 2320-Wilderness Management direction. An additional drift fence is located outside wilderness in the Beaver-Twin Allotment, between the Water Dog Lake area and the Gros Ventre Wilderness boundary. Both fences are needed to achieve livestock distribution to meet multiple resource objectives.

- Sheep allotment fences inside the Gros Ventre Wilderness adjacent to the project area within the Tosi Creek are in need of maintenance or removal. Fences left in poor condition within Wilderness, especially wire fences, are hazardous to Forest visitors and wildlife and are visually obtrusive. This fence maintenance concern has been addressed in the annual operating instructions for the adjacent sheep allotments, as well as for all allotments within or adjacent to the Upper Green River project area.
- Season-long grazing occurs within the Beaver-Twin Allotment, a portion of which is located within the Gros Ventre Wilderness. This does not meet Forest Plan standards for a rotational grazing system. Therefore, the Wilderness character (i.e. natural integrity) of the Gros Ventre Wilderness within this portion of the allotment may be compromised if this allotment is fully stocked without a rotational grazing system.
- Off-highway vehicle trespass within the Gros Ventre Wilderness, (particularly within the Tepee/Tosi Creek area of the Upper Green Allotment) adversely affects physical and social conditions within the Gros Ventre Wilderness, and has potential to affect livestock distribution within this portion of the project area. Trail #7152 was originally a user-created jeep trail before the Gros Ventre was designated as Wilderness in 1984. This jeep trail was converted to a non-motorized trail in 1984, but the tread width still exceeds Wilderness trail standards and attracts illegal off-highway vehicle use. This concern is related to impacts from recreation use rather than from livestock use.

Fitzpatrick Wilderness and Shoal Creek Wilderness Study Area

The Fitzpatrick Wilderness and Shoal Creek Wilderness Study Area are located adjacent to the project area. The Fitzpatrick Wilderness, designated by the 1964 Act, lies directly north and adjacent to the Bridger Wilderness. The Shoal Creek Wilderness Study Area is located directly south and adjacent to the Gros Ventre Wilderness. None of the six allotments are located within either of these two areas and there are no known livestock grazing concerns related to the Fitzpatrick Wilderness or Shoal Creek Wilderness Study Area from the six allotments in the Upper Green River project area.

Wild and Scenic Rivers

The entire project area encompasses the headwaters of both the Green River drainage of the Colorado River System and the Gros Ventre River drainage of the Snake/Columbia River Basin System.

Designated through the Craig Thomas Snake Headwaters Legacy Act in 2009, a short segment of the Gros Ventre Scenic River is located in the northwestern tip of the project area. This is the only river segment within the project area designated by Congress into the National Wild and Scenic River System. The entire portions of the Green River, Roaring Fork River and Tosi Creek located within the project area are eligible for Wild or Scenic River designation as identified in the Forest Plan. Figure 83 displays these streams.

Congress established the Wild and Scenic River Act to protect rivers and their immediate environments for the benefit and enjoyment of present and future generations; to preserve selected rivers in their free-flowing condition; and to protect water quality and fulfill other vital national conservation purposes. The goal of the National System is not to halt use of a river but to preserve the character of a river. Uses compatible with the management goals of a particular river are allowed; change is expected to happen. However, development must ensure the river's free flow and protect its "outstandingly remarkable resources." The intent of Congress was to create a national system of protected rivers that co-exist with use and appropriate development.

Once determined eligible, river segments are tentatively classified for study as either "Wild", "Scenic", or "Recreational" based on the degree of access and amount of development along the river. If designated by Congress, the enabling legislation generally specifies the classification.

- "Wild" rivers are free of impoundments, generally inaccessible except by trail, with watersheds or shorelines essentially primitive, and having unpolluted waters.
- "Scenic" rivers are free of impoundments, have shorelines or watersheds largely primitive and shorelines largely undeveloped, but accessible in places by roads. These rivers are usually more developed than "Wild" rivers and less developed than "Recreational" rivers.
- "Recreational" Rivers are readily more accessible by road, may have some development along the shoreline, and may have some pre-existing impoundments or diversions. A river segment may have one or more of these classifications, but the classifications cannot overlap.

Desired Condition

Designated Wild and Scenic Rivers

River segments that have been designated as Wild or Scenic in the 2009 Craig Thomas Snake River Headwaters Legacy Act, are identified in the January, 2014 Snake River Headwaters Comprehensive River Management Plan (CRMP). The CRMP establishes overall management direction for designated wild and scenic river segments within the Bridger-Teton National Forest. The CRMP establishes river corridor boundaries and incorporates river-specific goals, objectives, desired future conditions, standards and guidelines, user capacities, monitoring, and other management practices necessary to achieve desired resource conditions. All designated river segments will be managed to protect and enhance their outstandingly remarkable values, free-flowing condition, and water quality for future generations. More specifically, management will:

- Promote the rivers' natural hydrological processes, channel form and function, and ability to shape the landscape, reduce impediments to free flow, ensure sufficient flows to protect and enhance outstandingly remarkable values, and ensure the maintenance of water quality.
- Protect and enhance the natural biodiversity, complexity, and resiliency of riparian areas, wetlands, floodplains and adjacent uplands.
- Protect and enhance cultural resources as important links to the human history of the river corridors, including historical and archeological sites, cultural landscapes, and ethnographic resources.
- Provide a diversity of settings and opportunities for visitors of varying abilities to experience, learn about, and have a direct connection with the rivers and their special values. Such opportunities must be consistent with the values that caused the rivers to be designated.
- Allow for legal and permitted multiple uses and associated developments, consistent with each river segment's classification while supporting the protection and enhancement of river values.

Eligible Wild and Scenic Rivers

River segments that have been determined eligible for potential addition to the National Wild and Scenic River system are protected from activities that could diminish or change the free-flowing characteristic, water quality, or the scenic, recreational, fish and wildlife, and other values which make the river eligible for designation. All eligible rivers, including ¼ mile on either side of their banks (1/2 mile total), are managed as "Wild" or "Scenic" depending upon eligibility status.

Existing Condition

Designated Wild and Scenic Rivers

A small segment of the designated Gros Ventre Scenic River (Figure 5) is located within the Kinky Creek Pasture of the Upper Green Allotment. Outstandingly remarkable values identified for the Gros Ventre Scenic

River designation include scenic, recreational, cultural, ecological wildlife, fish and geologic features. This river segment is currently fenced to prohibit cattle within its riparian corridor but horse grazing from the adjacent private property (known as the Darwin Ranch) currently occurs within this fenced riparian area. Equine use of the Kinky Creek Pasture is discussed in more detail in the Rangeland section.

Eligible Wild and Scenic Rivers

The Bridger-Teton Forest Plan was amended in 1992 (U.S. Forest Service 1992) to identify 31 rivers eligible for Wild and Scenic River designation on the Forest. Forest-wide standards were created for these eligible rivers, regardless of Desired Future Condition designation. A corridor of ¼ mile on each side of the eligible river's banks (½ mile total) was also established through this Forest Plan amendment. A brief description of the three rivers determined eligible for designation within the analysis area are as follows:

- The Green River is eligible and managed as "Wild" inside the Bridger Wilderness from its source to the Lower Green River Lake, then "Scenic" for approximately 25.5 miles from Lower Green River Lake to the Forest boundary. Eligibility criteria include outstanding scenic values created by the glacial Green River Valley, spectacular scenic attractions such as Square Top Mountain, special interests such as the Kendall Warm Spring dace, pronghorn and mule deer migration corridors, and historic sites such as the Gros Ventre Lodge, Tie Camp Cemetery, and Osborn Mountain Homestead. This segment of the Green River is also located within Forest Plan Desired Condition Class 3A – River Recreation, which accounts for approximately one percent of the total project area. Management emphasis within DFC 3A meets management emphasis for eligible Scenic Rivers.
- Tosi Creek is eligible and managed as "Wild" from its source to Moore Ranch, then "Scenic" to its terminus at the Green River (approximately 12 miles total). Eligibility criteria include unique Karst topography, typical limestone bedrock eroded by water, in an alpine basin, where the creek runs underground in places.
- Roaring Fork Creek is eligible and managed as "Wild" from its source to its confluence with the Green River (approximately 12 miles). Eligibility criteria include a highly diverse creek corridor with change in elevation rock types from its source to its confluence with the Green River.

Livestock Grazing in Eligible and Designated Wild and Scenic Rivers

Livestock grazing is considered compatible with Wild and Scenic River management. Existing livestock grazing would not be discontinued or altered merely as a result of river designation, just as existing permitted livestock grazing has not been discontinued when Wilderness has been designated by Congress. Grazing occurs on federal lands along many western Wild and Scenic Rivers formally designated in the Wild and Scenic Rivers System and no grazing permit has been lost due to Wild and Scenic River designation in the nation.

There are no provisions in the Wild and Scenic Rivers Act that would further restrict livestock operations within the project area because the three eligible rivers and one designated river have been managed as "Wild" and "Scenic" since 1992, when they were determined eligible through the Forest Plan Amendment process. As long as desired conditions identified in the Bridger-Teton Forest Plan are achieved for eligible river segments, and 2014 Comprehensive Management Plan direction is met for the designated Gros Ventre River, all four of these rivers and their tributaries are in compliance with Wild and Scenic River direction.

Outstanding scenic, recreational, geologic, fish and wildlife, historic and cultural values, and free-flowing condition have, for the most part, been retained for the designated Gros Ventre Scenic River and eligible Green River, Roaring Fork River, and Tosi Creek, as well as for their tributaries.

There are several site-specific locations where resource conditions caused by livestock grazing and/or recreational use are not meeting resource objectives along segments of these rivers/streams or their tributaries (Robertson 2016). This adversely affects wild and scenic river objectives as follows:

Gros Ventre Drainage of the Snake/Columbia River Basin System:

- Kinky Creek Focus Area - A segment of Kinky Creek, (a tributary of the designated Gros Ventre Scenic River), is not meeting riparian function objectives. This segment is located within the Kinky Creek Pasture of the Upper Green Allotment.

Green River Drainage of the Colorado River System:

- Tosi Creek Focus Area - A segment of this eligible creek, (and tributary of the eligible Green River), within Noble Pasture #1 is not meeting stream bank stability objectives.
- Klondike Creek Focus Area – A segment of this creek, (a tributary of the Green River) within Noble Pasture #4, is not meeting streambank stability or vegetative cover objectives.
- Green River– (PFC Site #4) – This segment of the eligible Green River is located within the Mud Lake East Pasture of the Upper Green River Allotment at the elk feedground, near the confluence of the Roaring Fork River. This section of river was identified as functioning at risk, and is therefore not meeting riparian function objectives. This issue is primarily due to congregating elk during winter feeding operations and recreation use during the summer months.
- Roaring Fork River – this eligible river was determined to be in excellent condition with no riparian or stream concerns identified by the Interdisciplinary team.

Other than these site specific locations of concern, the remainder of the eligible and designated portions of rivers and streams and their tributaries within the project area meet desired ecological and free-flowing conditions and National, Regional, and Forest-level management direction for eligible or designated Wild and Scenic Rivers. With respect to the free-flowing status of Tosi Creek, there is a head-gate and diversion in Tosi Creek within the Noble Pastures Allotment which existed at this location for irrigation purposes before Tosi Creek was identified as an eligible Scenic River in the 1992 Forest Plan amendment (U.S. Forest Service 1992). Some water from Tosi Creek is diverted into Noble Pastures, and the remaining water continues to flow in Tosi Creek beyond the diversion, thus Tosi Creek remains free-flowing. Therefore, there is no change to the free-flowing status and eligibility of Tosi Creek as a Scenic River under any alternative as a result of the existing head-gate and water diversion for irrigation purposes.

Environmental Consequences

Indicators Used for Comparison of Alternatives

Indicators for this analysis: effects on recreation, access, Wilderness, and Wild and Scenic Rivers. Also considered were conclusions drawn by resource specialists for other resources, particularly riparian areas (hydrology), fisheries, wildlife, sensitive plants, soils, and rangeland vegetation.

Effects Common to the All Alternatives

Environmental effects, including cumulative effects, to visual quality, recreation, special uses, access, Wilderness, Wild and Scenic Rivers, Research Natural Areas, Special Interest Areas, and Inventoried Roadless Areas are based upon known existing conditions, trends, and expected responses to the proposed

action and alternatives. Within the project area, effects identified for other resource areas (Rangeland Vegetation, Hydrology, Fisheries, Wildlife, Soils, and Cultural Resources), have potential to also affect Wilderness, Wild and Scenic Rivers, Research Natural Areas, and Special Interest Areas, particularly if ecological function is out of balance within these areas.

Roads: No new motorized routes are proposed in any of the alternatives, and no closed motorized routes are being proposed to be reopened in any alternative. There are therefore no changes in road density within Desired Future Condition 10 or 12 related to livestock grazing and no net change in roaded access or road density standards with any alternative in this analysis.

Wild and Scenic Rivers: Under Alternative 1, 2, 3, and 4, the water diversion in Tosi Creek within the Noble Pastures Allotment used for irrigation purposes would continue. This diversion existed well before Tosi Creek was identified as an eligible Scenic River in the 1992 Forest Plan amendment (U.S. Forest Service 1992). The continuation of this water diversion and flood irrigation of the pastures does not disrupt the free-flowing character of Tosi Creek and would therefore not change its eligibility as a Scenic River under any of the alternatives.

Alternative 1 – No Livestock Grazing (No Action Alternative)

Direct, Indirect, and Cumulative Effects

Under Alternative 1 (No Livestock Grazing), livestock grazing would cease two years after notice of cancellation. Most range fences (approximately 62 miles) would be removed. Livestock impacts to visual quality, recreation, access, Wilderness, Wild and Scenic Rivers, Research Natural Areas, Special Interest Areas, and Inventoried Roadless Areas would improve over time under this alternative.

Visual Quality

Site specific visual quality concerns where Retention is not being met within the Green River corridor would be expected to slightly improve with removal of livestock, but would continue to be impacted primarily by recreational use (dispersed camping and off-highway vehicle use), and by elk within the feedground within this corridor.

Developed and Dispersed Recreation and Special Uses

Under Alternative 1, there would be no human-livestock conflict. Existing livestock improvements (approximately 62 miles of fence, corrals, pipelines, troughs, and cabins) would be removed from the Forest over time, except those fences determined necessary such as those along the Forest boundary, Noble Pasture boundary, or adjacent to other grazing allotments or inholdings. This would provide maximum freedom for Forest visitor wishing to travel by horse or foot cross-country throughout the project area. However, the Forest Service would become responsible for maintaining boundary fences that are currently maintained by the livestock permittees.

Introduction and spread of invasive and noxious weeds by domestic livestock grazing would discontinue, however the primary source of introduction and spread within the project area is from motorized recreation vehicles, recreation stock, and hikers, therefore noxious and invasive weeds would be expected to continue. In addition, Range funding and expertise has traditionally been used to monitor, document, and treat noxious and invasive weeds. Removal of domestic livestock would likely result in less funding for monitoring and treatment of invasive weeds, which would likely result in an increase in noxious and invasive weeds within the project area over time.

Livestock carcasses located near dispersed recreation sites, trails, and roads would no longer pose a safety concern for human-grizzly encounters. However, human-bear conflicts related to food storage violations by recreationists resulting in habituated bears would be expected to continue with the absence of domestic livestock.

Access (Roads and Trails)

The potential for vehicle accidents from impacts with cattle would be eliminated under Alternative 1. However, motor vehicle accidents related to impacts with cattle are very rare within the project area.

Fish Creek Focus Area: The unauthorized two-track road off of Forest Service Road #37-691 in the Fish Creek focus area would remain closed to motorized use but unauthorized motorized use associated with recreation would likely continue to impact Fish Creek because this unauthorized road would not be physically ripped and seeded as proposed in Alternatives 3 and 4.

Stream crossings on Forest System trails would be expected to improve without the cumulative effects of domestic livestock. However, impacts to stream crossings from recreational stock use, designated open motorized routes, and illegal OHV use would still be expected to continue with all alternatives.

Wilderness and Wilderness Study Areas

Bridger Wilderness: Current livestock management practices within the Bridger Wilderness are meeting desired conditions and are consistent with Forest Plan Goals and Objectives, standards and guidelines, as well as direction identified in the 1995 Bridger Wilderness Action Plan and 1964 Wilderness Act. No focus areas or site-specific livestock grazing concerns were identified by the interdisciplinary team within the Bridger Wilderness. However, removal of domestic livestock within designated Wilderness would improve natural integrity, apparent naturalness, remoteness, solitude, and opportunities for primitive recreation within this wilderness.

A portion of the Upper and Lower Gypsum Pastures of the Upper Green River Allotment is located in the Bridger Wilderness and is incorrectly identified in the Forest Plan as Desired Future Condition 6A. This area is therefore currently managed, and would remain managed, as Desired Future Condition 6B under Alternatives 2, 3 and 4 to be consistent with the Congressional Grazing Guidelines within designated Wilderness, Forest Plan, and Bridger Wilderness Action Plan direction. In Alternative 1, livestock grazing would be discontinued and this portion of the Bridger Wilderness would then be appropriately converted to, and managed as DFC 6A. The existing South Gypsum Trail and Jim Creek Trail would be re-evaluated for decommissioning to meet DFC 6A desired condition standards.

Gros Ventre Wilderness: Current livestock management practices within the Gros Ventre Wilderness are meeting desired conditions and are consistent with Forest Plan Goals and Objectives, standards and guidelines, as well as direction identified in the 1994 Gros Ventre Wilderness Action Plan and 1964 Wilderness Act. No focus areas or site-specific livestock grazing concerns were identified by the interdisciplinary team within the Gros Ventre Wilderness.

The one mile long buck and pole fence currently located in the Gros Ventre Wilderness within the Upper Tepee Creek Pasture of the Upper Green Allotment would be removed with this alternative. Fence removal operations would be expected to have short-term, minor social impacts to wilderness visitors. Removal of domestic livestock and the existing one-mile long fence within the Gros Ventre Wilderness would improve natural integrity, apparent naturalness, remoteness, solitude, and opportunities for primitive recreation within this wilderness.

Wild and Scenic Rivers

Outstanding scenic, recreational, geologic, fish and wildlife, historic and cultural values, and free-flowing condition have, for the most part, been retained for the eligible Green River, Roaring Fork River, and Tosi Creek, and designated Gros Ventre Scenic River, as well as for their tributaries. There are several site-specific locations where resource conditions caused by livestock grazing and/or recreational use have adversely impacted resource conditions along segments of these rivers or their tributaries, as identified by the interdisciplinary team.

Under Alternative 1, riparian conditions in the Tosi Creek focus area, Kinky Creek focus area, (tributary to the designated Gros Ventre Scenic River), and Klondike focus area (tributary to the Green River) would be expected to improve fairly rapidly as domestic livestock would be removed. Properly functioning conditions within PFC 4 of the Green River at the Roaring Fork confluence would not be expected to substantially improve because the primary cause of impacts at this site is winter elk feeding operations associated with the Green River elk feedground. Other sites within the Green River corridor impacted primarily by dispersed recreation would be expected to slightly, but not substantially improve with removal of livestock.

The water diversion in Tosi Creek within the Noble Pastures Allotment would be left in place to continue to irrigate the Noble Pastures to retain ground cover. The continuation of this partial water diversion does not disrupt the free-flowing character of Tosi Creek and would therefore not change its eligibility as a Scenic River under this alternative.

All rivers and streams within the project area, including eligible and designated rivers and streams, would be expected to benefit from removal of livestock and associated structures. Recreation impacts to these rivers and streams would remain unchanged.

Conclusion (Alternative 1)

Of the four alternatives, Alternative 1 would have the most beneficial overall effects to visual quality, recreation, special uses, Wilderness, Wild and Scenic Rivers, Special Interest Areas, Inventoried Roadless Areas, minor beneficial effects to access, and no measurable effect to Research Natural Areas.

Existing conditions, trends, and effects identified in the analysis for other resources (Wildlife, Fisheries, Hydrology, Soils, Rangeland Vegetation, and Heritage Resources) affect the desired primitive character, ecological function, and degree of naturalness of Wilderness, Wilderness Study Areas, eligible Wild and Scenic Rivers, Research Natural Areas, Special Interest Areas, and Inventoried Roadless Areas within the project area. Alternative 1 would have the greatest benefit to ecological function in focus areas and areas of concern at the fastest rate by removing livestock grazing compared to Alternatives 2, 3, and 4.

The primitive character and degree of naturalness would also improve under Alternative 1 within the Gros Ventre Wilderness through removal of the existing one-mile long buck and pole fence, and within the five inventoried roadless areas through removal of structures (fences, cabins, etc.).

This alternative would have beneficial effects to visual quality, recreation, special uses, access, Wilderness, Wild and Scenic Rivers, Research Natural Areas, Special Interest Areas, and Inventoried Roadless Areas within or adjacent to the project area.

Cumulative Effects

See discussion of cumulative effects under Alternative 4

Effects Common to Action Alternatives

Direct effects of livestock grazing are caused by the presence of cattle and/or range structures within or near dispersed campsites, along roads and trails, within recreation corridors such as rivers and streams, and within designated Wilderness, Research Natural Areas, and Special Interest Areas. Livestock also have the potential to directly impact trail tread, create multiple trails, and impact facilities such as kiosks, signs, fences, and other structures used as scratching posts. In addition, cattle on roadways can lead to motor vehicle accidents, particularly on higher speed roads such as Union Pass Road (FS-#37-600) and Green River Road (FS-#37-650).

Indirect effects of livestock grazing, which include removal of vegetation, trampling, compaction, and water quality impacts, can in general change the natural ecological function and/or unique characteristics of specially designated areas such as Wilderness, Wilderness Study Areas, Research Natural Areas, Special Interest Areas, and eligible Wild and Scenic Rivers depending upon the severity, size and duration of the impact.

Alternative 2 – Grazing as Currently Permitted/ Current Management

Under Alternative 2, domestic livestock grazing would continue to be authorized within the six allotments. Season-long grazing would continue in the Badger, Beaver-Twin, and Roaring Fork allotments. Forest Plan forage utilization standards for wildlife, livestock, and recreational stock would range from 50 to 65 percent. Specific grazing prescriptions would be identified only for one existing focus area (Waterdog Lakes), which would continue to be managed to reduce cumulative grazing effects of domestic livestock and outfitter-guide recreational stock. No new fences or structures would be added, and existing structures would be maintained or reconstructed over time as needed.

Direct and Indirect Effects

Visual Quality

Site specific visual quality concerns where Retention is not being met within the Green River corridor would continue to be impacted primarily by recreational use (dispersed camping and off-highway use), by elk within the feedground, and by domestic livestock to a lesser extent. However, a design feature common to Alternatives 2, 3, and 4 (Livestock Distribution, Range Improvements, and Best Management Practices section) requires that cattle would be actively herded away from the Green River Forest boundary, Kendall Bridge, and Dollar Lake to minimize or avoid potential conflicts with Forest recreationists and visitors and address visual concerns in these areas. The best management practice of placing salt a minimum of 200 yards from system trails and ¼ mile from streams would also result in improving visual quality objectives within the Green River corridor. These requirements would effectively keep cattle from congregating in these areas of concern, as demonstrated by present herding and livestock management which are keeping cattle from congregating at these sites. However, cattle use of the Upper Green River livestock driveway adds to existing recreation impacts to visual quality within this corridor equally under the three action alternatives.

In Alternatives 2, 3, and 4, the best management practice of placing salt a minimum of 200 yards from system trails and ¼ mile from streams would also result in improving visual quality objectives related to livestock grazing along the Union Pass Road – South Fork Fish Creek Bridge in the Fish Creek Pasture and along the South Fork Gypsum Creek in the Upper Gypsum Pasture of the Upper Green River Allotment.

The Visual Quality Objective of Retention for the Roaring Fork Trail #7146 within the Bridger Wilderness would not be expected to improve with any of the action alternatives because this area is impacted by recreation use rather than by livestock use. However, livestock would not contribute to this impact with the three action alternatives because salting would not be allowed in the area and cattle would continue to be herded away from the trail and impacted river corridor.

Developed and Dispersed Recreation and Special Uses

The potential for human-livestock conflict within popular dispersed sites and along the livestock driveway would likely be the same for Alternatives 2, 3 and 4. Human-livestock conflicts have not been reported, likely because Forest visitors to this area expect to encounter cattle, or evidence of cattle, throughout the project area. Most cattle move through areas occupied by people, and the permittees would continue to herd livestock away from popular dispersed recreation sites such as the Forest boundary, Kendall Bridge, Dollar Lake, and the Roaring Fork confluence with the Green River.

Livestock improvements (approximately 76 miles of fence, corrals, pipelines, troughs, cabins, and other structures) would remain with no new structures. There are no specific fences currently known to disrupt or impact dispersed recreation use within the project area, and there is approximately 9 miles less fence under Alternative 2 than Alternatives 3 and 4. There would be less potential for disruption of Forest visitor access by foot or horseback cross-country under Alternative 2 as compared to Alternatives 3 and 4. Range permittees would continue to be responsible for maintaining boundary fences in Alternatives 2, 3, and 4.

Introduction and spread of invasive and noxious weeds by domestic livestock grazing would remain the same for Alternatives 2, 3, and 4, as cattle numbers would be similar. However, the primary source of introduction and spread within the project area is from motorized recreation vehicles, therefore noxious and invasive weeds would be expected to continue under all three action alternatives. Range funding and expertise for monitoring and treatment of invasive weeds would likely remain the same in Alternatives 2, 3, and 4.

Livestock carcasses located near dispersed recreation sites, trails, and roads would be expected to be the same for Alternatives 2, 3 and 4. The design feature for Alternatives 2 – 4 requiring that “all carcasses would be removed or treated within ½ mile of Green River Lakes Road, Union Pass Rd, Forest Service roads 605, 660, 663B and 663C, Green River Lakes and Whiskey campgrounds, private cabins, Kendall and Fish Creek guard stations, permitted cow camps, permitted outfitter camps, Lake of the Woods, Waterdog Lakes, and North Beaver and Tosi trailheads” would help reduce the potential for human-bear conflicts associated with livestock carcasses in these areas. However, human-bear conflicts associated with livestock carcasses would be greater in all three action alternatives than under Alternative 1 (No Action).

In Alternative 2, livestock would continue to be permitted to graze in the South Pasture of the Roaring Fork Allotment season-long. This would increase the potential for human-livestock conflict in this popular area of the Green River during the peak recreation season of July through mid-September within this pasture.

Access (Roads and Trails)

The potential for vehicle accidents from impacts with cattle would be about the same for all action alternatives. However, motor vehicle accidents related to impacts with cattle are currently very rare within the project area. There would be no changes to road density under any alternative. No new roads are proposed to be opened or closed.

Fish Creek Focus Area: The unauthorized two-track road off of Forest Service Road #37-691 in the Fish Creek focus area would remain closed to motorized use, but unauthorized motorized use associated with recreation and livestock trailing on the road would likely continue to impact Fish Creek because the unauthorized road would not be ripped or seeded.

Wagon Creek Focus Area: An existing road, closed through the Pinedale District's 1995 Travel Management Planning process, would continue to receive unauthorized motor vehicle use. This unauthorized road provides administrative access to the Wagon Creek focus area, however unauthorized motor vehicle use by the public on this road has contributed to soil erosion at the stream crossing. Under Alternative 2, this erosion at the stream crossing would continue, resulting in the Wagon Creek focus area not meeting the riparian function objective.

Wilderness and Wilderness Study Areas

Bridger Wilderness: Current livestock management practices within the Bridger Wilderness are meeting desired conditions and are consistent with Forest Plan goals and objectives, standards and guidelines, as well as direction identified in the 1995 Bridger Wilderness Action Plan and 1964 Wilderness Act. No focus areas or site-specific concerns were identified by the interdisciplinary team within the Bridger Wilderness. No range structures are located within this wilderness and none are proposed with any of the action alternatives.

A portion of the Upper and Lower Gypsum Pastures of the Upper Green River Allotment is located in the Bridger Wilderness and is incorrectly identified in the Forest Plan as Desired Future Condition 6A. This area is therefore currently managed, and would remain managed, as Desired Future Condition 6B under Alternatives 2, 3 and 4 to be consistent with the Congressional Grazing Guidelines within designated Wilderness, Forest Plan, and Bridger Wilderness Action Plan direction.

Gros Ventre Wilderness: Current livestock management practices within the Gros Ventre Wilderness are meeting desired conditions and are consistent with Forest Plan Goals and Objectives, standards and guidelines, as well as direction identified in the 1994 Gros Ventre Wilderness Action Plan and 1964 Wilderness Act. No focus areas or site-specific livestock grazing concerns were identified by the interdisciplinary team within the Gros Ventre Wilderness.

The one mile long buck and pole fence currently located in the Gros Ventre Wilderness within the Upper Tepee Creek Pasture of the Upper Green Allotment would remain in Alternatives 2, 3, and 4. This fence has minor adverse effect to wilderness characteristics of apparent naturalness, remoteness, and solitude, and opportunities for primitive recreation because it is a man-made structure. However, this fence is limited in extent (1 mile in length) and was in existence before the Gros Ventre Wilderness was designated by Congress in 1984. Continued maintenance of this fence complies with Forest Service 2320-Wilderness Management direction. This fence is necessary for effective management of resources and its presence does not substantially change the existing wilderness character of the area. No additional fence would be constructed within the Gros Ventre Wilderness under Alternatives 2, 3, or 4.

In Alternative 2, season-long grazing would continue to occur within the Beaver-Twin Allotment, a portion of which is located within the Gros Ventre Wilderness. This does not meet Forest Plan standards requiring a rotational grazing system. Although no focus areas or areas of concern were identified within the Gros Ventre Wilderness portion of this allotment, the Wilderness character (i.e. natural integrity) of this Wilderness has potential to be compromised without an appropriate rotational grazing system in place.

Wild and Scenic Rivers

Under Alternative 2, outstanding scenic, recreational, geologic, fish and wildlife, historic and cultural values, and free-flowing condition would, for the most part, continue to be retained for the eligible Green River, Roaring Fork River, and Tosi Creek, and designated Gros Ventre Scenic River, as well as for their tributaries. However, there are several site-specific focus areas and areas of concern where resource conditions caused by livestock grazing and/or recreational use have adversely impacted resource conditions along segments of these rivers or their tributaries, as identified by the interdisciplinary team (see Hydrology and Fisheries sections).

Kinky Creek Focus Area (tributary to the designated Gros Ventre Scenic River): There would be slight benefits in terms of reduced sedimentation and water quality in the designated Gros Ventre Scenic River with improved conditions on Kinky Creek, a tributary of the Gros Ventre River, but this area would continue to not meet the riparian function objective because no site-specific prescriptions would be implemented. This condition has potential to impact the designated Gros Ventre Scenic River, which would not meet Wild and Scenic direction.

Tosi Creek Focus Area: Under Alternative 2, the eligible Tosi Creek segment within the Tosi Creek focus area would continue to not meet the riparian function objective because no site-specific prescriptions would be implemented. This would not meet Wild and Scenic direction for this segment of Tosi Creek.

Klondike Creek Focus Area (tributary to eligible Green River): Under Alternative 2, this tributary to the eligible Green River would continue to not meet the riparian function objective because no site-specific prescriptions would be implemented. This condition has potential to impact the eligible Green River, which would not meet Wild and Scenic direction for this eligible river.

Green River PFC #4 Area of Concern: Under Alternative 2, Riparian conditions in the Green River segment at the Roaring Fork confluence and near the elk feedground (PFC #4) would be expected to remain functioning at risk because elk would continue to congregate in this area in association with the Wyoming Game and Fish Department's Upper Green River elk feedground. This elk use would likely continue to impact riparian function on the Green River (see Riparian Areas section of this DEIS and U.S. Forest Service 2008b, c). Range permittees would continue to herd livestock away from the feedground area, which would minimize the impact of livestock on this segment of the Green River.

The remaining segments of eligible and designated rivers and their tributaries currently meet desired ecological and free-flowing conditions and meet National, Regional, and Forest-level management direction for eligible or designated Wild and Scenic Rivers, and would not be expected to be adversely affected by Alternative 2.

Conclusion

Under Alternative 2, design features common to action alternatives and monitoring measures would be implemented, but site-specific management prescriptions designed to improve resource conditions, particularly in focus areas, would not be implemented, except within the Waterdog Lakes focus area. Site-specific impacts of livestock grazing, although few and minor, would therefore be expected to continue.

Of the four alternatives, Alternative 2 would have the least beneficial overall effects to visual quality, recreation, special uses, access, Wilderness, Wild and Scenic Rivers, Special Interest Areas, and Inventoried Roadless Areas and no measurable effect on Research Natural Areas.

Existing conditions, trends, and effects identified in the analysis for other resources (Wildlife, Fisheries, Hydrology, Soils, Vegetation, and Heritage Resources) affect the desired primitive character, ecological function, and degree of naturalness of Wilderness, Wilderness Study Areas, eligible Wild and Scenic Rivers, Research Natural Areas, Special Interest Areas, and Inventoried Roadless Areas within the project area. Alternative 2 would not improve ecological function in four of the six focus areas or areas of concern within the project area, but these areas represent a very small portion of the entire project area. The majority of the project area is meeting multiple resource objectives. This alternative would therefore have no significant effects on visual quality, recreation, special uses, access, Wilderness, Wild and Scenic Rivers, Research Natural Areas, Special Interest Areas, and Inventoried Roadless Areas within or adjacent to the project area.

Cumulative Effects

See discussion of cumulative effects under Alternative 4.

Alternative 3 – Modified Grazing Management (Modified Proposed Action)

Direct and Indirect Effects

Under Alternative 3, allowable use standards, structural improvements, design features common to action alternatives and monitoring measures would be implemented. The seven focus areas and other areas of concern identified in Chapter 1 would receive site specific prescriptions to address resource concerns and move these areas towards desired conditions. Rotational grazing would also be implemented for all six allotments. Additional fencing would aid in livestock distribution to minimize concentration and maximize use of rotation pastures within the allotments. These additional measures would improve resource conditions and overall ecological function as described in the Rangeland Vegetation, Hydrology, Fisheries and Wildlife sections. This in turn will improve resource conditions related to visual quality, recreation, special uses, access, Wilderness, Wild and Scenic Rivers, Research Natural Areas, Special Interest Areas, and Inventoried Roadless Areas.

Visual Quality

Site specific visual quality concerns where Retention is not being met within the Green River corridor would continue to be impacted primarily by recreational use (dispersed camping and off-highway use), by elk within the feedground, and by domestic livestock to a lesser extent. However, a design feature common to Alternatives 2, 3, and 4 (Livestock Distribution, Range Improvements, and Best Management Practices section) requires that cattle would be actively herded away from the Green River Forest boundary, Kendall Bridge, and Dollar Lake to minimize or avoid potential conflicts with Forest recreationists and visitors and address visual concerns in these areas. The best management practice of placing salt a minimum of 200 yards from system trails and ¼ mile from streams would also result in improving visual quality objectives within the Green River corridor. These requirements would effectively keep cattle from congregating in these areas of concern, as demonstrated by present herding and livestock management which are keeping cattle from congregating at these sites. However, cattle use of the Upper Green River livestock driveway adds to existing recreation impacts to visual quality within this corridor equally under the three action alternatives.

In Alternatives 2, 3, and 4, the best management practice of placing salt a minimum of 200 yards from system trails and ¼ mile from streams would also address visual quality objectives related to livestock grazing along the Union Pass Road – South Fork Fish Creek Bridge in the Fish Creek Pasture and along the South Fork Gypsum Creek in the Upper Gypsum Pasture of the Upper Green River Allotment.

The Visual Quality Objective of Retention for the Roaring Fork Trail #7146 within the Bridger Wilderness would not be expected to improve with any of the action alternatives because this area is impacted by recreation use rather than by livestock use. However, livestock would not contribute to this impact with the three action alternatives because salting would not be allowed in the area and cattle would continue to be herded away from the trail and impacted river corridor.

Developed and Dispersed Recreation and Special Uses

The potential for human-livestock conflict within popular dispersed sites and along the livestock driveway would likely be the same for Alternatives 2, 3 and 4. Human-livestock conflicts have not been reported, likely because Forest visitors to this area expect to encounter cattle, or evidence of cattle, throughout the project area. Most cattle move through areas occupied by people, and the permittees would continue to herd livestock away from popular dispersed recreation sites such as the Forest boundary, Kendall Bridge, Dollar Lake, and the Roaring Fork confluence with the Green River.

Livestock improvements (76 miles of fences, corrals, pipelines, troughs, cabins, other structures) would remain and approximately 6 new miles of fence would be constructed to achieve more effective livestock management within the six allotments. There are no specific fences currently known to disrupt or impact dispersed recreation use within the project area, but additional fence proposed in Alternatives 3 and 4 could inconvenience visitor access while traveling cross country. Range permittees would continue to be responsible for maintaining boundary fences in all three action alternatives.

Introduction and spread of invasive plants by domestic livestock would remain the same for Alternatives 2 and 3, and 4 because cattle numbers would be similar. However, the primary source of introduction and spread within the project area is from motorized recreation vehicles; therefore invasive plants would be expected to continue under all three action alternatives. Range funding and expertise for monitoring and treatment of invasive weeds would likely remain the same in Alternatives 2, 3, and 4.

In Alternatives 3 and 4, rotational grazing would replace season-long grazing in the Roaring Fork Allotment, and livestock within the South Pasture of the Roaring Fork Allotment would graze only in June and be out of this pasture by July 1 annually. This will help minimize the potential for human-livestock conflict in this popular area of the Green River during the peak July recreation season.

Riparian impacts from livestock would be addressed at all seven focus areas, with site-specific allowable use standards, structural improvements, design features, and prescriptions to meet or move conditions towards resource objectives. Key areas would also be established to monitor and evaluate conditions within each pasture and allotment. These additional measures would improve conditions related to visual quality, recreation, special uses, access, Wilderness, Wild and Scenic Rivers, research natural areas, special interest areas, or inventoried roadless areas.

Access (Roads and Trails)

The potential for vehicle accidents from impacts with cattle would be about the same for all three action alternatives. However, motor vehicle accidents related to impacts with cattle are currently very rare within the project area. There would be no changes to road density under any alternative. No new roads are proposed to be opened or closed.

Fish Creek Focus Area: In Alternatives 3 and 4, the unauthorized two-track route off of Forest Service Road #37-691 in the Fish Creek focus area would remain closed to motorized use and would be physically closed, ripped and seeded to prevent unauthorized motor vehicle use to allow for riparian restoration of stream banks impacted by recreation and livestock within the Fish Creek focus area.

Wagon Creek Focus Area: In Alternatives 3 and 4, the existing two-track route closed through the Pinedale District's 1995 Travel Management Planning process would be gated and locked to help address unauthorized motor vehicle use while allowing necessary administrative use. Hardened crossing approaches would be constructed at Wagon Creek. These management actions would contribute to meeting road access objectives and move the riparian condition towards the riparian function objective.

Wilderness and Wilderness Study Areas

Bridger Wilderness: Current livestock management practices within the Bridger Wilderness are meeting desired conditions and are consistent with Forest Plan goals and objectives, standards and guidelines, as well as direction identified in the 1995 Bridger Wilderness Action Plan and 1964 Wilderness Act. No focus areas or site-specific concerns have been identified by the interdisciplinary team within the Bridger Wilderness. No range structures are located within this wilderness and none are proposed with any of the action alternatives.

A portion of the Upper and Lower Gypsum Pastures of the Upper Green River Allotment is located in the Bridger Wilderness and is incorrectly identified in the Forest Plan as Desired Future Condition 6A. This area is therefore currently managed, and would remain managed, as Desired Future Condition 6B under Alternatives 2, 3 and 4. This is consistent with the Congressional Grazing Guidelines within designated Wilderness and Forest Plan direction. Livestock grazing in the Wilderness portion of the Upper and Lower Gypsum Pastures would meet the desired condition for Wilderness (DFC 6B) because range and watershed conditions meet resource objectives in this area (see Rangeland Vegetation and Riparian Area sections) while providing forage for cattle, recreational stock and wildlife.

Gros Ventre Wilderness: Current livestock management practices within the Gros Ventre Wilderness are meeting desired conditions and are consistent with Forest Plan Goals and Objectives, standards and guidelines, as well as direction identified in the 1994 Gros Ventre Wilderness Action Plan and 1964 Wilderness Act. No focus areas or site-specific livestock grazing concerns were identified by the interdisciplinary team within the Gros Ventre Wilderness.

The one mile long buck and pole fence currently located in the Gros Ventre Wilderness within the Upper Tepee Creek Pasture of the Upper Green Allotment would remain in Alternatives 2, 3, and 4. This fence has minor adverse effect to wilderness characteristics of apparent naturalness, remoteness, and solitude, and opportunities for primitive recreation because it is a man-made structure. However, this fence is limited in extent (1 mile in length) and was in existence before the Gros Ventre Wilderness was designated by Congress in 1984. Continued maintenance of this fence complies with Forest Service 2320-Wilderness Management direction. This fence is necessary for effective management of resources and its presence does not substantially change the existing wilderness character of the area. No additional fence would be constructed within the Gros Ventre Wilderness under Alternatives 2, 3, or 4.

In Alternatives 3 and 4, season-long grazing would be replaced with a three-pasture deferred rotational grazing system for the Beaver-Twin Allotment to meet Forest Plan standards and resource objectives. The Rock Creek Pasture of this allotment is located almost entirely within the Gros Ventre Wilderness. Although no focus areas or areas of concern were identified within this allotment, this rotational grazing system would be expected to afford greater protection for resources throughout the allotment, including within the Gros Ventre Wilderness, which will help preserve Wilderness character (i.e. natural integrity and ecological function) within this Wilderness.

Wild and Scenic Rivers

Under Alternatives 2, 3 and 4, outstanding scenic, recreational, geologic, fish and wildlife, historic and cultural values, and free-flowing condition would, for the most part, continue to be retained for the eligible Green River, Roaring Fork River, and Tosi Creek, and designated Gros Ventre Scenic River, as well as for their tributaries.

Under Alternatives 3 and 4, focus areas and areas of concern where resource conditions caused by livestock grazing and/or recreational use have adversely impacted resource conditions along segments of these rivers or their tributaries, would be improved as follows:

Kinky Creek Segment Area of Concern (tributary to the designated Gros Ventre Scenic River): Under Alternatives 3 and 4, the Kinky Creek stream segment near Darwin Ranch would move towards meeting the riparian function objective, which would benefit the designated Gros Ventre Scenic River.

Tosi Creek Focus Area: Under Alternatives 3 and 4, the eligible Tosi Creek stream segment in the focus area would move towards meeting the riparian function objective and the creek would continue to meet Scenic River management objectives.

Klondike Creek Focus Area (tributary to eligible Green River): Under Alternatives 3 and 4, this tributary to the eligible Green River would move towards meeting the riparian function objective, which would afford more protection for the eligible Green River.

Green River PFC #4 Area of Concern: Under Alternatives 2, 3 and 4, riparian conditions in the Green River segment at the Roaring Fork confluence and near the elk feedground (PFC #4) would be expected to remain functioning at risk because elk would continue to congregate in this area in association with the Wyoming Game and Fish Department's Upper Green River elk feedground. This elk use would likely continue to impact riparian function on the Green River (Riparian section of this EIS and U.S. Forest Service 2008b). Range permittees would continue to herd livestock away from the feedground area, which would minimize the impact of livestock on this segment of the Green River. There would be no change in character/values of the Green River and its eligibility as a Scenic River as a result of implementing Alternative 3.

The remaining segments of eligible and designated rivers and their tributaries currently meet desired ecological and free-flowing conditions and meet National, Regional, and Forest-level management direction for eligible or designated Wild and Scenic Rivers, and would not be expected to be adversely affected by Alternatives 2, 3, or 4.

Conclusion

Under Alternative 3, allowable use standards, structural improvements, design features common to action alternatives and monitoring measures would be implemented. All seven focus areas and other areas of concern identified in Chapter 1 would receive site specific prescriptions to address resource concerns and move these areas towards desired conditions. Rotational grazing would also be implemented for all six allotments. Additional fencing would aid in livestock distribution to minimize concentration and maximize use of rotation pastures within the allotments.

Alternative 3 would have more beneficial overall effects to visual quality, recreation, special uses, access, Wilderness, Wild and Scenic Rivers, Special Interest Areas, and Inventoried Roadless Areas as compared to Alternative 2, less beneficial effects as compared to Alternative 1, slightly less beneficial effects as compared to Alternative 4, and no measurable effect to Research Natural Areas.

Beneficial effects would occur within all six focus areas which would move toward meeting resource objectives for visual quality, recreation, special uses, access, Wilderness, Wild and Scenic Rivers, Research Natural Areas, Special Interest Areas, and Inventoried Roadless Areas. Beneficial effects would include improved stream bank stability for the Tosi Creek focus area as a result of implementing a 20 percent maximum stream bank alteration limit and a 6-inch stubble height minimum retained, and beneficial effects to the designated Gros Ventre Scenic River as a result of improved conditions on Kinky Creek by reducing the duration that horses graze along Kinky Creek from season-long to a pasture rotation system. Approximately six miles of new fence, located outside Wilderness, would improve range vegetation conditions, particularly within the Beaver-Twin Allotment and Kinky Creek Pasture of the Upper Green Allotment.

Existing conditions, trends, and effects identified in the analysis for other resources (Wildlife, Fisheries, Riparian Areas, Soils, Rangeland Vegetation, and Cultural Resources) affect the desired primitive character, ecological function, and degree of naturalness of Wilderness, Wilderness Study Areas, eligible Wild and Scenic Rivers, Research Natural Areas, Special Interest Areas, and Inventoried Roadless Areas within the project area. This alternative would have no significant effect on visual quality, recreation, special uses, access, Wilderness, Wild and Scenic Rivers, research natural areas, special interest areas, or inventoried roadless areas within or adjacent to the project area.

Cumulative Effects

See discussion of cumulative effects under Alternative 4.

Alternative 4 – Modified Grazing Management with Riparian Emphasis

Direct and Indirect Effects

Alternative 4 is designed to promote healthy riparian and wetland conditions, providing the most restrictive livestock allowable use levels of all action alternatives. Alternative 4 is similar to Alternative 3 with the primary difference being a reduction in the forage utilization permitted in riparian and meadow areas across four allotments when existing conditions meet desired conditions. Alternative 4 would permit 35 percent maximum forage utilization on key forage species in riparian and meadow areas for Badger, Beaver-Twin, Roaring Fork and Upper Green River allotments compared with 50 percent in Alternative 3. Alternative 4 brings the maximum utilization level for riparian and meadow areas in line with actual livestock use as described under Alternative 2 – Current Management.

Effects to recreation, special uses, access, Wilderness, Wild and Scenic Rivers, Research Natural Areas, Special Interest Areas, and Inventoried Roadless Areas would be expected to be very similar for Alternative 3 and Alternative 4, as identified below.

Visual Quality

Site specific visual quality concerns where Retention is not being met within the Green River corridor would continue to be impacted primarily by recreational use (dispersed camping and off-highway use), by elk within the feedground, and by domestic livestock to a lesser extent. However, a design feature common to Alternatives 2, 3, and 4 requires that cattle would be actively herded away from the Green River Forest boundary, Kendall Bridge, and Dollar Lake to minimize or avoid potential conflicts with Forest recreationists and visitors and address visual concerns in these areas.

The best management practice of placing salt a minimum of 200 yards from system trails and ¼ mile from streams would also result in improving visual quality objectives within the Green River corridor. These requirements would effectively keep cattle from congregating in these areas of concern, as demonstrated by present herding and livestock management which are keeping cattle from congregating at these sites. However, cattle use of the Upper Green River livestock driveway adds to existing recreation impacts to visual quality within this corridor equally under the three action alternatives.

In Alternatives 2, 3, and 4, the best management practice of placing salt a minimum of 200 yards from system trails and ¼ mile from streams would also address visual quality objectives related to livestock grazing along the Union Pass Road – South Fork Fish Creek Bridge in the Fish Creek Pasture and along the South Fork Gypsum Creek in the Upper Gypsum Pasture of the Upper Green River Allotment.

The Visual Quality Objective of Retention for the Roaring Fork Trail #7146 within the Bridger Wilderness would not be expected to improve with any of the action alternatives because this area is impacted by recreation use rather than by livestock use. However, livestock would not contribute to this impact with the three action alternatives because salting would not be allowed in the area and cattle would continue to be herded away from the trail and impacted river corridor.

Developed and Dispersed Recreation and Special Uses

The potential for human-livestock conflict within popular dispersed sites and along the livestock driveway would likely be the same for Alternatives 2, 3 and 4. Human-livestock conflicts have not been reported, likely because Forest visitors to this area expect to encounter cattle, or evidence of cattle, throughout the project area. Most cattle move through areas occupied by people, and the permittees would continue to herd

livestock away from popular dispersed recreation sites such as the Forest boundary, Kendall Bridge, Dollar Lake, and the Roaring Fork confluence with the Green River.

Livestock improvements (76 miles of fences, corrals, pipelines, troughs, cabins, other structures) would remain and approximately 6 miles of new fence would be constructed to achieve more effective livestock distribution within the six allotments. There are no specific fences currently known to disrupt or impact dispersed recreation use within the project area, but additional fences proposed in Alternatives 3 and 4 could inconvenience visitor access while traveling cross country. Range permittees would continue to be responsible for maintaining boundary fences in all three action alternatives.

Introduction and spread of invasive plants by domestic livestock would remain the same for Alternatives 2, 3, and 4 because cattle numbers would be similar. However, the primary source of introduction and spread within the project area is from motorized recreation vehicles; therefore invasive plants would be expected to continue under all three action alternatives. Range funding and expertise for monitoring and treatment of invasive weeds would likely remain the same in Alternatives 2, 3, and 4.

Livestock carcasses located near dispersed recreation sites, trails, and roads would be expected to be the same for Alternatives 2, 3 and 4. The design feature for action alternatives requiring that “all carcasses would be removed or treated within ½ mile of Green River Lakes Road, Union Pass Rd, Forest Service roads 605, 660, 663B and 663C, Green River Lakes and Whiskey campgrounds, private cabins, Kendall and Fish Creek guard stations, permitted cow camps, permitted outfitter camps, Lake of the Woods, Waterdog Lakes, and North Beaver and Tosi trailheads” would reduce human-bear conflicts in these areas. However, human-bear conflicts associated with livestock carcasses would be greater in the action alternatives than under Alternative 1 (No Action).

In Alternatives 3 and 4, rotational grazing would replace season-long grazing in the Roaring Fork Allotment, and livestock within the South Pasture of the Roaring Fork Allotment would graze only in June and be out of this pasture by July 1 annually. This will help minimize the potential for human-livestock conflict in this popular area of the Green River during the peak July recreation season.

In Alternatives 3 and 4, riparian impacts from livestock would be addressed at all seven focus areas, with site-specific allowable use standards, structural improvements, design features, and prescriptions to meet or move conditions towards resource objectives. Key areas would also be established to monitor and evaluate conditions within each pasture and allotment. In Alternative 4 there would be a further reduction in key forage utilization permitted in riparian and meadow areas across four allotments when existing conditions meet desired conditions (35 percent maximum forage utilization on key forage species in riparian and meadow areas for Badger, Beaver-Twin, Roaring Fork and Upper Green River allotments) compared with 50 percent in Alternative 3. Under Alternative 4, riparian and meadow conditions would be expected to improve sooner than they would under Alternative 3. These additional measures would improve conditions related to visual quality, recreation, special uses, access, Wilderness, Wild and Scenic Rivers, Research Natural Areas, Special Interest Areas, and Inventoried Roadless Areas.

Access (Roads and Trails)

The potential for vehicle accidents from impacts with cattle would be about the same for all three action alternatives. However, motor vehicle accidents related to impacts with cattle are currently very rare within the project area. There would be no changes to road density under any alternative. No new roads are proposed to be opened or closed.

Fish Creek Focus Area: In Alternatives 3 and 4, the unauthorized two-track route off of Forest Service Road #37-691 in the Fish Creek focus area would remain closed to motorized use and would be physically closed,

ripped and seeded to prevent unauthorized motor vehicle use to allow for riparian restoration of stream banks impacted by recreation and livestock.

Wagon Creek Focus Area: In Alternatives 3 and 4, the existing two-track route closed through the Pinedale District's 1995 Travel Management Planning process would be gated and locked to help address unauthorized motor vehicle use while allowing necessary administrative use. Hardened crossing approaches would be constructed at Wagon Creek. These management actions would contribute to meeting road access objectives and move the riparian condition towards the riparian function objective.

Wilderness and Wilderness Study Areas

Bridger Wilderness

Current livestock management practices within the Bridger Wilderness are meeting desired conditions and are consistent with Forest Plan goals and objectives, standards and guidelines, as well as direction identified in the 1995 Bridger Wilderness Action Plan and 1964 Wilderness Act. No focus areas or site-specific concerns have been identified by the interdisciplinary team within the Bridger Wilderness. No range structures are located within this wilderness and none are proposed with any of the action alternatives.

A portion of the Upper and Lower Gypsum Pastures of the Upper Green River Allotment is located in the Bridger Wilderness and is incorrectly identified in the Forest Plan as Desired Future Condition 6A. This area is therefore currently managed, and would remain managed, as Desired Future Condition 6B under Alternatives 2, 3 and 4 to be consistent with the Congressional Grazing Guidelines within designated Wilderness, Forest Plan, and Bridger Wilderness Action Plan direction.

Gros Ventre Wilderness

Current livestock management practices within the Gros Ventre Wilderness are meeting desired conditions and are consistent with Forest Plan Goals and Objectives, standards and guidelines, as well as direction identified in the 1994 Gros Ventre Wilderness Action Plan and 1964 Wilderness Act. No focus areas or site-specific livestock grazing concerns were identified by the interdisciplinary team within the Gros Ventre Wilderness.

The one mile long buck and pole fence currently located in the Gros Ventre Wilderness within the Upper Tepee Creek Pasture of the Upper Green Allotment would remain in Alternatives 2, 3, and 4. This fence has minor adverse effects to wilderness characteristics of apparent naturalness, remoteness, and solitude, and opportunities for primitive recreation because it is a man-made structure. However, this fence is limited in extent (1 mile in length) and was in existence before the Gros Ventre Wilderness was designated by Congress in 1984. Continued maintenance of this fence complies with Forest Service 2320-Wilderness Management Direction. This fence is necessary for effective management of resources and its presence does not substantially change the existing wilderness character of the area. No additional fence would be constructed within the Gros Ventre Wilderness under Alternatives 2, 3, or 4.

In Alternatives 3 and 4, season-long grazing would be replaced with a three-pasture deferred rotational grazing system for the Beaver-Twin Allotment to meet Forest Plan standards and resource objectives. The Rock Creek Pasture of this allotment is located almost entirely within the Gros Ventre Wilderness. Although no focus areas or areas of concern were identified within this allotment, this rotational grazing system would be expected to afford greater protection for resources throughout the allotment, including within the Gros Ventre Wilderness, which will help preserve Wilderness character (i.e. natural integrity and ecological function) within this Wilderness.

Alternative 4 would be expected to exceed Alternative 3 in improving riparian and wetland health, as well as associated amphibians and other wildlife dependent on wetlands and meadows in allotments within the Gros Ventre Wilderness areas, particularly within the Rock Creek Pasture of the Beaver-Twin Allotment and

Upper Tepee Creek Allotment of the Upper Green Allotment. Riparian and wetland health would also be expected to improve within the Bridger Wilderness within the Upper and Lower Gypsum Creek Pastures of the Upper Green Allotment.

Wild and Scenic Rivers

Under Alternatives 2, 3 and 4, outstanding scenic, recreational, geologic, fish and wildlife, historic and cultural values, and free-flowing condition would, for the most part, continue to be retained for the eligible Green River, Roaring Fork River, and Tosi Creek, and designated Gros Ventre Scenic River, as well as for their tributaries.

Under Alternatives 3 and 4, focus areas and areas of concern where resource conditions caused by livestock grazing and/or recreational use have adversely impacted resource conditions along segments of these rivers or their tributaries, would be improved as follows:

Kinky Creek Segment Area of Concern (tributary to the designated Gros Ventre Scenic River): Under Alternatives 3 and 4, the Kinky Creek stream segment near Darwin Ranch would move towards meeting the riparian function objective, which would benefit the designated Gros Ventre Scenic River.

Tosi Creek Focus Area: Under Alternatives 3 and 4, the eligible Tosi Creek stream segment in the focus area would move towards meeting the riparian function objective and the creek would continue to meet Scenic River management objectives.

Klondike Creek Focus Area (tributary to eligible Green River): Under Alternatives 3 and 4, this tributary to the eligible Green River would move towards meeting the riparian function objective, which would afford more protection for the eligible Green River.

Green River PFC #4 Area of Concern: Under Alternatives 2, 3 and 4, riparian conditions in the Green River segment at the Roaring Fork confluence and near the elk feedground (PFC #4) would be expected to remain functioning at risk because elk would continue to congregate in this area in association with the Wyoming Game and Fish Department's Upper Green River elk feedground. This elk use would likely continue to impact riparian function on the Green River (Riparian section of this EIS and U.S. Forest Service 2008b). Range permittees would continue to herd livestock away from the feedground area, which would minimize the impact of livestock on this segment of the Green River. There would be no change in character/values of the Green River and its eligibility as a Scenic River as a result of implementing Alternative 4.

The remaining segments of eligible and designated rivers and their tributaries currently meet desired ecological and free-flowing conditions and meet National, Regional, and Forest-level management direction for eligible or designated Wild and Scenic Rivers, and would not be expected to be adversely affected by Alternatives 2, 3, or 4. Alternative 4 would be expected to exceed Alternatives 2 and 3 in improving riparian and wetland health throughout the affected pastures and allotments, which would be expected to improve conditions for eligible and designated Wild and Scenic rivers and creeks.

Conclusion

Under Alternative 4, allowable use standards, structural improvements, design features common to action alternatives and monitoring measures would be implemented. All seven focus areas and other areas of concern identified in Chapter 1 would receive site specific prescriptions to address resource concerns and move these areas towards desired conditions. Rotational grazing would also be implemented for all six allotments. Additional fencing would aid in livestock distribution to minimize concentration and maximize use of rotation pastures within the allotments. In addition, Alternative 4 would be expected to exceed Alternatives 2 and 3 in improving riparian and wetland health throughout the affected pastures and

allotments, which would be expected to improve conditions related to visual quality, recreation, special uses, access, Wilderness, Wild and Scenic Rivers, Special Interest Areas, and Inventoried Roadless Areas, and no measurable change to Research Natural Areas.

Beneficial effects would occur within all six focus areas which would move toward meeting resource objectives for visual quality, recreation, special uses, access, Wilderness, Wild and Scenic Rivers, Research Natural Areas, Special Interest Areas, and Inventoried Roadless Areas. Beneficial effects would include improved stream bank stability for the Tosi Creek focus area as a result of implementing a 20 percent maximum stream bank alteration limit and a 6-inch stubble height minimum retained, and beneficial effects to the designated Gros Ventre Scenic River as a result of improved conditions on Kinky Creek by reducing the duration that horses graze along Kinky Creek from season-long to a pasture rotation system. Approximately 9 miles of new fence, located outside Wilderness, would improve range vegetation conditions, particularly within the Beaver-Twin Allotment and Kinky Creek Pasture of the Upper Green Allotment.

Alternative 4 would therefore be expected to have more beneficial overall effects to visual quality, recreation, special uses, access, Wilderness, Wild and Scenic Rivers, Special Interest Areas, and Inventoried Roadless Areas as compared to Alternatives 2 and 3, less beneficial effects as compared to Alternative 1, and no measurable effect to Research Natural Areas.

Existing conditions, trends, and effects identified in the analysis for other resources (Wildlife, Fisheries, Riparian Areas, Soils, Rangeland Vegetation, and Cultural Resources) affect the desired primitive character, ecological function, and degree of naturalness of Wilderness, Wilderness Study Areas, eligible Wild and Scenic Rivers, Research Natural Areas, Special Interest Areas, and Inventoried Roadless Areas within the project area. This alternative would have no significant effect on visual quality, recreation, special uses, access, Wilderness, Wild and Scenic Rivers, Research Natural Areas, Special Interest Areas, or Inventoried Roadless Areas within or adjacent to the project area.

Cumulative Effects for All Alternatives

Appendix A lists the past, present, and reasonably foreseeable future actions considered for recreation and related resources in this cumulative effects analysis. Actions contributing to cumulative effects to visual quality, recreation, special uses, access, Wilderness, Wild and Scenic Rivers, Research Natural Areas, Special Interest Areas, and Inventoried Roadless Areas within the project area include dispersed camping, roads, unauthorized off-road-vehicle use, firewood cutting, and past timber harvest activities. The cumulative effects analysis areas are bounded both in space and time. The cumulative effects analysis area for this project is the Upper Green River project area because recreation and related resources occur throughout the project area. The temporal boundary for this analysis is ten years into the past and future. This temporal boundary was selected because ten years is the life of a typical term grazing permit.

Recreation

Cumulative effects from recreation and domestic livestock use within riparian areas are evident within several site-specific locations in the project area, particularly within the Green River Corridor. Seven focus areas have been identified by the interdisciplinary team within this project area. Impacts within several of these focus areas are the result of recreation use in combination with domestic livestock grazing. Livestock and Forest visitors tend to be attracted to the same or similar sites, which are relatively flat and located within 300 feet of water. In addition, cattle and humans tend to select similar shallow locations for stream crossings and the easiest, shortest paths to and from water. For these reasons, sites impacted by cattle are often cumulatively impacted by recreation use.

Firewood Cutting and Past Timber Harvest Activities

Dead trees are felled and removed from forested areas for private firewood outside of Wilderness areas. Cutting of dead trees can improve the overall visual appearance of an area, but high stumps (> 12 inches) and excess slash often remain along open roads and are visual evidence of human activity. Likewise past timber harvest has resulted in changed visual appearance of the natural landscape and associated management activities that are visually evident and do not blend into the surrounding natural landscape. These activities meet the Partial Retention and Modification visual quality objectives for areas outside of the Wilderness areas, but Retention is not being met, particularly along the Green River Lakes Road #37-600/650. Firewood cutting and timber harvest does not occur inside designated Wilderness.

Unauthorized Off-Road Vehicle Use

Unauthorized off-road vehicle use causes soil compaction, vegetation trampling and establishment of unauthorized roads. This reduces visual quality and natural integrity in the project area. In addition, unauthorized motor vehicle use by recreationists occurs in portions of the Bridger Wilderness and Gros Ventre Wilderness within the project area in violation of the Wilderness Act.

Invasive Plant Treatments

Current invasive plant control efforts benefit recreation and related resources in the project area by reducing and controlling the spread of invasive plants. This management activity would continue under all alternatives.

Visual Quality

Compacted soil, trampled vegetation, and stream bank impacts are of concern in the Green River corridor (particularly at the Green River Feedground, Forest boundary, Kendall Bridge, and Dollar Lake). These impacts are a result of cumulative impacts primarily from dispersed recreation, illegal off-road-vehicle use, past tie-hack timber harvest, and firewood cutting activities, rather than from livestock use. No salting is authorized at these sites and livestock are currently herded away from these areas. The visual quality at these sites is not meeting the Retention objective.

Wilderness and Inventory Roadless Areas

Wilderness characteristics and roadless attributes within the five inventoried roadless areas in the project area have primarily been affected by past actions unrelated to livestock grazing. Timber harvest activity, as well as constructed roads and two-track roads created by the public over the years have substantially altered the Wilderness character within much of the project area. Illegal use of off-highway vehicles within the Gros Ventre Wilderness, particularly within the Tepee/Tosi Creek area of the Upper Green Allotment has potential to adversely affect physical and social conditions as well as livestock distribution within this portion of the project area. Trail #7152 was originally a user-created jeep trail before the Gros Ventre was designated as Wilderness in 1984. This jeep trail was converted to a non-motorized trail in 1984, but the tread width still exceeds Wilderness trail standards and attracts illegal off-highway vehicle use. This concern is related to impacts from recreation use.

Green River Corridor Recreation Planning (future activity)

In 2004, the Pinedale District initiated an assessment of existing roads and campsites within the Green River corridor from the Green River Lakes administrative site south to the Forest boundary. The District plans to initiate an environmental assessment of this corridor in 2015 in order to address resource and social concerns primarily related to dispersed recreation use and motorized access within this corridor. Currently, there are several site-specific locations where resource conditions caused by recreational use have adversely impacted resource conditions (e.g. soil compaction, sedimentation, stream bank stability) along segments of these rivers or their tributaries. Expected results of this assessment and implementation of the proposed project

include a reduction in the number of unauthorized motorized vehicle routes within the corridor and dispersed camping restrictions within 100 feet of the Green River. A similar assessment is scheduled for the Fish Creek area within the next five years, although Fish Creek receives far less recreational pressure than the Green River corridor.

Road Maintenance (future activity)

The Green River Lakes Road (#37-600/650) is in critical need of resurfacing with gravel when funding allows. The existing condition of this road is poor, with multiple washboards, which effectively reduces visitor access. Forest visitor use of this road is believed to have been reduced by a minimum of 20 percent over the past five years due to the poor condition of this road. Forest Service funding for road maintenance and reconstruction continues to decline. Through partnership grants, it is possible this road could be resurfaced within the next five years, which would be expected to bring visitor use of the Green River area back to similar use levels experienced before road conditions declined substantially, beginning around 2008. This combined with Alternatives 1, 2, 3, or 4, which each have similar visitor access, would result in a cumulative improvement in road access and resource conditions caused by poor drainage and lack of maintenance on the existing road.

Cumulative Effects Summary

Wilderness characteristics and roadless attributes within the five Inventoried Roadless Areas in the project area have been affected by past timber harvest activities as well as constructed roads and two-track roads created by the public over the years. Visual quality has been negatively impacted along the Green River corridor primarily from dispersed recreation, illegal off-road-vehicle use, past timber harvest, and firewood cutting activities. Invasive plant treatments have been effective at controlling the spread of noxious weeds. The Green River Corridor Recreation Planning Project and the Green River Lakes Road maintenance project would have beneficial effects on visual quality, recreation, special uses, access, Wilderness, Wild and Scenic Rivers, Research Natural Areas, Special Interest Areas, and Inventoried Roadless Areas within the project area.

The cumulative effect of these activities added to the beneficial and neutral effects of Alternatives 1, 3 and 4 at focus areas and areas of concern would be unnoticeable. Alternative 2 does not address resource needs at all focus areas and areas of concern and therefore, the cumulative effect on visual quality, recreation, special uses, access, Wilderness, Wild and Scenic Rivers, Research Natural Areas, Special Interest Areas, and Inventoried Roadless Areas associated with Alternative 2 would be less beneficial than the cumulative effect under Alternatives 1, 3, and 4. Overall conditions within and adjacent to specially designated areas currently meet National, Regional, and Forest Plan direction and would continue to meet this direction under Alternatives 1, 2, 3, and 4.

Cultural Resources

Section 106 of the National Historic Preservation Act requires Federal agencies to take into account the effects of their actions on historic properties. Regulations 36 FCR 800, which implements Section 106, outlines the procedures for the identification of historic properties and for consulting with the State Historic Preservation Office on the effects the project may have on historic properties. Information provided in this DEIS about the cultural resources of the project area was summarized from the Cultural Resource Report (Schoen 2015). Adaptive management was referred to as "progressive design features" in this specialist report. The term "progressive design features" is synonymous with "adaptive management" and is described in this DEIS beginning on page 71 and 112 for Alternatives 3 and 4, respectively.

Overview of Issues Addressed

The issuance of term grazing permits and the administration and management of rangeland activities associated with term permits for National Forest System lands may affect properties either listed in or eligible for listing in the National Register of Historic Places. The analysis area for cultural resources is the six grazing allotments that are part of the Upper Green River Rangeland Project. These allotments are Badger Creek, Beaver-Twin Creeks, Noble Pasture, Roaring Fork, Upper Green and Wagon Creek allotments.

Indicators Used for Comparison of Alternatives

- Potential damage to prehistoric and historic sites, known and unknown.

Affected Environment

Cultural resources include prehistoric sites, historic sites, buildings, structures, and traditional cultural properties. These resources are the remains of past patterned human activity. Prehistoric and historic sites can be significant, or eligible for the National Register of Historic Places, if they meet one of the following characteristics: 1) associated with events that have made a significant contribution to the broad patterns of our history; 2) associated with the lives of persons significant in our past; 3) embody the distinctive characteristics of a type, period or method of construction, or that represent the work of a master, possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction; or 4) have the ability to yield important information about the past. Those sites that have been determined eligible for the National Register are referred to as historic properties.

Desired Conditions

The Forest Plan goal and objectives for cultural resources provide direction for desired conditions:

- Cultural resource values are preserved and protected so that their scientific, historic, and social values are retained (U.S. Forest Service 1990, p. 121).

Existing Condition

Systematic surveys within the Upper Green River Grazing Complex began in 1975 and subsequent surveys, site identification and monitoring have continued through the 2014 field season. These surveys were conducted for vegetation management, wildlife improvement, recreation development, road construction and maintenance, proposed gravel pit locations, fence line construction, and riparian focus area. Cultural resource surveys conducted specifically for the grazing complex analysis were conducted between 2000 and 2002. As a result of these past surveys, a total of 5,462 acres within the allotment complex has been intensely inventoried for cultural resources. A total of 64 sites have been recorded within the allotment complex. Forty-four of these sites are prehistoric; 13 have been determined eligible for the National Register of Historic Places, 28 are not eligible, and three are unevaluated. Nineteen sites are historic and include tie hack cabins and tie hack cemetery, the Billy Wells Dude Ranch, and the Kendall Guard Station. Eight of these historic

sites have been determined eligible for the National Register, seven are not eligible and four remain unevaluated. One site has both a prehistoric and historic components and has been determined eligible for the National Register. It should be noted that the original EIS for the Upper Green River allotments listed a total of 68 sites. This number was revised downward because four previously recorded sites were found to be on private lands in the Red Hills area, or was outside allotment boundaries.

A site monitoring and evaluation project was undertaken on 11 prehistoric sites along the Upper Green River during the 2009 field season. Four of these sites were initially recorded in 1975 while the remaining seven sites were recorded in 1999 and 2000.

On one of these prehistoric sites, it was noted that a two track road cut through the site exposing buried fire pits and artifacts in un-consolidated sandy soil. These deposits were susceptible to damage from livestock trampling as well as from dispersed recreation activity. Protective barriers were placed along this road cut in an attempt to keep livestock and human traffic from causing damage to the site and to help re-establish vegetation cover on these exposed deposits. This site will be monitored on a yearly basis. If the protective barriers prove to be inadequate for the protection of the site, then consultation with the Wyoming State Historic Preservation Office will be required in accordance with the *Programmatic Agreement Among the U.S.D.A. Forest Service, Wyoming Forests, Wyoming State Historic Preservation Office and Advisory Council on Historic Preservation* (2008).

There were no changes in site condition on the remaining ten sites since those sites were initially recorded. Livestock grazing was not adversely affecting site condition or the data potential contained on those sites. The Evaluation and Monitoring Report was submitted to the Wyoming State Historic Preservation Office with a determination that no historic properties would be affected by continued livestock grazing for the six Upper Green River allotments. The Wyoming State Historic Preservation Office concurred with this determination in a letter dated January 7, 2010. The tribal representative for the Eastern Shoshone Tribe was also consulted with regards to protective barriers placed on site 48SU1762 as well as livestock grazing in the Upper Green River Grazing Complex on September 2, 2010. Tribal Representative Richard Ferris indicated that the use of protective barriers was an acceptable method for site protection. He also stated that in general, he is not concerned with cattle grazing on the Forest potentially impacting prehistoric sites. He likens this activity to what big game animals or bison would do.

In 2013, the Green River Drift Trail (also known as the livestock driveway) was officially listed on the National Register of Historic Places as a traditional cultural property. The Green River Drift Trail is the corridor used by the Upper Green River Cattle Association to trail their cattle from winter and spring grazing areas in the Green River Basin to summer and fall grazing allotments on the Bridger-Teton National Forest. This drift trail has been used for more than one hundred years and has played a pivotal role in the development of ranching in the area. The designation of the Green River Drift Trail as a National Register property pertains only to the drift trail, not to the management of the grazing allotments.

Analysis of site location information for the Bridger-Teton National Forest indicates that on average, sites will be found within 206 meters of permanent water, and the average distance to a major change in vegetation cover or distance to ecotonal boundary is 69 meters. It was also found that 90 percent of all sites recorded on the Forest are on slopes of less than 16 percent.

Environmental Consequences

Methodology

As noted above, the Bridger-Teton National Forest entered into a *Programmatic Agreement among the U.S.D.A. Forest Service, Wyoming Forests, Wyoming State Historic Preservation Office and Advisory*

Council on Historic Preservation (2008). Under the protocol established in this agreement for rangeland management and livestock grazing activities, the focus of analysis will be limited to livestock congregation areas and their intersection with areas known or likely to contain cultural resources. Standard predictive variables for determining where livestock tend to congregate include, but are not limited to, the following:

- Adjacent to existing livestock management improvements such as water tanks, fences, and handling structures;
- Unimproved areas where livestock congregate to drink;
- Near salting areas.

Standard predictive variables for determining where cultural resources are likely to occur include, but are not limited to, the following:

- Within ¼ mile of permanent water;
- On slopes of less than 15 percent;
- On topographic prominences, such as ridge tops, saddles, and high points;
- Near ecotonal boundaries.

The intersection of these two variables shall be the focus of the analysis and is considered to be the area of potential effect. If damage or potential damage is noted on newly recorded and previously known historic properties within the livestock congregation areas, but the cause, degree, or extent is unclear, the site will be monitored at least once a year to help determine whether or not protective measures are needed. The Programmatic Agreement also states that all unevaluated sites within the area of potential effect will be evaluated for National Register eligibility. The Evaluation and Monitoring Report submitted to the Wyoming State Historic Preservation Office in the fall of 2009 focused on those sites that fell within the area of potential effect.

Spatial and Temporal Context for Effects Analysis

The spatial boundary for the effects analysis is limited to the six allotments within the Upper Green River Area Rangeland Project. The temporal boundary for past activities is arbitrarily set in the1930s. It is at this time that the Civilian Conservation Corp was employed to construct roads, trails, and the campground at Green River Lakes. These improvements allowed for an increase in recreation activities within the analysis area. Commercial timber harvest followed during the 1940s and 1950s which expanded the road network and resulted in greater surface disturbing activities. The temporal boundary for reasonably foreseeable future activities is five years.

Alternative 1 – No Livestock Grazing (No Action Alternative)

Direct and Indirect Effects

There would be a direct adverse effect to the Green River Drift Trail under this alternative because cattle would no longer graze in the Upper Green River area. The Green River Drift Trail would no longer be used and would cease to exist as a traditional cultural property. The Bridger-Teton National Forest would then enter into consultation with the Wyoming State Historic Preservation Office to develop appropriate measures to mitigate the adverse effect. If agreement cannot be reach for appropriate mitigation, the Forest would follow the procedures found in 36 CFR 800.7, which implements the National Historic Preservation Act.

There are potentially some beneficial effects to cultural resources under Alternative 1. The lack of cattle grazing in the area would reduce the potential for cultural resources to be damaged by activities associated with livestock grazing.

Cumulative Effects

Cultural resource surveys for Forest Service undertakings in the analysis area, as mandated by the National Historic Preservation Act, did not begin until 1975. Prior to that date, adverse effects for cultural resources by surface disturbing activities were not considered. It is likely that cultural resources were damaged, altered or destroyed by past activities associated with commercial timber activity, road maintenance, or other activities. In addition, the increase in developed and dispersed recreation activity likely resulted in vandalism and unauthorized artifact collecting. It has been observed that the primary impacts to cultural resources on the Bridger-Teton National Forest results from intensive human activity. When these activities occur on or near significant historic properties, the result could lead to exposed subsurface cultural deposits or damaged historic structures. These exposed sites are then susceptible to further damage from erosional processes, artifact collecting, and potentially from livestock grazing activities.

There is a direct adverse effect to the Green River Drift Trail in the event that cattle grazing were discontinued. However, past, present and foreseeable future projects would not likely contribute to the disappearance of the Drift Trail. Thus, there are no other effects occurring due to other projects or human endeavors that would result in cumulative effects under Alternative 1 for the drift trail.

There are potential beneficial effects due to the removal of cattle grazing under Alternative 1 because the potential for livestock to damage cultural resources would be totally eliminated. However, when these potential beneficial effects are added to the negative effects of past, present, and foreseeable future projects the resulting negative cumulative effects are offset to a very slight degree.

It is anticipated that future impacts to cultural resources as a result of Forest Service projects would diminish over time. Cultural resource surveys, as mandated by the National Historic Preservation Act, would continue for all future projects which would allow for the identification of significant historic properties so they can be avoided, or adverse effects can be adequately mitigated. Our increased knowledge about where significant sites might be located would also aid in avoiding these sites in the future. However, as the Upper Green River area continues to receive increased recreational activity, it is possible that impacts to cultural resources from vandalism and unauthorized artifact collecting would continue. Future impacts to historic properties are also possible if wildland fires burn through the area, resulting in the loss of standing structures of historic significance.

Alternative 2 - Grazing as Currently Permitted and Current Management

Direct and Indirect Effects

There is always the potential that livestock grazing could have direct effects to cultural resources. These effects could include trampling or chiseling in damp and/or sandy soils and sloughing and collapse of stream banks. Fire pits and other archeological features that are exposed in road cuts or on the surface of a site can be damaged by livestock as they move across these site areas. Livestock also have the potential for impacting historic structures if they congregate around these structures in great numbers. However where cattle grazing activities are not intense, such as across well managed and healthy pastures with low utilization rates, occasional use would not be considered significant and impacts would not exist. The cultural resource surveys and monitoring of site conditions in the Green River allotments over the last 40 years indicate that direct effects are not occurring on historic and/or prehistoric sites. The trailing of livestock along the Green River Lakes Road and other locations within the allotments is not resulting in direct effects to cultural resources. This occasional use is not considered significant.

Indirect effects could involve the removal of vegetation and trampling induced compaction that could lead to reduced infiltration rates and subsequent increased runoff that causes sheet erosion. The loss of vegetation can cause the loss of artifact context through down slope transportation, stream bank destabilization, and increased visibility of surface materials and subsequent unauthorized artifact collection. Monitoring of site conditions in the Upper Green River allotments has failed to detect areas where indirect effects are occurring to historic properties.

There would be beneficial effects to the Green River Drift Trail under this alternative because it would allow for the traditional use of this driveway and recognition of the property's historic significance.

Cumulative Effects

There would be no negative direct or indirect effects to cultural resources from Alternative 2. As a result, there are no negative effects to add to the past, present and reasonably foreseeable project activities in the analysis area. Therefore, there would be no cumulative effects to cultural resources under this alternative.

Alternative 3 - Modified Grazing Management (Proposed Action)

Direct and Indirect Effects

Under Alternative 3, livestock grazing would continue to be authorized using livestock management strategies designed to sustain resource conditions where desired conditions are being met and improve resource conditions where a gap exists between existing conditions and desired conditions. The cultural resource surveys and monitoring of site conditions in the Green River allotments over the last 40 years indicate that direct effects are not occurring on historic and/or prehistoric sites. The desired conditions for cultural resources is currently being met, therefore there would be no direct effects to cultural resources.

Implementing a livestock grazing management strategy that includes site specific allowable use standards, focus area prescriptions, structural improvements, and adaptive management to meet or move conditions towards resource objectives would reduce the potential for direct and indirect effects to cultural resources which may not have been previously recorded. Those sites which are currently buried under soil deposits and are therefore not visible on the surface would also be protected.

Cumulative Effects

There would be no direct or indirect effects to cultural resources from Alternative 3. As a result, there are no effects to add to the past, present and reasonably foreseeable project activities in the analysis area. Therefore, there would be no cumulative effects to cultural resources under this alternative.

Alternative 4 - Modified Grazing Management with Riparian Emphasis

Direct and Indirect Effects

There would be no direct or indirect effects to cultural resources under this alternative. Reducing the maximum key forage utilization in riparian/meadows to 35 percent in four allotments has the potential to benefit cultural resources by maintaining or increasing ground cover, thereby protecting any cultural resources that have not been detected or that are currently buried and are not visible on the surface. Reducing the number of livestock or season of use would not affect the Green River Drift because this historic trail would still be used.

Cumulative Effects

There would be no direct or indirect effects to cultural resources from Alternative 4. As a result, there are no effects to add to the past, present and reasonably foreseeable project activities in the analysis area. Therefore, there would be no cumulative effects to cultural resources under this alternative.

Relationship between the Alternatives and Federal, Regional, State, Local, and Tribal Land Use Plans, Policies and Controls

To better integrate environmental impact statements into Federal, regional, state, local, and tribal land use planning processes, 40 CFR 1506.2 requires statements to discuss any inconsistency of a proposed action with any approved plan and laws. In addition, a project or activity approval document must describe how the project or activity is consistent with applicable Forest Plan components (36 CFR 219.15).

Table Consistency with Forest Plan, Federal, State and Local Laws and RegulationsThe Forest Plan was approved in 1990 and has since been amended and clarified to include additional direction concerning Wild and Scenic Rivers, grazing in Wilderness, fires, grizzly bears, management indicator species, lynx, pronghorn migration, and greater sage-grouse. It provides broad-scale management policy and long-term direction and guidance for managing the Bridger-Teton National Forest. It contains management emphases and actions needed to move toward the desired future state of the Forest. The following table displays the alternatives consistency or inconsistency with Forest Plan Goals, Objectives, Desired Future Conditions, Standards, and Guidelines, and the suitability of grazing in the applicable DFC areas.

Table 43. Consistency with Federal, State and Local Requirements				
Would the project or activity 1) contribute to the maintenance or attainment of one or more goals, desired conditions, or objectives, or 2) not foreclose the opportunity to maintain or achieve any goals, desired conditions, or objectives, over the long term?				
Forest Plan Component	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Goal 1.1 – Communities continue or gain greater prosperity (Forest Plan, page 112) Objective 1.1 (h) - Provide forage for about 260,000 Animal Unit Months of grazing annually (Forest Plan, page 113)	May foreclose the opportunity to maintain or achieve Objective 1.1 (h) by curtailing livestock grazing	Contributes to attainment of Goal 1.1 and Objective 1.1 (h) by providing opportunity for up to 46,148 AUMs annually.	Contributes to attainment of Goal 1.1 and Objective 1.1 (h) by providing opportunity for up to 44,722 AUMs of grazing annually.	Contributes to attainment of Goal 1.1 and Objective 1.1 (h) by providing opportunity for up to 44,722 AUMs of grazing annually.
Goal 4.7 – Grazing use of the National Forest sustains or improves overall range, soils, water, wildlife, and recreation values or experiences. (Forest Plan, page 120) Objectives 4.7 (a), (b), (c), and (d) - concerning impacts of grazing on range, riparian resources, soils, recreation, wildlife, and fish. (Forest Plan, page 120)	Not applicable because no grazing occurs in this alternative	Contributes to attainment of Goal 4.7 and the associated objectives by sustaining the overall resource conditions.	Contributes to attainment of Goal 4.7 and the associated objectives by improving the overall resource conditions.	Contributes to attainment of Goal 4.7 and the associated objectives by improving the overall resource conditions.
Greater sage-grouse Amendment Desired Condition #36 - Livestock grazing is managed to maintain or move existing conditions towards greater sage-grouse desired habitat conditions. (GRSG Amendment, page 103)	Not applicable because no grazing occurs in this alternative	Would not contribute to attainment of DC #36.	Contributes to attainment of DC #36.	Contributes to attainment of DC #36.

Table 43. Consistency with Federal, State and Local Requirements				
Would the project or activity 1) contribute to the maintenance or attainment of one or more goals, desired conditions, or objectives, or 2) not foreclose the opportunity to maintain or achieve any goals, desired conditions, or objectives, over the long term?				
Forest Plan Component	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Would the project or activity comply with applicable standards?				
Forage Utilization Standard - Season-long grazing will be changed to rotational grazing as allotment management plans are revised. During AMP revision, site-specific forage utilization levels will be prescribed on key wildlife ranges. (Forest Plan, pages 127-128)	Not applicable, livestock grazing is curtailed	Would not comply – season-long grazing would continue in the Badger Creek, Beaver-Twin Creeks, Roaring Fork, and Wagon Creek allotments and site specific forage utilization levels would not be prescribed on key wildlife ranges	Complies	Complies
Livestock Grazing of Riparian Areas Standard - Livestock grazing in riparian areas will be managed to protect streambanks. (Forest Plan, page 128)	Not applicable, livestock grazing is curtailed	Would not comply – some stream reaches would not meet desired conditions if forage utilization of up to 60% in uplands and 65% in riparian areas occurs	Complies	Complies
Forage Improvement Standard - Range in less-than-satisfactory condition will be improved. Disturbed areas will be stabilized or regenerated prior to resuming grazing use. (Forest Plan, page 128)	Complies	Would not comply - range condition improvement is not required, soil disturbance would remain if forage utilization of up to 60% in uplands and 65% in riparian areas occurs	Complies	Complies

Table 43. Consistency with Federal, State and Local Requirements				
Would the project or activity 1) contribute to the maintenance or attainment of one or more goals, desired conditions, or objectives, or 2) not foreclose the opportunity to maintain or achieve any goals, desired conditions, or objectives, over the long term?				
Forest Plan Component	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Fish, Wildlife, and Threatened, Endangered, and Sensitive Wildlife Species Standard - Range improvements, management activities, and trailing will be coordinated with and designed to help meet fish and wildlife habitat needs, especially on key habitat areas such as crucial winter range, seasonal calving areas, riparian areas, sage-grouse leks, and nesting sites. Special emphasis will be placed on helping to meet the needs of Threatened, Endangered, and Sensitive species. (Forest Plan, page 129)	Not applicable, livestock grazing is curtailed	Would not comply - habitat for Canada lynx, cutthroat trout, greater sage-grouse, and amphibians would be negatively affected if forage utilization of up to 60% in uplands and 65% in riparian areas occurs	Complies	Complies
Would the project or activity: (i) comply with applicable guidelines as set out in the plan; or (ii) achieve the purpose of the applicable guidelines?				
Fencing Riparian Area Guideline - New or rebuilt fences across riparian areas or upland areas adjacent to riparian areas should be built using a wooden top pole or other state-of the art marking technique to increase visibility of the fence and reduce possible collision of cranes and waterfowl. (Forest Plan, page 125)	No new or rebuilt fences	Complies	Complies	Complies

Table 43. Consistency with Federal, State and Local Requirements				
Would the project or activity 1) contribute to the maintenance or attainment of one or more goals, desired conditions, or objectives, or 2) not foreclose the opportunity to maintain or achieve any goals, desired conditions, or objectives, over the long term?				
Forest Plan Component	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Fish Habitat Management Guideline – For fish habitat providing a fishery at or near its potential, fish populations should be maintained at existing levels. For habitat below its potential, habitat should be improved and maintained to at least 90 percent of its natural potential. (Forest Plan, page 126)	Complies	Would not comply – fishery habitat would be degraded if forage utilization of up to 60% in uplands and 65% in riparian areas occurs	Complies	Complies
Streambank Stability Guideline – At least 90 percent of the natural bank stability of streams that support a fishery, particularly Threatened, Endangered and Sensitive species, and all other trout species, should be maintained. (Forest Plan, page 126)	Complies	Would not comply – some streams would not meet the stability objective if forage utilization of up to 60% in uplands and 65% in riparian areas occurs	Complies	Complies
Proper Use Guideline - Range proper use standards, including forage utilization standards, should vary depending on site specific objectives. (Forest Plan, page 127)	Not applicable, livestock grazing is curtailed	Would not comply - allowable use standards are not based on site-specific objectives on all allotments	Complies	Complies

Table 43. Consistency with Federal, State and Local Requirements				
Would the project or activity 1) contribute to the maintenance or attainment of one or more goals, desired conditions, or objectives, or 2) not foreclose the opportunity to maintain or achieve any goals, desired conditions, or objectives, over the long term?				
Forest Plan Component	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Grazing Guideline GRAZ G2 - In aspen stands, livestock grazing should be managed to contribute to the long-term health and sustainability of aspen. (Northern Rockies Lynx Management Direction, page 5)	Not applicable, livestock grazing is curtailed	Would not comply - adverse effects on winter snowshoe hare foraging habitat would occur if forage utilization of up to 60% in uplands and 65% in riparian areas occurs	Complies	Complies
Grazing Guideline GRAZ G3 - In riparian areas and willow carrs, livestock grazing should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes. (Northern Rockies Lynx Management Direction, page 5)	Not applicable, livestock grazing is curtailed	Would not comply - adverse effects on winter snowshoe hare foraging habitat would occur if forage utilization of up to 60% in uplands and 65% in riparian areas occurs	Complies	Complies

Table 43. Consistency with Federal, State and Local Requirements				
Would the project or activity 1) contribute to the maintenance or attainment of one or more goals, desired conditions, or objectives, or 2) not foreclose the opportunity to maintain or achieve any goals, desired conditions, or objectives, over the long term?				
Forest Plan Component	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Greater sage-grouse Amendment Grazing Guideline #37 – Grazing guidelines in table 2 (minimum perennial grass height and minimum stubble height of riparian and meadow herbaceous vegetation) should be applied in greater sage-grouse seasonal habitats. (Greater sage-grouse Management Direction, page 103)	Not applicable, livestock grazing is curtailed	Would not comply – minimum grass and herbaceous vegetation heights would not be met if forage utilization of up to 60% in uplands and 65% in riparian areas occurs	Complies	Complies
Would the project or activity occur in an area: (i) That the plan identifies as suitable for that type of project or activity; or (ii) For which the plan is silent with respect to its suitability for that type of project or activity.				
DFC 2A	This DFC is suitable for livestock grazing, evidenced by the Range Prescription that states: Range is managed to maintain and enhance range and watershed condition while providing forage for livestock and wildlife (Forest Plan, page 163).			
DFC 3	This DFC is suitable for livestock grazing, evidenced by the Range Prescription that states: Range is managed to maintain and enhance range and watershed condition while providing forage for livestock and wildlife (Forest Plan, page 176).			
DFC 10	This DFC is suitable for livestock grazing, evidenced by the Range Prescription that states: Range is managed to maintain and enhance range and watershed condition while providing forage for livestock and wildlife (Forest Plan, page 236).			
DFC 12	This DFC is suitable for livestock grazing, evidenced by the Range Prescription that states: Range is managed to maintain and enhance range and watershed condition while providing forage for livestock and wildlife, particularly big-game. (Forest Plan, page 244).			

The following list of laws, regulations, and policies were reviewed to determine consistency between their requirements and the actions proposed in all alternatives.

National Environmental Policy Act (Public Law 91-190) - This Act requires the Forest Service to prepare reports stating the potential environmental effects of proposed agency actions. The environmental analysis and the actions proposed in all alternatives are in compliance with this Act.

Administrative Procedures Act of 1946 (Public Law 89-554) - This Act requires the Forest Service to keep the public informed of their organization, procedures and rules; provides for public participation in the rulemaking process; establishes uniform standards for the conduct of formal rulemaking and adjudication; and defines the scope of judicial review. In particular, it requires the Forest Service to ensure their decisions are neither arbitrary nor capricious. The environmental analysis presented in this document is based upon the best environmental science available to the Forest Service.

National Forest Management Act (NFMA) of 1976 (Public Law 94-588) - This Act is the primary statute governing the administration of national forests and was an amendment to the Forest and *Rangeland Renewable Resources Planning Act of 1974*, which called for the management of renewable resources on national forest lands. NFMA changed forest planning by obliging the Forest Service to use a systematic and interdisciplinary approach to resource management. It also provided for public involvement in preparing and revising forest plans. The actions described in the alternatives were designed in conformance with Forest Plan standards and incorporate appropriate land use and resource management plan guidelines.

National Historic Preservation Act of 1966 (Public Law 89-665) - This Act requires the Forest Service to evaluate the impact of all funded or permitted projects on historic properties (buildings, archaeological sites, etc.) and submit that evaluation to the State Historic Preservation Office for review and concurrence. A cultural resource survey for the area including in this analysis was prepared and the results and recommendations are described in this document.

Wilderness Act of 1964 (Public Law 88-577) - This Act created the National Wilderness Preservation System and described limits on uses allowable in Wilderness Areas. This Act states: “the grazing of livestock, where established prior to the effective date of this Act, shall be permitted to continue subject to such reasonable regulations as are deemed necessary by the Secretary of Agriculture.” This Act further mandates that Wilderness be managed so its community of life is untrammeled by man, its primeval character is retained, and its natural conditions are preserved. The Congressional Grazing Guidelines provide further direction regarding domestic livestock grazing inside designated Wilderness and Wilderness Study Areas. Portions of the Upper Green range allotments lie within the Bridger Wilderness and Gros Ventre Wilderness, and adjacent to the Fitzpatrick Wilderness and Shoal Creek Wilderness Study Area. Grazing use proposed in any alternative is in compliance with this Act.

Clean Water Act of 1977 and the North American Wetlands Conservation Act of 1989 - All alternatives are consistent with these Acts and amendments. No construction or ground disturbing activities within wetlands are involved and therefore no permit is required from the U.S. Army Corps of Engineers. No state permit for streambed alteration is required because no streambed alteration is involved in the project.

Executive Order 11990 of May 1977 (Wetlands) - This order requires the Forest Service to take action to minimize destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. In compliance with this order, Forest Service direction requires that an analysis be completed to determine whether adverse impacts will result. Based on discussions in Chapter 3 of this document, the 2016 Hydrology Report, and the Project Record concerning wetlands, Alternative 1, 3, and 4 comply with EO 11990 by maintaining and restoring riparian conditions (Robertson 2015). Riparian conditions is not expected to be maintained if forage utilization of up to 60% in uplands and 65% in riparian areas occurs as described in Alternative 2.

Migratory Bird Treaty Act of 1918 and Executive Order 13186 of January 2001 - This Act prohibits the pursuit, hunt, take, capture, killing, sale, delivery, or transport, of listed migratory birds. This order requires the Forest Service to provide for the protection of migratory birds by entering and following an MOU with the Fish and Wildlife Service (FWS). High priority migratory bird species breeding habitats are analyzed and discussed in the effects analysis chapter of this document, as required in the 2008 MOU with FWS.

Executive Order 13112 of February 3, 1999, Invasive Species - This order requires the Forest Service to not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions. All action alternatives incorporate the implementation of a weed management plan. That is expected to minimize the risk of introduction and/or spread of invasive species due to livestock grazing.

Endangered Species Act of 1973 - This Act requires the Forest Service to consult (formally or informally) with the US Fish and Wildlife Service (FWS) or the National Marine Fisheries Service (NMFS) if any project occurs in the habitat of a species that has been listed as endangered or threatened. The Act also prohibits the Forest Service from authorizing, funding or carrying out actions that "destroy or adversely modify" critical habitats. The expected effects to listed species are described in this document along with determinations as to the severity of those effects. Consultation with the FWS on the proposed decision is planned to be accomplished before a final project decision is made.

Civil Rights Act of 1964 - This Act outlawed discrimination based on race, color, religion, sex, or national origin. It ended unequal application of voter registration requirements and racial segregation in schools, at the workplace and by facilities that served the general public (known as "public accommodations"). No alternative is expected to result in discrimination or segregation related to these categories.

Executive Order 12898 of February 11, 1994 (Environmental Justice) - This order requires the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies. Actions proposed in any alternative are not anticipated to cause disproportionate adverse human health or environmental effects to minority or low-income populations. In Sublette County, only 2.5% of families are below the poverty level, while that figure is 10.9% in the United States as a whole. People that are below the poverty level in Sublette County are White or consider themselves a mix of two or more races. No Black or African American, American Indian, Asian, Native Hawaiian and Oceanic, or any other race alone are below the poverty level in Sublette County (Headwaters Economics 2013). While the Agriculture sector of the economy in Sublette County has less than average annual county-wide income, that average income in 2013 was $38,673 per year. That annual income would be above national poverty levels unless the family size dependent on that income was 8 or more family members (USDA Department of Health and Human Services, 2013 Poverty Guidelines).

Treaty Rights - Actions described in any alternative do not conflict or affect any American Indian Treaty Rights. The relationship of the U.S. Government with American Indian tribes is based on legal agreements between sovereign nations. The United States signed the Fort Bridger Treaty of 1868 which established the Fort Hall Indian Reservation and the Wind River Indian Reservation for members of the Shoshone and Bannock Tribes. Tribal members continue to exercise off reservation treaty rights, and return to aboriginal lands to practice their unique culture and traditions. The 1868 Fort Bridger Treaty reserves the right to

continue traditional activities on all unoccupied lands of the United States for hunting, fishing, and gathering of resources for subsistence purposes.

Other Federal, State and Local Laws - No alternative is expected to violate any other federal, state or local laws or requirements for the protection of the environment.

Short-term Uses and Long-term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

The indicators of rangeland vegetation directly describe the effects to long-term productivity. When rangeland vegetation is at risk, long-term productivity is at risk. The short-term use of livestock grazing as described in this alternative is not expected to affect long-term productivity as design features and monitoring are set up to address functionality. Currently productivity is at risk in six of the twenty-seven key areas.

The short term annual use of the allotments by livestock under Alternative 1 is not authorized and thus does not contribute to the stability of local ranches and the local economy. There is little productivity loss, however, for this alternative because any area that does not now meet desired conditions due to livestock grazing is likely to rapidly recover. In other words, while the sector of the economy associated with livestock production may decline, the sector of the economy associated with amenity values (such as scenery and wildlife habitat) may benefit due to the fact that isolated areas of resource damage would improve most rapidly under this alternative. These resource areas of concern are discussed in other resource sections such as wildlife, fisheries, and rangeland vegetation.

The short term annual use of the allotments by livestock under Alternative 2 contributes, although in a relatively small way, to the stability of local ranches and the local economy. The productivity loss for this alternative is that there are some isolated areas that may not meet desired conditions while current grazing is authorized. Those isolated situations or areas are generally described in the purpose and need section of Chapter 1, and described in the Range section of Chapter 3.

The short term annual use of the allotments by livestock under Alternative 3 and Alternative 4 contribute, although in a relatively small way, to the stability of local ranches and the local economy. The productivity loss for Alternative 3is that there are some isolated areas that may take some time to meet desired conditions. Under Alternative 4 most areas would recover more quickly to desired conditions due to more restrictive utilization limits. Areas not meeting desired conditions are generally described in the purpose and need section of Chapter 1, and more specifically described in the Range section of Chapter 3.

Unavoidable Adverse Effects

No unavoidable adverse effects are associated with Alternative 1. There are unavoidable adverse effects associated with the three action alternatives (Alternatives 2, 3, and 4). The effects of livestock grazing on soil erosion would continue in high use areas such as along fence lines, near fence corners, around watering areas, and along trailing areas. The direct mortality of grizzly bears and gray wolves would occur as a result of predator removals associated with livestock management. Livestock would potentially trample tadpoles, toadlets, froglets and bird nests.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line right-of-way or roadway.

There are no irreversible effects to any resources under any of the four alternatives in this document. Irreversible commitments would only apply to rangelands if they became non-functional and could not regain functionality even if grazing were eliminated. The threshold of rangeland functionality has been established at 60 percent ground cover for the project area. It is unlikely, that this threshold would be crossed considering the relatively stable existing conditions that developed in the presence of historic livestock grazing. While isolated areas may remain in less than desired condition under Alternative 2, there are no irreversible effects to rangeland vegetation under any of the alternatives in this document. Extinction of a species is not anticipated under any alternative. There are no irreversible effects to soil and riparian resources.

There are no irretrievable effects to soil and riparian resources associated with Alternatives 1, 3 and 4. There are some irretrievable effects to soil resources, riparian areas, and wildlife habitat associated with Alternative 2. Areas of detrimental disturbance and low riparian function would not recover as long as this level of grazing (maximum of 65 percent forage utilization) continues.

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Distribution of the Draft Environmental Impact Statement

This Draft Environmental Impact Statement (DEIS) will be distributed to persons, organizations and agencies that submitted substantive comments on the DSEIS (U.S. Forest Service 2010), the DEIS (U.S. Forest Service 2004) or specifically requests a copy. A cover letter and executive summary of this DEIS will be circulated to the mailing list for the Upper Green River Area Rangeland project. The DEIS will be posted electronically at the Bridger-Teton National Forest Website, http://www.fs.usda.gov/projects/btnf/landmanagement/projects, under the Upper Green River Area Rangeland project. In addition, copies or a link to an electronic copy have been sent to the following Federal agencies, tribes, State and local elected officials and agencies, permittees and organizations representing a wide range of views.

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Wyoming Department of Environmental Quality – Water & Air Quality
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Glossary

Actual use: The number of livestock and date of actual dates of use within the season of use or the degree of forage or browse utilization during the season of use, often reported at the end of the season.

Adaptive management: A system of management practices based on clearly identified intended outcomes and monitoring to determine if management actions are meeting those outcomes; and, if not, to facilitate management changes that will best ensure that those outcomes are met or re-evaluated. Note: “adaptive management” was referred to as “progressive design features” in the specialist reports.

Administrative action: Any management action that is associated with the general terms and conditions of a grazing permit, existing decisions (Forest Plans, project level grazing authorizations, Endangered Species Act consultation agreements, etc.), or other regulatory authority, that does not require additional NEPA disclosure to implement.

Allotment management plan: a document, prepared in consultation with lessees or permittees, that applies to livestock operations on public lands, and (1) prescribes the manner in and extent to which livestock operations would be conducted in order to meet multiple use, sustained-yield, economic, objectives, and other needs, (2) describes range improvements to be installed and maintained, and (3) contains such other provisions relating to livestock grazing and other objectives to be consistent with provisions of the Federal Land Policy Management Act

Allowable use: The degree of forage or browse utilization considered desirable and attainable on various specific parts of an allotment considering the present resource condition, management objectives and management level.

Alternation: Stream bank disturbance caused by animals (e.g., elk, moose, cattle, sheep, and horses) walking along the stream banks or the margins of the stream. The animals’ weight can cause shearing that results in a breakdown of the stream bank and subsequent widening of the stream channel. Alteration also exposes bare soil, increasing the risk of erosion of the stream bank.

Animal Unit: A unit of measure for rangeland livestock equivalent to one mature cow or five sheep or five goats, all over 6 months of age. An animal unit is based on average daily forage consumption of 26 pounds of dry matter per day.

Animal unit month (AUM): An animal unit month is the amount of forage for one mature cow or equivalent for one month based upon an average daily forage consumption of 26 pounds of dry matter per day. One animal unit month is equivalent to 1.32animal unit months for a cow/calf pair and 0.7 animal unit month for a yearling.

Annual Plant: A plant that completes its life cycle and dies in 1 year or less.

Annual operating instructions (AOI): The AOI specifies annual instructions to the permittee identifying actions that are required to implement the management direction set forth in the term grazing permit, the Forest Land and Resource Management Plan (Forest Plan), project-level NEPA-based decisions, and the associated allotment management plan. Actions in the AOI must be within the scope of Forest and project-level decisions, and as such are not required to undergo any additional site-specific environmental analysis or disclosure. Thus, issuance of an AOI is not an appealable decision. Suggested AOI content is described in FSH 2209.13 sec. 94.3. The AOI also constitutes Forest officer permit compliance instructions as described in Part 1, clause 3 and Part 2 clause 8(a) of the term grazing permit.

Authorized use: The number and season of use that is in the Annual Operating Instructions and billed for on an annual basis.

Areas of concern: Areas that are not resource objectives and, therefore, not meeting desired conditions. See Table 1 for areas of concern identified in the Upper Green River project area.

Benthic Zone: The ecological region at the lowest level of a body of water such as an ocean or a lake, including the sediment surface and some sub-surface layers.

Capability: The evaluation of the potential of an area of land to produce resources, supply goods and services. Grazing capability is the ability of the landscape to support long term grazing by livestock.

Carrying Capacity: The average number of livestock and/or wildlife that may be sustained on a management unit compatible with management objectives for the unit.

Class of Livestock: Description of age or sex group for a particular kind of livestock, such as cow, bull, calf, yearling, ewe, ram or lamb.

Climax Vegetation: The final vegetation community and highest ecological development of a plant community that emerges after a series of successive vegetational stages. The climax community in theory perpetuates itself indefinitely unless disturbed by outside forces.

Critical Area: An area which must be treated with special consideration because of inherent site factors, size, location, condition, values, or significant potential conflicts among uses. Note: In the DSEIS these sites were referred to as “critical area” and in this 3rd DEIS, these sites were referred to as “focus areas”.

Decreaser species: For a given plant community, those plant species that decrease in amount as a result of a specific abiotic/biotic influence or management practice.

Deferred Rotation: The order in which pastures are grazed would be rotated annually so that plants are not grazed at the same time each year. Or deferred rotation could involve the delay of grazing in a pasture to promote seed maturity of key forage species.

Designated monitoring area (DMA) - A site or location on a stream where monitoring is established and required (designated).

Desired condition –A description of specific ecological, social, and economic characteristics on a landscape scale toward which management of the land and resources should be directed. Desired conditions are described in terms that are specific enough to allow progress toward their achievement, but do not include completion dates. Desired conditions are described in part using resource objectives.

Desired Future Condition (DFC): A future land or resource condition that achieves a set of compatible multi-resource Forest Plan goals and objectives (U.S. Forest Service 1990). Each DFC has a unique set of prescriptions, standards, and guidelines. Prescriptions set the “policies” and standard and guidelines se the “limits” specific to that DFC.

Desired Plant Community: The plant community that has been determined through a land use or management plan to best meet the plan objectives for a site. A real, documented plant community that embodies the resource attributes needed for the present or potential use of an area, the desired plant community is consistent with the sites capability to produce the required resource attributes through natural succession, management intervention, or a combination of both.

Dry Meadow: A meadow dominated by grasses which are characterized by soils which become moderately dry by mid-summer.

Duration of grazing: How long livestock are in a specific unit, pasture or allotment.

Focus area: An area in need of special management consideration due to its unique characteristics or sensitivity to disturbance. Focus areas typically do not currently meet desired conditions for one or more resource and the causative factors vary. Focus areas do not represent the entire pasture or allotment. Seven focus areas were identified and discussed in this document. Note: “focus areas” were referred to as “critical areas” in the DSEIS.

Frequency of grazing: How often a pasture is grazed in one season or how often a plant is defoliated.

Erosion: (verb) Detachment and movement of soil or rock fragments by water, wind, ice, or gravity. (noun) The land surface worn away by running water, wind, ice, or other geological agents, including such processes as gravitational creep.

Forage: All browse (woody) and herbaceous growth available and acceptable to grazing animals. Forage includes grasses, forbs, and shrubs depending on the animal species.

Forage Utilization is the proportion of the current year’s production of herbaceous vegetation that is consumed by grazing animals.

Forb: A herbaceous plant that is not a grass, sedge, or rush.

Grazing capability: A biological identification of lands that are capable of supporting long-term livestock grazing use.

Grazing capacity: The maximum amount of livestock grazing that can be sustained on a land unit for a specific period of time without causing damage to vegetation or related resources.

Grazing permit: Official written permission to graze a specific number, kind, and class of livestock for a specified time period on a defined rangeland.

Grazing season: On federal lands, an established period for which grazing permits are issued.

Grazing suitability: A determination whether livestock grazing is an appropriate use within a particular area when combined with other considerations such as management activities, permitted uses, and wildlife requirements.

Grazing system: A systematic sequence of grazing use and nonuse of an allotment to meet multiple use goals by improving the quality and amount of vegetation. Examples include season-long, deferred, deferred rotation and rest rotation grazing systems.

Greenline is a linear grouping of live perennial plants, embedded rock or anchored wood above the waterline on or near the water’s edge. It often forms a relatively continuous line of perennial vegetation adjacent to the stream.

Ground cover: The percentage of material, other than bare ground, covering the land surface. It may include live and standing dead vegetation, litter, cobble, gravel, stones and bedrock. Ground cover plus bare ground would total 100 percent.

Guideline – A constraint on project and activity decision-making that allows for departure from its terms, so long as the purpose of the guideline is met. Guidelines are established to help achieve or maintain a desired future condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements.

Herbaceous plant species are grasses and wildflowers.

Herbaceous retention is the percent of all herbaceous vegetation (key forage and otherwise) remaining, calculated as 100 percent minus total forage used.

Incidental take statement: The U.S. Fish and Wildlife Service formally recognizes in a biological opinion the take of individual animal(s) from a threatened or endanger species population as incidental to, and not for the purpose of, carrying out an otherwise lawful activity conducted by an agency or applicant.

Increaser species: For a given plant community, those plant species that increase in amount as a result of a specific abiotic/biotic influence or management practice.

Indicator: An attribute used to measure the impacts of grazing on a particular resource.

Intensity of grazing: How much of the plant is removed or remains as a result of grazing, often referred to as percent utilization or stubble height.

Interdisciplinary team: A team of varied land use and resource specialists formed to provide a coordinated, integrated information base for overall land use planning and management.

Key Area is a relatively small portion of rangeland which because of its location, grazing or browsing value, and/or use, serves as a representative monitoring site and evaluation site for the pasture and/or allotment. A key area guides the general management of the entire area of which it is a part, and will reflect the overall acceptability of grazing management over the range.

Key forage species include Idaho fescue (*Festuca idahoensis*) in uplands, sedges (*Carex* species) in riparian areas and other species identified as appropriate for the site.

Lek: A breeding display site. A sage-grouse lek typically occurs in open areas surrounded by sagebrush.

Litter: The uppermost layer of organic debris on the soil surface; essentially the freshly fallen or slightly decomposed vegetal material.

Littoral Zone: The part of a sea, lake or river that is close to the shore.

Management indicator species: Any species, group of species, or species habitat element selected to focus management attention for the purpose of resource production, population recovery, maintenance of population viability, or ecosystem diversity (FSM 2605).

Meadow (includes wet meadow and mesic (dry) meadow): Permanently wet or intermittently water-covered areas with vegetation.

Mesic meadow: A meadow that provides the interface between perennial riparian area/wet meadows and the more arid uplands.

Multiple use: A combination of balanced and diverse resource uses that considers long-term needs for renewable and nonrenewable resources, including recreation, rangeland, timber, minerals, watershed, fisheries and wildlife, along with scenic, scientific, and cultural values.

Permitted use: The number and season on the face of the term grazing permit.

Permittee: One who holds a permit to graze livestock on state, federal, or certain privately-owned lands.

Perennial plant: A plant that has a life cycle of 3 or more years.

Progressive design features are also referred to as "adaptive management". See definition for "adaptive management".

Proper use: Degree of forage utilization of current year's growth, which, if not exceeded, will help to achieve management objectives to maintain or improve the long-term productivity of rangelands.

Range condition: The current productivity of a rangeland relative to what it could naturally produce.

Rangeland: A kind of land on which the native vegetation, climax or natural potential consists predominately of grasses, grass-like plants, forbs, or shrubs. Rangeland includes lands revegetated naturally or artificially to provide a plant cover that is managed like native vegetation. Rangelands may consist of natural grasslands, savannas, shrub lands, most deserts, tundra, alpine communities, coastal marshes, and wet meadows.

Redd: spawning area of trout

Resource objectives are concise and measurable statements of desired conditions for resources such as rangelands, riparian areas, soils, wildlife, and recreation.

Rest rotation: One pasture in the pasture rotation would not be grazed by livestock for a full year, allowing vegetation in the rested pasture a full season to develop. The remaining pastures would be grazed in a deferred rotation. In the second year, another pasture would be rested, and the remaining pastures grazed in a deferred rotation. This pattern would continue until all pastures have been rested.

Riparian areas: The banks and adjacent areas of water bodies, water courses, seeps and springs whose waters provide soil moisture sufficiently in excess of that otherwise available locally so as to provide a moister habitat than that of contiguous flood plains and uplands.

Rotational grazing: Rotational grazing involves the movement of livestock from one pasture to another on a scheduled basis. The time period in which pastures are grazed would be rotated periodically so that plants are not grazed at the same time every year. There are two types of rotational grazing systems proposed – deferred rotation and rest rotation

Scenic River Areas: Classification of river segments as described in the Snake River Headwaters Legacy Act. Those rivers or sections of a river that is free of impoundments, with shorelines or watersheds still largely primitive or shorelines largely undeveloped but accessible in places by roads.

Season-long grazing: Season-long grazing involves livestock use of a pasture or allotment for an entire season of use.

Season of use: The time during which livestock grazing is permitted on a given range area, as specified in the grazing permit.

Sensitive species: Those plant and animal species identified by a regional forester for which population viability is a concern, as evidenced by a (1) significant current, or predicted, downward trend in population numbers or density; or (2) significant current or predicted, downward trend in habitat capability that would reduce a species' existing distribution (FSM 2670.5).

Seral: Pertaining to the successional stages of biotic communities.

Soil erodibility factor (K-factor) is a quantitative description of the inherent erodibility of a particular soil; it is a measure of the susceptibility of soil particles to detachment and transport by rainfall and runoff.

Standard - A mandatory constraint on project and activity decision-making, established to help achieve or maintain the desired future condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements.

Stocking rate: The number of specific kinds and classes of animals grazing or using a unit of land for specified time. Not the same as carrying capacity.

Stream bank stability: Stream bank stability is the percent of the bank that can be susceptible to erosion but which has sufficient vegetation and structure to maintain stability.

Suitability: is the appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses foregone. Grazing suitability determines whether livestock grazing is an appropriate use within a particular area when combined with other considerations such as management activities, permitted uses, and wildlife requirements.

Term permit: A document authorizing grazing for a stated number of years (usually 10) as contrasted to an annual or temporary permit.

Threshold of concern: A resource condition that indicates things are not going well or as expected, and maybe it’s time to look at doing something differently before too much resource damage has occurred.

Timing of grazing: When, within the permitted season of use, livestock are in a specific pasture or allotment. By changing the timing from year to year, the effects on the resources can change.

Total Herbaceous Retention is the current year’s production of all herbaceous vegetation on a given site that is not consumed or trampled by grazing animals. The herbaceous vegetation that remains intact or relatively intact.

Utilization: The proportion of current year's forage production that is consumed or destroyed by grazing animals. May refer either to a single species or to the vegetation as a whole. Syn. degree of use.

Viable population: A population which has the estimated numbers and distribution of reproductive individuals to ensure its continued existence is well distributed in the planning area [36 CFR 219.19, 1982 regulations].

Wetlands: Permanently wet or intermittently water-covered areas, such as swamps, meadows, marshes, bogs, potholes, swales, and glades.

Wet Meadow: A meadow where the surface remains wet or moist throughout the growing season, usually characterized by sedges and rushes.

Wild River areas: Classification of river segments as described in the Snake River Headwaters Legacy Act. Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

Xeric: Having very little moisture; tolerating or adapted to dry conditions.

Appendices

Appendix A: Past, present, and reasonably foreseeable future activities considered for the cumulative effects analysis

Past Activities:

Roads
- Travel Plan implementation
- User-Created Roads Closures/Roads

Forested Vegetation
- Blowdown salvage
- Firewood, Post/Pole Removal
- Existing Plantations
- Old tie hack areas
- Timber Harvest
- Historical fires

Miscellaneous
- Mining
- Private land access/activities

Range
- Livestock & Rec Stock grazing
- Predator control
- Fences
- Water developments
- Prescribed burns
- Sagebrush treatments
- Noxious Weed treatments

Recreation
- ORV use (off road)
- Developed/Dispersed Recreation
- Black bear baiting
- Snowmobile use
- Trail Construction/Maintenance

Present Activities:

Roads
- Misc. Road Maintenance
- Travel Plan Implementation

Range
- Livestock & Recreational stock grazing (federal and non-federal lands within the project area)
- Predator control
- Invasive Plants /Noxious Weed treatments

Forested Vegetation
- Firewood, Post/Pole Removal
- Existing plantations
- Urban Interface Fuel Treatment at Red Cliff
- Bend in the River Timber Sale
- Lost Creek Timber Salvage
- Battle Mountain Timber Salvage
- Washakie Timber Sale

Recreation ORV use (illegal off-road)
- Developed/Dispersed recreation camping
- Black bear baiting
- Snowmobile trail grooming and use
- Outfitter guide/ hunting and fishing
- Campground insect tree treatments at Green River Lakes, Whiskey Grove, and Kendal Campgrounds
- Green River Corridor Recreation Planning
- Special Uses
- Cannon Access (Green River)
- Upper Green Elk Feedground

Reasonably Foreseeable Future Activities: Pinyon Osborn Vegetation Treatments

Appendix B: Response to Comments

Adaptive Management (also referred to as progressive design features in specialist reports)

1) EPA 1

Additional adaptive management options should be considered. If monitoring does not indicate progress toward desired conditions, allowable use percentages should be lowered and/or residual riparian stubble height should be increased to six inches in affected pastures.

Response: Both of those options are included under adaptive management in Alternative 3 and Alternative 4. Please refer to the description of these alternatives in Chapter 2, Adaptive Management section and Appendix C, the Monitoring Plan. When resource objectives are not being met, the forage utilization would drop in increments of 10 percent to a minimum of 30 percent allowable use, and/or a 6-inch stubble height. The adaptive management would apply to all six allotments in the project area. In addition, Alternative 3 and Alternative 4 already include a reduction of allowable use percentages in Noble Pasture 1 as well as in Mosquito NW and SW pastures. Six-inch stubble height restrictions are required along all or portions of Tosi Creek, Fish Creek, and Wagon Creek focus areas, and South Gypsum Creek and Strawberry Creek.

2) EPA 4

Reducing stocking rates and/or duration of the grazing season may be necessary where resource management objectives are not being met. Modifications to the season of use and allotment boundaries are other adaptive management tools available.

Response: The action alternatives do not preclude subsequent actions to permanently or temporarily reduce season of use, livestock numbers, or both for the purpose of meeting management objectives. In fact, these alternatives specify that these actions would take place if that is necessary to meet allowable use. Similarly, the action alternatives do not preclude subsequent actions to change allotment boundaries for the purpose of meeting management objectives. Such actions may be taken under administrative authority, and as such do not require NEPA analysis. Alternative 3 and Alternative 4 include an allotment boundary change to add Kinky Creek Pasture within the project area. These alternatives also include a potential reduced duration of grazing season (i.e. livestock must be removed from pastures or taken off of the allotment, when allowable use levels are reached).

3) EPA 5

The FEIS should specify both positive and negative potential impacts of each adaptive management technique included.

Response: Each resource specialist considered the environmental effects, positive and negative, of each adaptive management feature in Chapter 3.

4) EPA 7

An explanation should be provided regarding the general timing of adaptive management implementation, given that effectiveness monitoring may only occur every 5-10 years on pastures without regularly scheduled rest years. Shorter timeframes should be considered if undesirable results are encountered sooner than 5-10 years.

Response: The timing of implementation of adaptive management is described in Appendix C, the Monitoring Plan. Alternative 3 and Alternative 4 employ management actions that have been proven in the scientific literature to achieve desired conditions. Five or more years is an appropriate amount of time to expect changes in rangeland vegetation, as more rapid changes are not expected unless extreme disturbances are experienced (Wiegand and Milton 1996). However, Alternative 3 and Alternative 4 do provide for more frequent measurements to be accomplished where it has been determined that a response to environmental conditions can be expected in a reduced timeframe such as the species composition in the Mosquito SW pasture.

5) WWP 3

All the adaptive management actions mentioned in the document have been available to the Forest Service for decades and do not require NEPA for implementation. Most of these tools are part of the normal permit administration process. The Forest Service has failed in the past to implement these actions to correct problems associated with grazing and the chances that they will be implemented now is slight to nonexistent.

Response: It is true that some tools are available to use that do not require NEPA and the agency and permittees have implemented a number of management actions throughout the years. Some examples include the exclosure on Wagon Creek, the exclosure on Tepee Creek, the grizzly bear food storage order, limiting livestock use near the elk feedground, installing range improvements, changing grazing systems to include rest rotation, and including mitigations to reduce grizzly bear conflicts. Alternative 3 and Alternative 4 are part of our ongoing strategy to improve livestock grazing management.

6) WWP 51

The defining of the adaptive management process in this case is woefully inadequate. The DSEIS implements neither FSH 2209.13 nor the R2 Quimby document. We request that you review the R2 Adaptive Management Guidance document which clearly defines the minimum level of adaptive management.

Response: The adaptive management process was designed in compliance with agency direction; the Quimby document was used as a guide. We went beyond the requirements of that guide by being specific about which adaptive management actions would be taken and specifying exactly when and how they would be employed.

7) WWP 52

FSH 2209.13 93.3g defines adaptive management as: Adaptive management is an interdisciplinary planning and implementation process that provides for: 1) identification of site specific desired conditions; 2) definition of appropriate decision criteria (constraints) to guide management; 3) identification of pre-determined optional courses of action, as part of a proposed action, from which to adjust management decisions over time; and 4) establishment of carefully focused project monitoring to be used to make adaptive adjustments in management over time. The desired conditions laid out in the EIS are general and not for specific benchmark areas and as such do not meet the requirement of the FSH. Additionally, as discussed in more detail in the Quimby document, "pre-determined" means "if this… then that", not just a general 'toolbox' with everything stuffed into it. The EIS's "Monitoring Plan" could hardly be called "carefully focused".

Response: Please refer to Appendix C: the Monitoring Plan as well as the action alternatives descriptions in Chapter 2. The adaptive management actions were proposed in compliance with agency

direction. We went beyond the requirements of the Quimby document by being specific about which action would be used and specifying exactly when and how they would be employed, as well as disclosing the environmental effects of employing the actions. In response to the commenter and other's observations regarding adaptive management, the action alternatives do not contain any "toolbox" list of features that may be implemented if objectives are not met. Resource objectives have been more clearly defined in terms of species composition, ground cover, riparian function and streambank stability in Chapter 1. These resource objectives clearly define the benchmarks when existing conditions meet or do not meet desired conditions. If existing conditions are not meeting or moving towards the resource objective after implementing the livestock grazing prescriptions outlined under Alternative 3 and Alternative 4, then the adaptive management actions (i.e., predetermined courses of action) would be implemented. Adaptive management actions include reducing the upland forage utilization standard in increments of 10 percent (minimum of 30 percent forage utilization) and/ or implementing a 6-inch stubble height standard in riparian areas. If a 30 percent forage utilization and/or 6-inch stubble height do not result in meeting resource objectives, selection of additional prescriptions would be determined by the District Ranger with Interdisciplinary Team involvement. The adaptive management actions do not extend beyond a 6-inch stubble height or a 30 percent allowable use limit because deleterious effects from livestock grazing are not expected below these levels of use (please refer to our response to WWP 33, comment # 99.

8) WWP 53

Attached is the cited Quimby document with key sections highlighted. These sections need to be thoroughly reviewed as the EIS does not implement most of them.

Response: We thoroughly reviewed the document and the sections the commenter highlighted. The Monitoring Plan (2016 DEIS, Appendix C) implemented all of these concepts.

9) WWP 54

Included as an attachment is a useful document written by the U.S. Fish and Wildlife Service on how to write goals and objectives. This document meshes closely with the R2 document discussed above.

Response: We reviewed this document and it was very specific to writing goals for a wildlife refuge, and as such did not provide additional information for the Interdisciplinary Team in formulating or discussing goals and objectives for a grazing allotment.

10) WWP 55

The falsity of the Forest Service's purported need for "flexibility" is clearly exposed in FSH 2209.13 – 92 which states: "The majority of these changes can be implemented administratively, provided the changes do not fall outside the scope of the NEPA decision. Examples of actions that may be taken without further NEPA analysis include alteration of management to respond to Biological Opinions or other *Endangered Species Act*, *Clean Water Act*, or other consultation requirements; changes in specific dates of grazing, class of livestock to be grazed, grazing systems, or livestock numbers based on evaluation of monitoring results; and, implementation of the LRMP [Land Resource Management Plan] through modifications to the term grazing permit. Administrative actions to implement higher level decisions or to respond to monitoring results should be undertaken as a routine administrative action prior to initiating NEPA."

Response: The Forest Service agrees that the majority of these changes can be implemented administratively. They are included in the document for the purpose of full public disclosure. This

document analyzes the maximum levels or sideboards of the livestock grazing management proposed, such as season of use and livestock numbers, in order to disclose and analyze the maximum potential impacts on the resources. Administrative changes would only occur within the sideboards analyzed and would have fewer impacts than disclosed in this analysis. The Forest Service previously consulted with the U.S. Fish and Wildlife Service regarding threatened and endangered species within the project area. The Forest Service has developed conservation measures, and the U.S. Fish and Wildlife Service has provided terms and conditions for management of grizzly bears and other listed species in the project area. The applicable actions have been implemented prior to completion of this NEPA document and subsequent decision. In the event that there is a changed condition such as a new federally listed species, the Forest Service will consult with the U.S. Fish and Wildlife Service and implement the applicable protections. If those additional protections are already included in this DEIS as a part of the selected alternative, no additional NEPA analysis or decision would be necessary to implement them.

11) WWP 23

In the adaptive management section, the document states "failure to meet long-term objectives should be demonstrated by a statistically significant measured change in groundcover or other long-term indicator, a result that does not meet minimum desired condition". Again, while this sounds good it fails in practice. Groundcover is the only measurable desired condition and so there is no way to demonstrate "by a statistically significant measured change" in all the other critical issues. The result is that, since the desired conditions with the exception of one, are not even measurable, and the monitoring does not take into consideration statistical issues, this leaves the Forest Service unable to take action because it doesn't have the "statistically significant" data.

Response: The measurable long-term objectives for rangeland vegetation that were determined to be relevant to this analysis include both groundcover and species composition. Additional long-term objectives are described for other resources such as fisheries and hydrology. For species composition changes, the Forest Service has a specific methodology for analyzing whether a statistically significant measured change has taken place. Briefly that analysis specifies whether the change in composition is significant at 80 percent probability with 1 degree of freedom. We use this methodology to bracket a statistically significant change (a change from one reading to the following reading; not to test how many readings are necessary). Please refer to our response to WWP 10 (comment # 76) under the Range heading of the Response to Comments regarding the appropriateness of ground cover to represent desired condition.

12) WWP 24

A clear example that the Forest Service is not taking its management responsibilities seriously is that the adaptive management discussed in some future tense needs to be implemented presently on many areas within the allotment yet this has not been done.

Response: This DEIS analyzes effects of the no action and action alternatives; the opinion that some element of the action alternatives should have been implemented already is beyond the scope of this document. Most of the project area is in good condition. New adaptive management actions were proposed under Alternative 3 and Alternative 4 for every area that does not meet desired conditions. The adaptive management actions are designed to achieve desired conditions, and monitoring is established to test the effectiveness of their ability to meet desired conditions. Modifications to Alternative 3 and Alternative 4 from the DSEIS to the 2016 DEIS include changes such as a reduction

in forage utilization in Noble Pasture 1, Mosquito NW and Mosquito SW pastures, pastures that currently are not meeting upland resource objectives.

13) WWP 60

FSH 2209.13 94.2 requires “The evaluation of a proposed action’s environmental effects must include the potential effects of all adaptive management options that may be implemented at some future point in time.” This was not done.

Response: In the 2016 DEIS, we have identified specific adaptive management actions that would be triggered should specific objectives fail to be achieved (see Chapter 2, Alternative 3 and Alternative 4 descriptions). This is described in the Monitoring Plan and the effects of the adaptive management actions were analyzed and disclosed by the resource specialists. Generally, as more restrictive triggers are implemented, the environmental effects from livestock grazing are expected to be reduced.

14) WWP 45

A review of the adequacy of the Forest Service's implementation of current AMPs, AOIs and Forest Plan standards is essential to a valid NEPA process. If there have been problems with Forest Service implementation in the past, it is not logical to assume that implementation will now all of a sudden be appropriate.

Response: Please see response to comment # 55 (WWP 43). We addressed the adequacy of previous decisions and how they were implemented by describing the existing condition, which is obviously a result of those decisions, the effectiveness of their implementation and the effectiveness of compliance with permit terms and conditions. Then we compared existing conditions to desired conditions.

In Chapter 1, we describe the scope of the decision and the fact that administrative actions (often taken in response to compliance issues) are within the sideboards provided by the action alternatives and the decision made through this NEPA process.

Cultural Resources

15) EPA 13

The FEIS should include documentation concerning the Wyoming State Preservation Office concurrence with the FS determination that no historic properties would be affected by continued livestock grazing in the project area.

Response: The letter of concurrence received from the Wyoming State Historic Preservation Office (SHPO) was dated January 7, 2010. A copy of this letter is in the project file.

16) WWP 71

The programmatic agreement between the Forest Service and SHPO requires a Class III survey within all areas of overlap between livestock concentration areas, including riparian areas and areas with a high probability for cultural resources. The NEPA document does not provide information to indicate that these Class III surveys have been completed or if completed what the results were.

Response: The programmatic agreement between the Forest Service and SHPO states "Class II Inventory, if any, will focus on those areas determined to be most at risk from grazing activities and associated improvements." The agreement goes on to say "The Heritage Program Leader shall contact the Forest and district Rangeland Management Staff to define areas where livestock tend to

congregate. Congregation areas should be defined based upon the number of livestock in the allotment, the duration, and the likelihood of soil and other resource damage. The Heritage Program Leader shall then determine additional inventory needs, if any, based upon the specific environmental and cultural setting of each analysis area." A cultural resource survey was conducted for the Upper Green River Allotments in 1999 and 2000 following the protocol established in the programmatic agreement. This report was submitted to the Wyoming SHPO in 2002 and the results of this inventory were used in the analysis for this EIS. For more information please refer to the Prehistoric and Historic Sites subsection of the Cultural Resources section in Chapter 3.

17) WWP 17

The heritage resources section states that "heritage resource sites would continue to be inventoried and monitored" but there is very little evidence that this has occurred over the last 10 to 20 years.

Response: During the 2009 field season, a number of previously recorded sites within the allotment complex were monitored. In addition, previously recorded sites that fall within areas where livestock tend to congregate were evaluated for the National Register. The sites monitored and evaluated showed no change in condition from when they were initially recorded in 2000. A report detailing the results of the monitoring and evaluation effort was submitted to the Wyoming State Historic Preservation Office (SHPO) on December 7, 2009. SHPO concurred with the determination that sites were not being affected by livestock grazing activities.

Document

18) UW 1

Commenter supports Alternative B in the DSEIS (USFS 2010).

Response: Alternative B was considered but not analyzed in detail in the 2016 DEIS because it no longer sufficiently addresses the updated desired conditions and areas of concern. Alternative B is similar to Alternative 3 in the 2016 DEIS. Alternative 3 is a modification of Alternative B and is designed to address updated existing conditions and areas of concerns using similar livestock management prescriptions.

19) WWP 5

Issues that WWP commented on in 2005 regarding the Upper Green LSA have not been addressed in the DSEIS.

Response: The *Upper Green Landscape Scale Assessment* (LSA) (1999) recommends a multitude of projects, most of which are beyond the scope of this analysis, however, a number of the recommendations were incorporated into the alternatives. For example, Wagon Creek was identified as an area needing improvement. A portion of Wagon Creek that was identified has been excluded from livestock grazing by fencing the area when livestock are present under current management. This management action is also proposed under Alternative 2 - Current Management, Alternative 3 and Alternative 4. The LSA also identified the need for a strategy to protect tall forb communities in the Beaver-Twin Allotment. All action (grazing) alternatives include limiting both livestock and recreational stock use in the tall forb site at the Waterdog Lake focus area within that allotment. Alternatives 3 and 4 also outline a deferred rotation system in the Beaver-Twin Allotment instead of the current season-long grazing proposed under Alternative 2. Construction of fences is proposed to divide the allotment into three pastures under Alternatives 3 and 4. This will provide better livestock

distribution in the allotment and reduce the time livestock spend in a given area. There are several other items in the action alternatives that were proposed in response to the LSA.

It should also be noted that we responded to all of the comments from WWP in Appendix 2 of the ROD (USFS 2005).

20) WWP 8

The document states that "specific objectives include…" but then lists various issues. The only objective discussed is for the issue of groundcover.

Response: The section of the document to which the commenter refers, is quoted from the Forest Plan and the specific page of the Forest Plan is referred to in the DSEIS. It is quoted as written and defined in the Forest Plan. In the 2016 DEIS additional objectives were summarized and added to Chapter 1 for clarification. Included are four upland objectives addressing ground cover, species composition, invasive plants, sagebrush canopy cover, three riparian resource objectives addressing streambank stability, stream temperature and riparian function and wildlife objectives addressing grizzly bears, Greater Sage-grouse, boreal toads and Columbian spotted frogs, and elk.

21) WWP 11

The document states "this decision would not determine the suitability of particular areas for livestock grazing" but that is exactly what this NEPA document is supposed to do according to the applicable handbook and manual. On the previous page the document contradicts itself by stating "this project would determine if grazing is appropriate within the project area".

Response: This is old verbiage from the 2004 decision when it was the Agency's position that the suitability analysis was required at the programmatic level (Land Management Plan level). This direction has changed; the capability and suitability analysis was completed and is included in the 2016 DEIS in Chapter 3 of the Rangeland Vegetation section. Areas determined to be not suitable for livestock grazing are the Whiskey Grove and Green River Lake campgrounds, Kendall and Fish Creek guard stations, Upper Green River elk feedground, and the Kendall Warm Spring dace exclosure. Livestock grazing would not occur at these sites in any alternative.

22) WWP 50

FSH 2209.13 93.3f requires: “There is a two-part decision to be made for authorizing livestock grazing. The first part is whether livestock grazing should be authorized on all, part, or none of the project area.” The DSEIS failed to provide any information at all regarding the first requirement.

Response: The 2016 DEIS identifies this Forest Service direction in the Decision Framework in Chapter 1. To facilitate the decision whether livestock grazing should be authorized on all, part, or none of the project area, four alternatives were developed and analyzed as described in Chapter 2 and Chapter 3. Alternatives analyzed were Alternative 1 - No Livestock Grazing, Alternative 2 - Grazing as Currently Permitted and Current Management, Alternative 3 - Modified Grazing Management, and Alternative 4 - Modified Grazing Management with Riparian Emphasis. Alternative 1 - No Livestock Grazing (No Action Alternative) would eliminate livestock grazing on the entire project area.

To evaluate whether livestock grazing should be authorized on parts of the project area, lands within the project area were evaluated in terms of their capability and suitability to support livestock grazing (Chapter 3, Rangeland section). Capable lands are areas able to support long-term grazing by livestock based on the resource, using a set of criteria. Suitable lands are areas where livestock grazing is an

appropriate use considering other management activities, permitted uses, fish and wildlife requirements, and other factors in the same area. Lands identified as not suitable for livestock grazing in the project area included developed campgrounds and the area inhabited by the endangered Kendall Warm Springs dace. Livestock grazing would not be authorized on lands identified as unsuitable under Alternatives 2, 3 and 4; therefore action alternatives authorize livestock grazing on "part" of the project area. Furthermore, Alternatives 3 and 4 propose to exclude livestock grazing from additional portions of the project area including the Klondike Creek and Tepee Creek focus areas with the construction of fencing while Alternative 2 would continue livestock grazing on these focus areas.

Finally, the decision maker has the ability in the Record of Decision to pick and choose management actions from different alternatives. For example, the decision maker could choose to authorize livestock grazing in one or more allotments and not in the other allotment(s) based on the analysis completed for each allotment.

23) WWP 61

There are no maps of areas meeting or not meeting desired conditions.

Response: A map of areas not meeting desired conditions (Figure 3) was added to Chapter 1 in the 2016 DEIS. Rangelands in the six allotments generally meet desired conditions based on resource objectives; however, areas not meeting desired conditions were identified. See the "Gap between Desired and Existing Conditions" section of Chapter 1 for further discussion.

24) WWP 83

The cumulative impact sections throughout Chapter 4 suffer from nearly all the same flaws that have been ruled to violate NEPA in dozens of cases. We request that the Forest Service review these cases as well as direction from the Washington office implementing these rulings in order to bring this document into compliance.

Response: The cumulative effects analysis sections were updated in the 2016 DEIS.

Fisheries

25) WGFD 13

Page 34: Table 2.3 Alternative Design Features: Upper Gypsum and Lower Gypsum are within cutthroat trout conservation population watersheds. We suggest it should have a critical area prescription of a 10 percent maximum stream-bank trampling.

Response: There are two conservation populations of Colorado River cutthroat trout located in the Gypsum Creek Unit: the Gypsum Creek population in the Upper Gypsum Pasture and the Jim Creek population in Lower Gypsum Pasture. A Multiple Indicator Monitoring (MIM) site was established and surveyed on Gypsum Creek in 2009, and at the time of monitoring, the site had 85 percent bank stability and 15 percent bank alteration. The bank stability value met objectives even with the higher bank alteration. The site was selected because it is one of the lower-gradient and most highly sensitive to grazing impacts locations on the stream. Much of Gypsum Creek is higher gradient and the bank and bed substrate is larger and more resistant to grazing impacts. The MIM site was revisited in 2012, but the values were not reread because the site was inundated with beaver dams. Jim Creek does not have a MIM site because the stream is high gradient and has little risk of riparian impacts from cattle grazing. Our analysis indicates that the management direction for this location under Alternative 3, including a 4-inch minimum greenline stubble height and 50 percent maximum riparian utilization, or

Alternative 4, including a 4-inch minimum greenline stubble height and 35 percent maximum riparian utilization, would maintain or improve existing habitat conditions on the stream. A bank alteration (which the commenter refers to as stream-bank trampling) criteria is not required for the protection of these streams. That decision may be revisited if future monitoring of these streams reveals declining riparian conditions.

26) WGFD 16

Page 45: 9th Bullet: Reword — Monitor the Colorado River cutthroat trout (Tepee, Rock, Gypsum, and Jim creeks) and Yellowstone cutthroat trout populations within these streams/allotments every 5 to 10 years to determine changes in population density. Genetic samples should be collected every 10 years to determine any changes in purity.

Response: The Forest Service will continue to collaborate with the Wyoming Game and Fish Department to monitor the Colorado River cutthroat trout and Yellowstone cutthroat trout populations within these streams/allotments to determine the robustness and purity of the populations. We agree that monitoring population density should be conducted every 5-10 years. Genetic sampling can be focused on populations with the potential for hybridizing species to interbreed and may not need to be conducted that frequently where risk of hybridization is low.

27) WGFD 19

Page 197: Last paragraph 4th line: Add sentence: Previous surveys in 2002 add 32 percent CRCT [Colorado River cutthroat trout] and 68 percent BKT [brook trout]. Reasons for the decline in CRCT density are unknown.

Response: This section has been revised in the 2016 DEIS and does accurately reflect the best available information on fish density.

28) WGFD 20

Page 200: Tosi-Tepee Upper Tepee Pasture: Add sentence: Fish population data was collected in 2001 and a density of 269 CRCT/mile were found. However the density varied between the sampling sites.

Response: This section has been revised in the 2016 DEIS and does accurately reflect the best available information on fish density.

29) WGFD 21

The WGFD provided detailed information about the history, current distribution, and conservation strategy for the Colorado River cutthroat trout.

Response: We have incorporated the information provided to help ensure that we are using the best available information to inform the fisheries analysis and effects determinations.

30) WWP 31

The document entirely ignores the issue of farming National Forest Service lands. I have reviewed the sale agreement for the Noble pastures and nowhere within those documents has the federal government agreed to continue irrigating these pastures. While the Forest Service discounts the importance of the Tosi Creek Colorado River cutthroat trout population, the issue is significant water diversions are flushing fish out into these pastures as there are no fish screens installed. The document fails to discuss why it is in the public's best interest to continue farming practices on public lands.

Response: The Forest Service has decided to manage Noble Pastures Allotment (762 acres) for livestock grazing in support of Forest Plan Goal 1.1 Objective 1.1(h) provide forage for about 260,000 animal unit months of livestock grazing annually. Water rights to irrigate Noble Pastures were tied to the land sale. To maintain water rights, the Forest Service must beneficially use these rights. The Forest Service is maintaining and beneficially using these diversions to water livestock and irrigate pasture for forage.

In the state of Wyoming, applying for general surface water rights and instream flows are two separate types of water rights. Only the Wyoming Game and Fish Department can apply for instream flows for the benefit of fisheries because only state entities can apply for instream flows.

As stated above, for Noble Pastures, the Bridger-Teton National Forest is beneficially using the water to maintain water rights. The Forest does not hay but does flood irrigate the pastures to promote growth of vegetation for livestock forage. Water in the ditches also provide drinking water for livestock. By this action, the Forest is still beneficially using water in an appropriate way given by the water right certificate. Another thing to consider is that these water rights that are tied to Noble Pastures are something acquired when the Forest Service bought the Noble property which adds to the total value of that land acquisition. The Forest cannot just give away or sell these water rights because they are considered government property.

Colorado River cutthroat trout are present in Teepee Creek, a tributary to Tosi Creek, and do not have populations established in lower Tosi Creek within Noble Pastures except for possible occasional entry from the Green River. Entrainment of cutthroat trout in the diversion may occur occasionally, but screening the diversion is a low priority in the conservation of Colorado River cutthroat trout, especially given the cost of project implementation and maintenance. Our monitoring indicates that the diversion on Tosi Creek does at times entrain non-native trout and native sculpin that are present in lower Tosi Creek, but there is no evidence to suggest that such entrainment is limiting these populations.

31) WWP 81

In the fisheries section, the document states "habitat is managed for the species to achieve fish population levels, harvest success, and recreation day objectives identified by the Wyoming Game and Fish Department" but the document fails to provide what these are, nor compare them to current conditions.

Response: We have added a discussion on page 12 of the Fisheries Specialist Report. The Forest Plan has a desired future condition statement for many of the DFC areas included in this project that states, “Provides habitat for populations, harvest levels, success rates, and recreation days.” The desired condition statement refers to harvest fish species including brook trout, brown trout, cutthroat trout, rainbow trout, and mountain whitefish. The Green River from the Forest boundary to Wagon Creek has a population target of 1,500 fish per mile and an angler catch rate of one fish per hour. Wagon Creek to Lower Green River Lake has a target of 300 fish per mile and 0.5 fish per hour, and above Lower Green River Lake there is no population target and a catch target of 0.3 fish per hour. The Wyoming Game and Fish Department (WGFD) last monitored the reach from Kendall Bridge to Whiskey Grove campground in 2011 and determined that the trout density was 757 trout per mile (SE = 204; WGFD 2011). This was the lowest density of trout in this reach in six monitoring events since 1993. WGFD suggests that the reduced numbers may be caused by changes in rainbow trout stocking practices and sediment deposition in fish structures (WGFD 2011). Cattle grazing is one contributor to elevated erosion in the watershed, however, with most riparian conditions trending upward from

historic conditions, it is not a likely cause of recent declines in trout density. Alternatives 1, 3, and 4 would each help address erosion and sedimentation issues, which could have minor benefits to the fisheries condition in the Green River.

32) WWP 82

The fisheries section discusses the loss of many of the core conservation populations of Colorado River cutthroat trout within the project area as well as significant population declines all clearly pointing to the fact that habitat is not being managed for the species and clearly the trend is towards federal listing. The differences between the current management and the proposed management are essentially nonexistent resulting in unsupportable claims that the proposed action will not continue the current trends.

Response: Declines in native cutthroat populations have been documented across the range of the species. Habitat impairment can be a contributing factor, but has been identified in the *Colorado River Cutthroat Trout Conservation Strategy* as "site specific and not an overall threat throughout the range" of the species (2005, see page 9). Monitoring indicates that most of the riparian areas are in suitable condition. Focus area prescriptions included in Alternatives 3 and 4 have been designed to address those stream and riparian conditions that are not currently meeting desired conditions. Declines to native cutthroat populations are primarily attributable to interactions with introduced, non-native trout species. According to the fisheries analysis, there are substantive differences in the management direction among the alternatives and those differences result in different determinations for the influence of the project on the trend of Colorado River cutthroat trout.

33) WWP 34

Beginning on page 39, the DSEIS lists various Forest Plan standards and guidelines but fails to provide rationale as to how they are complied with.

Response: The section of the DSEIS which the commenter refers to is intended only as a listing of the applicable standards and guidelines, not as an analysis. Analysis of the ability for the alternatives to meet those standards and guidelines follows in Chapters 3 and 4 of the DSEIS. Much of the analysis in Chapters 3 and 4 focuses on the extent of compliance with these standards and guidelines. Please refer to Chapters 3 and 4 of the DSEIS and specialists' reports for a complete rationale. The full compliance analysis is found in each resource specialist report (Booth 2016, Booth and Hayward 2015, Robertson 2016, Anderson 2015, Murphy 2016, Roberts 2016, A. DeLong 2015, Wilmot 2015, Egan 2015, D. DeLong 2016, Stein 2016, Schoen 2015, Winthers 2015, Johnson 2014)

34) WWP 42

FSH 2209.13 91.1 requires: "Under the *National Forest Management Act* (NFMA), project level decisions which authorize the use of specific National Forest System lands for a particular purpose like livestock grazing must be consistent with the broad programmatic direction established in the LRMP [Land and Resource Management Plan]. Consistency is determined by examining whether the project level decision will implement the goals, objectives, desired conditions, standards and guidelines, and monitoring requirements from the LRMP." This is an absolutely critical part of the NEPA process.

Response: The Forest Service has complied with the quoted requirement. Forest Plan (i.e., LRMP) goals, objectives, standard, and guidelines addressed in this project are briefly presented in Chapter 1 and listed by resource in Chapter 3 with an assessment as to how each alternative complies with the

direction. A comparison of the alternatives' ability to meet the purposes and need for the project and ability to address issues is provided at the end of Chapter 2. Monitoring requirements are generally described in Chapter 2 under "Items Common to Action Alternatives" section and fully described in Appendix C, the Monitoring Plan. The ability of the alternatives to meet resource objectives, desired conditions and standards and guidelines was analyzed in Chapter 3.

35) WWP 48

The team, using an interdisciplinary approach, should identify the desired rangeland conditions within the analysis area. Desired conditions should be "specific, quantifiable, and focused on rangeland resources." The EIS does not comply with this requirement. The so-called Desired Conditions are general Forest Plan desired conditions and have not been made site-specific for the area in question and the issues in question.

Response: The desired condition description for the project has been expanded upon in Chapter 1 of the 2016 DEIS in response to this comment. The desired conditions for rangeland conditions are indicated primarily by ground cover objectives and species composition objectives that are specific to each pasture. Ground cover objectives range from 80 percent to 95 percent and the species composition objective is a mid or late seral plant community or an upward trend in plant species composition (Booth and Hayward 2015, Range Specialist Report). In addition, desired conditions were defined by riparian, soils, wildlife, and recreation objectives in Chapter 1.

36) WWP 63

The EIS states that general capability and suitability determinations were made at the Forest Plan level, but ignores the requirements of FSH 2209.13 – 91 which states: "Although an area may be deemed suitable for use by livestock in a LRMP, a project level decision evaluating the site-specific impacts of the grazing activity, in conformance with the *National Environmental Policy Act* (NEPA), is required in order to authorize livestock grazing on specific allotment(s)."

Response: Capability analysis was completed for each of the allotments in the project area. Please see the "Grazing Capability and Suitability" section in Chapter 3, Rangeland Vegetation of the Draft EIS. A suitability analysis was also completed at the project level (Chapter 3 and Figure 39). Several parts of the project area were determined to not be suitable for livestock grazing. Areas identified as not suitable were the Green River Lakes and Whiskey Grove campgrounds, the Kendall and Fish Creek guard stations, Kendall Warm Springs dace exclosure, and the Green River elk feedground, under Alternatives 2, 3 and 4. This and other aspects of the suitability analysis are addressed in the "Capability and Suitability of the Area to Support Livestock Grazing" section in Chapter 3. Site-specific environmental effects of livestock grazing are described in Chapter 3 of the 2016 DEIS.

Hydrology

37) EPA 2

We support broad consideration of techniques such as exclusions and upland water development to protect streams, wetlands, riparian corridors and fishery spawning areas.

Response: Both Alternatives 3 and 4 include a grazing exclosure on Wagon Creek and Tepee Creek in stream segments where the livestock would naturally congregate and cause unacceptable impacts. This project area is unlike most of the Intermountain Region in that water is plentiful. Because water and riparian areas are so plentiful, it is also not feasible to fence all riparian areas. Our analysis

indicates that it is possible to manage impacts from grazing in riparian areas by imposing stubble height standards, except in those areas where additional protection is needed. In those areas we have proposed exclosures, hardened crossings, streambank alteration standards or 6-inch stubble height standards.

38) EPA 3

We recommend protection of stream corridors through use of a minimum 100-foot buffer, particularly where grazing may contribute to pathogen, sediment, and/or temperature concerns.

Response: There are no threatened or impaired waters within the project area. A detailed summary of the water body classifications is presented in the Hydrology Specialist Report in the project record. Our analysis indicates that it is possible to manage impacts from grazing in riparian areas by imposing stubble height standards, except in those areas where additional protection is needed. In those areas we have proposed exclosures, streambank alteration standards or 6-inch stubble height standards. Please refer to pages 105-106 of the Hydrology Analysis within Chapter 3 of the 2010 DSEIS for a description of the water quality within the analysis area.

39) EPA 14

The 2016 DEIS should more fully document how Executive Order 11990 - Protection of Wetlands will be carried out with regard to this project.

Response: When the Forest Plan (U.S. Forest Service 1990, p. 127-128) grazing utilization standards of riparian areas are being met, the wetlands within the project area will maintain their proper functioning conditions. Implementing the Forest grazing utilization standards and guidelines (U.S. Forest Service 1990), and Wyoming State Grazing Best Management Practices (WDEQ 2007) under Alternatives 3 and 4 will ensure that the requirements of Executive Order 11990 will be met.

40) EPA 15

Tables should be added to the 2016 DEIS clearly identifying water bodies that are identified as having beneficial uses, including agriculture, fisheries, drinking water, and recreation, as well as any threatened or impaired water bodies included on the State of Wyoming's Clean Water Act Section 303(d) list.

Response: Information can be found in paragraph format in the Hydrology Resources section of the 2010 DSEIS, Chapter 3 on page 105. Class 1 water includes the entire section of the Green River within the project area. Beneficial uses for Class 1 include drinking water, fisheries, agriculture and recreational uses. Class 2AB waters are North Beaver Creek, Little Twin and Big Twin Creeks, Jim Creek, Gypsum Creek, Rock Creek, Lime Creek, Klondike Creek, Tosi Creek, Tepee Creek, Roaring Fork, and Wagon Creek. Class 2AB waters are those know to support game fish populations or spawning and nursery areas at least seasonally and all their perennial tributaries and adjacent wetlands and where a game fishery and drinking water use is otherwise attainable. There are no threatened or impaired waters within the project area. A detailed summary of the water body classifications is presented in the Hydrology Specialist Report in the project record.

41) EPA 16

Stream channel condition assessment should be provided for the Green River, Jim Creek, Rock Creek, and Lime Creek.

Response: The Interdisciplinary Team determined that the field surveys completed, adequately covered the analysis area and that any additional surveys were not needed. This decision was reached after looking at the stream reaches most used by livestock

Rock Creek, Jim Creek, Lime Creek and lower Wagon Creek were not included within the reaches surveys because they do not meet the Multiple Indicator Monitoring (MIM) site selection criteria of less than 4 percent gradient or a distinctive floodplain with vegetation that heavily influences the channel. Lower Wagon Creek and Jim Creek have cobble and boulder armored streambanks along with gradients greater than 4 percent. The only stream reach within Rock Creek that qualified using the above guidance was an area not representative of cattle use and had very little to no visible impacts due to livestock within that allotment and therefore would not show trends of use or change due to grazing. Big Twin and Little Twin allotments are on the monitoring schedule for the next round of monitoring but photo points and visual observations were made of the stream channels during the time of the visit. Photo points, visual observations, and 5 PFC assessments were completed during the field visits of the Upper Green River as well (found in the project record).

42) EPA 18

The 2016 DEIS should include any water quality data available now for the area and should establish a long-term Monitoring Plan to document existing conditions and to track effectiveness of management practices. It should include turbidity, E. coli, nutrient concentrations (total phosphorus and total nitrogen or ammonia); and any other parameters necessary to address potential concerns identified through the State of Wyoming's impaired water body listing for this area.

Response: There are no impaired waters within the project area. A more detailed summary of the water quality data collected on the Green River is presented in the Hydrology Specialist Report (Robertson 2016) in the project record. Raw data are available from the Forest upon request. Compliance with the *Clean Water Act* is achieved through the proper site-specific design, implementation and monitoring of Best Management Practices (BMPs). BMPs are state and Environmental Protection Agency approved practices that are intended to result in compliance with state water quality standards. As approved practices or as Forest Standards, they are required elements of each environmental analysis and Allotment Management Plan. A key concept of BMPs is that if monitoring identifies any circumstances of noncompliance with state water quality standards, then the Forest Service is obligated to respond to the situation to restore compliance. BMPs will continue to be applied and monitoring and adjustments are ongoing; thus the Forest Service is in compliance with the *Clean Water Act* (See EPA's SAM-32 direction, Water Quality Handbook, Chapter 2).

43) WWP 25

With the exception of a single key area within a small pasture, the document implements no area-wide move on use trigger of annual bank alteration despite the fact that this is critical to the recovery of Colorado River cutthroat trout and riparian conditions.

Response: Under both Alternatives 3 and 4, a 20 percent current-year streambank alteration was identified for Tosi Creek within the Noble Pastures allotment and is identified as a focus area. While this objective applies to all allotments in the analysis area, a 4-inch stubble height prescription was identified as the annual indicator for most of the allotments with the exception given to Noble Pastures Allotment, Fish Creek Pasture, Mosquito Lake SE Pasture and Upper and Lower Tepee within the Upper Green Allotment. Monitoring of these three allotments has identified riparian resource concerns. The allotments that have been identified as having resource concerns are assigned a focus

area prescription of 6-inch stubble height utilization and/or a maximum 20 percent streambank alteration. If through monitoring, it is shown that streambank stability objectives are not being reached with this annual indicator of a 4-inch stubble height in the allotments otherwise not identified as having riparian concerns, we will implement a prescription to a more restrictive 6-inch riparian vegetation stubble height trigger. Bank alteration objectives are described in more detail in the Hydrology Specialist Report which can be found in the project record and are also described in the Streambank Stability Guideline.

44) WWP 59

The impact section regarding water quality ignores the issue of E. coli contamination.

Response: Sublette County Conservation District and Wyoming DEQ data for the project area indicate that all water quality parameters, including E. coli, meet state of Wyoming water quality criteria (2010 DSEIS, Chapter 3, page 105). A more detailed summary of the water quality data collected on the Green River is presented in the Hydrology Specialist Report in the project record. Raw data are available from the Forest upon request. Compliance with the *Clean Water Act* under the action alternatives is achieved through the proper site-specific design features, and implementation and monitoring of Best Management Practices (BMP) (WDEQ 1997). BMPs are state and Environmental Protection Agency approved practices that are intended to result in compliance with state water quality standards. As approved practices or as Forest Standards, they are required elements of each environmental analysis and Allotment Management Plan. A key concept of BMPs is that if monitoring identifies any circumstances of noncompliance with state water quality standards, then the Forest Service is obligated to respond to the situation to restore compliance. BMPs will continue to be applied and monitoring and adjustments are ongoing; thus the Forest Service is in compliance with the *Clean Water Act* (See EPA's SAM-32 direction, Water Quality Handbook, Chapter 2 in the project record).

45) WWP 77

As with many sections in the document the Hydrology Resources section states that "in general, most wetlands have robust vegetation". The problem with these types of statements is that they are very inaccurate. If the statement was just "most wetlands" the meaning could be 51 percent of the wetlands fit this category. What do the other 49 percent look like?

Response: The 2016 DEIS was reworded to “At this time, in general most wetlands have robust vegetation reflective of healthy conditions which is described further in the stream channel conditions and is based upon visual observations.” Wetlands are generally located along the Green River and in the northern pastures of the Upper Green Allotment, although there are also small isolated wetlands throughout the entire analysis area. Vegetation within these identified wetlands are comprised of a sedge/grass mixture that in some places was measured at over 18 inches in height. Within Gypsum Creek Allotment, beaver complexes were re-established along the entire segment within the analysis area which created new wetland habitat. Areas that were identified as being in poor condition were the riparian/wetland areas around the Cow Camp cabin at Wagon Creek, a portion of a riparian area along Tepee Creek and Crow Creek, the wetland around Kinky Creek which is currently being grazed by horses, a segment of Crow Creek, and the elk feedground. Of all of the sites identified, this constitutes less than 5 percent of the entire analysis area. The description of wetlands and riparian areas is described in detail within the Hydrology Specialist Report (Robertson 2016) on page 10, and pages 13-46.

46) WGFD 14

Page 45: 3 Bullet: Reword — Monitoring on these allotments should be focused on the following streams: Lower Tosi, Gypsum Creek, Wagon Creek, Klondike Creek, Tepee Creek, Raspberry Creek, South Fork Fish Creek, Jim Creek, and Rock Creek.

Response: Jim Creek and Rock Creek were not included for long-term monitoring of stream channel form, characteristics, and stability because they do not meet the Multiple Indicator Monitoring (MIM) site selection criteria of less than or equal to 4 percent gradient. Where Rock Creek's gradient is less than or equal to 4 percent, livestock use of the area is not representative of cattle use within the allotment and therefore would not show trends of use or change due to grazing. Big Twin and Little Twin allotments are on the monitoring schedule for the next round of monitoring, but photo points and visual observations were made of the stream channels during the time of visit. The monitoring plan includes monitoring of Lower Tosi, Gypsum, Wagon, Klondike, Tepee, Raspberry Creek, and Fish creeks.

47) WWP 76

In the watershed section there is a brief discussion of BMPs stating that "the BTNF adheres to these Best Management Practices" but fails to provide information of what these BMPs are, how they have been applied or their effectiveness.

Response: Best Management Practices (BMPs) are state and EPA approved practices that are intended to result in compliance with state water quality standards (WDEQ 1997). BMPs are a component of Forest Land and Resource Management Plans and have been incorporated into the action alternatives. As approved practices or as Forest Standards, they are required elements of each environmental analysis and Allotment Management Plan. A key concept of BMPs is that if monitoring identifies any circumstances of noncompliance with state water quality standards, the Forest Service is obligated to respond to the situation to restore compliance. BMPs have been applied and monitoring and adjustments are ongoing; thus the Forest Service is in compliance with the *Clean Water Act* (See EPA's SAM-32 direction, Water Quality Handbook, Chapter 2). This is described in more detail in the Hydrology Specialist Report (Robertson 2016) which can be found in the project record. Wyoming Grazing Best Management Practices applicable to the project are: Practice #1A, Proper Grazing-Domestic Animals; #1E, Proper Grazing-Riparian and Wetland Areas; #2: Fencing, #3 Livestock Herding; #4, Access Roads; #5, Water Development – Instream and Off stream; #6A, Land Treatment – Biological; and #7, Weed and Pest Management (WDEQ 1997). These BMPs are recommended by the state of Wyoming because they have generally proven to be effective in reducing environmental impacts associated with livestock grazing. Specific measures recommended in the BMPs are described as part of the action alternatives, and include timing and duration of rest and grazing periods, livestock kind and class, forage allocation (i.e., forage utilization), herding, salting and fence location, design and construction.

Monitoring

48) EPA 6

More detail should be provided regarding timing of monitoring for water quality, wildlife impacts, and soil quality parameters.

Response: Timing regarding monitoring is detailed in the Monitoring Plan (Appendix C). The descriptions of Alternatives 3 and 4 in Chapter 2 of the 2016 DEIS have been updated to include

additional information. Resource management specialists determined that the level of detail in these alternatives is sufficient to disclose the anticipated environmental effects.

49) EPA 9

A firm commitment to effectiveness monitoring should be included in the 2016 DEIS. An environmentally conservative default management plan should be defined in case adequate resources for monitoring are not secured. The 2016 DEIS should include a discussion of how the Annual Operating Instructions will ensure compliance with monitoring requirements.

Response: Funding for monitoring efforts is an administrative action that is not within the scope of this analysis. The Annual Operating Instructions are instructions for permittees only, not the administering agency. The permittees have an obligation to follow Annual Operating Instructions, and failure to do that may result in administrative action. Permittees are required to meet standards, such as proper use standards. The Forest Service is responsible for monitoring.

In addition, the Forest Service is both committed and required to implement the selected alternative as described in the Record of Decision. The Monitoring Plan (see Appendix C) is a required element in any selected alternative. Monitoring requirements are stipulated in the Monitoring Plan. The Monitoring Plan is part of the Allotment Management Plan (AMP). The AMP is attached and is part of the Term Grazing Permit. Failure to comply with provisions of the permit may result in adverse permit actions.

50) WDOA 2

If a trend towards meeting desired conditions on key areas is not being met, the Forest Service should consider all causal factors and not automatically use livestock grazing modifications to resolve the situation.

Response: The Monitoring Plan has provisions built in to further investigate the ability of key areas to represent effects from livestock grazing when desired conditions are not achieved. This includes the ability to move the key area or to change the desired condition for the key area. The Monitoring Plan includes the following text which directly responds to this concern: *If existing conditions are not meeting or moving towards long term objectives, causative factors would be reviewed by the Interdisciplinary Team, permittees and District Ranger. If the undesirable condition is determined by the District Ranger to be unrelated to any livestock grazing parameters (timing, intensity, frequency or duration) livestock grazing would not be altered. If grazing intensity is determined to be a primary causative factor, the decision to reduce upland forage utilization standard in increments of 10 percent (minimum of 30 percent forage utilization) and/ or to implement a minimum 6-inch stubble height standard in riparian areas would be determined by the District Ranger with advice from the Interdisciplinary Team and the permittees regarding which would be most applicable and effective. If a 30 percent forage utilization and/or 6-inch stubble height do not result in meeting or moving towards objectives, selection of additional or alternate prescription would be determined by the District Ranger using the best available information from the Interdisciplinary Team, permittees, and other agencies, etc. If, however, the timing, frequency, or duration of grazing is determined to be a primary causative factor, the applicable parameter (shorten season of use or change season of use by at least 10 percent [example: 12 days in a 120 day season]) would be altered to reduce the effects of livestock grazing.*

51) WDOA 9

The decision made from this analysis should be based on long-term monitoring and peer-reviewed science.

Response: This decision will be made based upon long-term monitoring and peer reviewed science documented in each specialist report, as well as upon the results of the information exchange that took place as a result of the NEPA process.

52) WWP 12

The document states that "the actual number of animal unit months permitted in the project area would be determined based on meeting proper use criteria" but there is no set process defined within the document that would ensure that this is implemented nor is there any indication that the Forest Service is committed to doing this.

Response: Please refer to Alternatives 3 and 4 in Chapter 2 as well as the Monitoring Plan (Appendix C). These sections of the 2016 DEIS describe how we propose to implement allowable use criteria and outline that process. There are several design features that can be applied to address areas not meeting objectives; they can include reducing a utilization standard, reducing numbers of livestock, changing the grazing rotation, etc. We changed some aspect of Alternatives 3 and 4 to address all areas where objectives were not achieved. We will monitor utilization and require the permittees to comply. Administrative sanctions are available to enforce these requirements. Monitoring is conducted annually on key sites and utilization is determined. Once the desired utilization is met, whether upland utilization or riparian utilization (i.e. stubble height) the livestock are moved. This process will occur under Alternatives 3 and 4; however Alternative 4 contains even more restrictive standards where objectives have not been achieved.

53) WDOA 6

BTNF staff should work closely with livestock permittees to cooperatively identify key areas for monitoring.

Response: Upper Green permittees were involved in identifying key areas for monitoring. It is our policy and practice to work cooperatively with all grazing permittees; however the final determination is the agency's responsibility.

54) WWP 39

In the monitoring section there are various monitoring practices which provide general statements that do not provide how, when, where, who will be required to do these nor what the objectives or timelines to meet those objectives will be. For most of the short or long-term monitoring there was no commitment, triggers or measurable objectives.

Response: The Forest Service is responsible to insure that monitoring is completed. This is specified in the Monitoring Plan, Appendix C. Utilization monitoring varies annually and by pasture. Design features are associated with Alternatives 3 and 4. Typically, utilization is measured one-two weeks prior to a proposed move date, as specified in the Annual Operating Instructions. The decision is made at the point where proper use is achieved to move livestock to another pasture or if utilization of forage has not reached its target, livestock may remain within that pasture for additional time. Measureable resource objectives have been identified in Chapter 1 and include ground cover (80-95 percent), species composition (mid or late seral plant community or an upward trend in species composition),

and streambank stability. Monitoring to determine existing condition in relation to the resource objectives would occur every 3-10 years depending on the objective (Appendix C and Alternative 3 description).

NEPA

55) WWP 43

A fundamental aspect of NEPA is to take a "hard look" at current management, conditions, assumptions and implementation. A NEPA document that fails to analyze the following violates the purposes of NEPA: 1) Validity of assumptions from previous NEPA processes; 2) Accuracy of predictions from previous NEPA processes; 3) Adequacy of Forest Service implementation of previous decisions; 4) Permittee compliance with permit terms and conditions, AMPs [Allotment Management Plans], AOIs [Annual Operating Instructions] and other requirements; 5) effectiveness of actions taken in previous decisions

Response: The previous NEPA analysis and resulting decision was signed in June of 1978. The purpose and need for the current project are strongly tied to the current Forest Plan (USFS 1990), which was not in existence at the time of the previous NEPA effort. We reviewed the previous NEPA document, however, and it is clear that evaluating the effects of livestock grazing in terms of the ability to meet current Forest Plan direction is much more applicable than evaluating the effects in terms of the limited direction contained in the previous analysis. The only assumptions and predictions from the earlier analysis was that new grazing strategies and range improvements would result in better overall conditions. Current monitoring examined existing conditions in terms of the Forest Plan and identified resource objectives and desired conditions with regard to rangeland conditions. Current monitoring indicated that current grazing use is meeting resource management objectives in most cases; however, monitoring has identified some instances where objectives are not being achieved. See "Gap between Desired and Existing Conditions" in Chapter 1 of the 2016 DEIS.

We addressed the adequacy of previous decisions and how they were implemented by describing the existing condition, which is a result of those decisions, the effectiveness of their implementation and the effectiveness of compliance with permit terms and conditions. Then we compared existing conditions to currently desired conditions.

In Chapter 1 of the 2016 DEIS, we describe the scope of the decision and the fact that administrative actions (often taken in response to compliance issues) are within the sideboards provided by the action alternatives and the decision made through this NEPA process, although existing conditions reflect the effectiveness of past actions.

56) WWP 44

Without analyzing the accuracy and validity of the assumptions used in previous NEPA processes one has no way to judge the accuracy and effectiveness of the current analysis and proposals. This vitiates the NEPA process. The predictions made in previous NEPA processes need to be disclosed and analyzed because if the accuracy was not there, most likely you are making the same predictions in the current process and as such the process again will be vitiated.

Response: See response to comment # 55 (WWP 43) and comment # 14 (WWP 45).

57) WWP 58

There is no evidence within the NEPA document that the range of actions proposed as adaptive management had been actually analyzed for impacts or effectiveness. Further, there is no specific monitoring or measurable triggers or timelines which are necessary to define the adaptive management process. Adaptive management is solely based on monitoring as its foundation yet the Forest Service provided no commitment to conduct this monitoring.

Response: Measureable resource objectives have been summarized in Chapter 1 and include ground cover (80-95 percent), species composition (mid or late seral plant community or an upward trend in species composition), streambank stability (75 – 85 percent depending on stream type) and stream temperature (68 degrees Fahrenheit). Adaptive management is part of Alternatives 3 and 4 and are described in Chapter 2. Monitoring is described in the Monitoring Plan in Appendix C of the 2016 DEIS. In Chapter 3, under the Alternative 3 and Alternative 4 sections for each resource, an expanded analysis of effects of implementing adaptive management is provided. Monitoring to determine existing conditions in relation to the resource objectives would occur every 3-10 years depending on the objective (Appendix C).

Effectiveness of implementing elements of adaptive management (i.e. reduction in percent forage utilization and 4 to 6-inch stubble height) has been documented in the literature (Holecheck 2004; Clary and Webster 1989; Clary and Leininger 2000; Elmore 1988; Myers 1989; Leffert 2005) as well as documented within the project area. Implementation of 30 percent forage utilization in the Tosi Creek/Tepee Creek rotation and the Gypsum Creek rotation of the Upper Green River Allotment has resulted in increased ground cover and species composition and upland conditions generally meeting desired conditions. On site implementation of retaining 6-inch stubble height on South Gypsum Creek has resulted in increased streambank stability, willow production and sedge production, indicating improved riparian conditions due to implementation of this adaptive management action.

Range

58) UW3

The AMPs [Allotment Management Plans] that are developed as the outcome of this assessment should incorporate the concept of ecological sites and associated State and Transition vegetation models as the fundamental land vegetation cover inventory and assessment tool for key areas and critical areas. This may reveal that thresholds in vegetation succession have been crossed that limit the probability that any livestock management strategy or practice will result in change toward the proposed desired future condition.

Response: It is our understanding that the ecological site descriptions, to which you refer, have not been developed for much of our project area. We used a number of tools for assessing the rangeland vegetation in the project area including the Ecological Unit Inventory completed for the area in 1997 and the General Technical Report (GTR), *Indicators of Rangeland Health and Functionality in the Intermountain West*. Our assessment was largely based on the latter publication and its subsequent inclusion in Forest Service rangeland management policy and regulation (FSH 2209.21 Chapter 20 Rangeland Inventory and Analysis – Upland Rangeland Health Criteria 12/23/2005). The GTR used locally obtained data, which was used to identify a threshold at which functionality (sustainability) was threatened. It is possible that those few areas that were found to be “functioning at risk”, might be in a successional state that limits the areas ability to achieve desired conditions. The Monitoring

Plan associated with the action alternatives has incorporated a strategy to further evaluate key areas, should this be the case. Please refer to Appendix C, the Monitoring Plan in the 2016 DEIS.

59) WGFD 1

The WGFD supports the preferred alternative [Alternative B in the DSEIS] and the management plan to enhance grazing management such as rotational grazing systems and improvements on riparian areas currently identified as experiencing overuse. We support updating AMPs [Allotment Management Plans] for those identified allotments.

Response: As a result of this analysis and pending decision, AMPs would be developed for these allotments. The specifics of the AMPs would be developed using agency and permittee input. All items included within the AMPs would help to implement the decision.

60) WGFD 2

The seven key areas identified as needing improvement should be high priority for immediate implementation and action for improved management of cattle. A degraded tall forb site that has been identified at-risk should have additional data collected and rest provided from livestock grazing if possible. Alternative B [Alternative 3 in the 2016 DEIS] indicates this area would be restored, but no details are provided as to which allotment this is in or how it would be implemented. Most likely the "restoration" will be very slow and rest from livestock grazing is the only management action that can enhance the function and condition on this site.

Response: The area that was identified by the WGFD is located adjacent to Waterdog Lake in the Beaver-Twin Creeks Allotment. This area has been identified as the Waterdog Lake focus area and is an area where cumulative effects are causing this site to degrade. Under Alternative 3 and Alternative 4 commercial outfitter livestock, which cause the majority of the grazing impacts, would not be allowed to graze the Waterdog Lake focus area and domestic livestock grazing would be limited to 20 percent allowable use. Additionally, the allotment would be divided into a three pasture deferred rotation grazing system, rather than season long grazing. This is expected to result in positive changes to the identified site.

61) WGFD 3

We support using *Indicators of Rangeland Health and Functionality in the Intermountain West*, RMRS-GTR-l04 (O'Brien et al. 2003) for thresholds in functioning ground cover included as Table 3.3 opposed to thresholds listed previously in the document.

Response: Thank you for your comment. Our objective (i.e., thresholds) were set using RMRS-GTR-104 (O'Brien et al. 2003) and the Forest Service Handbook *Upland Rangeland Health Criteria* (2209.21.22.1, USFS 2005a), and were revised for site-specificity at the project level by the Interdisciplinary Team. In some cases our objectives are even more restrictive than the thresholds described in GTR-104. We never proposed to implement the less-restrictive regional standards; they were included for comparison.

62) WGFD 4

Alternative B [Alternative 3 in the 2016 DEIS] includes more detailed forage utilization standards and stubble heights that would be implemented to meet site-specific objectives. We support this action, but recommend that data collection efforts track species composition, trend, and/or change, which would need to be monitored with a different methodology than covered by life form and ground cover

monitoring. We support utilizing monitoring methodologies that include species identification and frequency of occurrence in representative areas within uplands sites. Also, department personnel are available to assist with this effort due to mutual interest in habitat conditions for wildlife and livestock alike. Adjusting allowable use based on stubble height is supported when conditions are not meeting objectives.

Response: The Forest Service established a species composition objective (2016 DEIS, Chapter 1) and collected additional species composition data in the summer of 2011 to evaluate existing condition (Chapter 3). Data was collected at key sites using both Line Point Intercept and Rooted Nested Frequency protocols which include identification of plant species and frequency of occurrence within representative areas. The stubble height monitoring and measuring is designed to evaluate utilization and will indicate when a management action is necessary. Assistance from WGFD is always appreciated.

63) EPA 11

The Rangeland Vegetation Resources section should include an assessment of annual vegetation production for the plant communities within the allotments and impacts related to grazing. This is necessary to determine whether there is adequate forage to meet the needs of both livestock and wildlife while still protecting related stream and riparian resources.

Response: This assessment was completed and is discussed in the "Grazing Capacity Interpretation" section (2010 DSEIS, page 73) and the "Introduction" section (2010 DSEIS, page 67) of the Range Vegetation Resources analysis in Chapter 3, as well as in other sections of the document. Grazing capacity information for portions of the project area is based on range analysis information collected during the 1960s. The average amount of livestock forage produced per acre on the land area multiplied by the number of acres within the land area results in a forage production determination. However, forage production is highly variable and dependent on variables such as annual precipitation. Grazing capacity may be “firmed up” by determining whether current management is causing damage to vegetation or related resources. This may be determined by measuring whether enough forage remains after both livestock and wildlife have used an area, or by determining whether long-term vegetation measures are indicating that vegetation health is being sustained under the livestock and wildlife use that is occurring. For the most part, ranges are by their nature too variable for estimated grazing capacity to be reliable, thus “firming up” capacity is a much more reliable method of determining livestock numbers (INT-GTR-134, USFS 1982). In addition our direction for analysis of rangeland conditions as influenced by livestock grazing is to consider timing, intensity, frequency, and duration of grazing rather than annual production. Forage production was also considered in the grazing capacity analysis for the 2016 DEIS. The conclusion of this analysis is that there is sufficient forage available for both livestock and wildlife with enough remaining for rangeland (which includes riparian areas) and watershed health. The grazing capacity analysis is documented in the Range Specialist Report. Additionally, it should be noted that vegetation proper use standards include use by wildlife as well as livestock. In other words, once proper use is reached the livestock must move, without regard for how much of the forage was used by wildlife. This should result in sufficient remaining forage for wildlife. See also the analysis for the harvest management indicator species (Wilmot 2015) which concludes that all alternatives considered in detail would retain suitable and adequate amounts of forage for elk, mule deer, pronghorn and moose.

64) EPA 12

Impacts related to grazing should also address any resulting changes in forest stand composition as it relates to fire fuels and fire risks.

Response: The coniferous forest type (timber) was identified as one of eight vegetation classes for the project area in the "Landscape Scale Vegetation Conditions" section (2010 DSEIS, Chapter 3 page 68-70) but was not included in further analysis because the effects of livestock grazing were mostly confined to other vegetation types. Livestock grazing would have negligible effects on forest stand composition because the effects of livestock grazing are mostly confined to the other vegetation types (Range Specialist Report, page 15). Effects on aspen were described by alternative in Chapter 4, "Rare or Sensitive Plant Resources". Under Alternative A and B (2010 DSEIS pages 249-250) [Alternatives 2 and 3 in the 2016 DEIS] livestock grazing use and management would adversely affect individual aspen trees, suckers/saplings, and small parts of stands. Grazing would reduce fine fuels, reducing the potential for the stand to regenerate through planned or unplanned fire ignitions. There also would be the potential for opportunities for planned fire use to be foregone due to complications with an allotment in active status. However, the analysis indicates that while individual aspen ramets and the associated plant community could be impacted by livestock grazing, the effect would not move beyond the indicators of significance for aspen (2016 DEIS, Chapter 3, "Botany: Sensitive and Management Indicator Species", Aspen-Determination.)

65) WDOA 8

The FEIS should include the number of acres and the percentage of the project areas not meeting objectives to create scale and perspective.

Response: A discussion of the scale and perspective of the areas not meeting desired conditions was included in the Rangeland Vegetation Specialist Report (pages 4-5 and pages 12-17) and are included in the 2016 DEIS, Chapter 3, "Rangeland Resources" section under ground cover and species composition existing conditions. In general, two of the pastures, or approximately 13,615 acres of the 74,410 acres that are suitable and capable for livestock grazing in the project area (approximately 18.3 percent) currently demonstrate a statistically significant departure from groundcover and/or species composition objectives. In addition seven focus areas, five of which are stream segments, have been identified as areas of concern that do not meet resource objectives.

WWP 4

The current management alternative and the proposed alternative are essentially identical and the differences discussed in the various analyses have little basis in reality.

Response: A summary comparison of livestock management by alternative is presented in Table 18 of the 2016 DEIS (see also Table 2.7 of the 2010 DSEIS, page 49). Alternative 2, the current grazing alternative, and Alternatives 3 and 4, the modified grazing alternatives differ in forage utilization level, 4-inch minimum stubble height requirement, rotational grazing systems, permitted number of livestock, structural improvements, and adaptive management. In addition, pasture specific and focus area prescriptions would be implemented to move areas not meeting resource objectives towards desired conditions under Alternatives 3 and 4.

66) WWP 6

The document provides no information regarding how "herding" would be required (to meet prescribed vegetation and stream channel conditions). Aspirations that herding may occur is not management.

Response: For the purpose of this analysis, "herding" or “riding” is essentially any method of moving livestock from one area to another to improve livestock distribution and disperse utilization across the pasture. Herding is not a requirement under Alternatives 3 or 4, but is recommended. Permittees have the option to use herding to improve livestock distribution, thereby increasing the time until allowable use limits are reached. Alternatives 3 and 4 set allowable use limits in all grazed areas, particularly the most sensitive areas, and specify that livestock would be removed from a pasture when those limits are reached. Herding cattle away from sensitive areas allows the livestock to spend more time in the pasture before reaching allowable use limits. Should the permittees choose not to herd, allowable use limits would likely be reached sooner and livestock removed from the pasture sooner.

67) WWP 7

The document fails to provide any information regarding the appropriateness of grazing at the site-specific level (such as in campgrounds, in Colorado River cutthroat trout habitat, wilderness, etc.).

Response: This information is contained in the “Capability and Suitability Analysis” section of the 2016 DEIS in Chapter 3, Range Vegetation Resources. Campgrounds are capable of supporting livestock but are not suitable. All campgrounds within the analysis area are effectively fenced to exclude cattle and none of the alternatives allow livestock grazing inside campgrounds. Wilderness legislation recognizes that grazing inside wilderness is appropriate where it historically occurred prior to wilderness designation. Therefore, livestock grazing in wilderness areas within the project area is authorized and impacts were disclosed and analyzed. This information is discussed in Chapter 3, of the “Recreation, Wilderness, and Related Resources” section under “Wilderness and Wilderness Study Areas”.

68) WWP 8

The document states that "specific objectives include…" but then lists various issues. The only objective discussed is for the issue of groundcover.

Response: In the DSEIS, ground cover was used as an indicator of rangeland health. In the 2016 DEIS, species composition, invasive plants, shrub cover, streambank stability and other objectives are also detailed. Objectives were summarized in Chapter 1 of the 2016 DEIS.

69) WWP 41

The document assumes that the Kinky Creek allotment is now restocked and that the decision to restock it is not part of this process. We have seen no information regarding the authorization to restock this allotment.

Response: Continuation of livestock grazing was authorized for the Kinky Creek Allotment in the decision signed July 3, 1980 by then Forest Supervisor Reid Jackson, and was based on the associated environmental analysis. A decision was signed by District Ranger Craig Trulock in 2005 that modified the allotment boundaries of the Green River and Kinky Creek allotments to include a small portion of the Kinky Creek Allotment in the Upper Green River Allotment. Alternative 3 and Alternative 4 would

retain the ability to stock the area in a manner that would maintain or move towards desired conditions. The effects of stocking this pasture are disclosed in this analysis.

70) EPA 10

Outdated information is presented in Table 3.4 Ground Cover Readings. While more recent data is provided for the Upper Green Allotment, nothing more recent that 2002 data is provided for the Roaring Fork, Beaver-Twin Creeks, Noble Pastures, and Wagon Creek Pastures. No data is presented for the Badger Creek Allotment. This table should be revised to represent current conditions in all allotments.

Response: Data for 2011 was added to this analysis for all of the areas mentioned, as well as others, and these data can be found in project record.

71) WDOA 1

Commenter supports Alternative A (note: Alternative A corresponds to Alternative 2 in the 2016 DEIS) - Continuation of Current Management, except supports use of a rotational grazing system on those allotments that do not currently have one. This change should be considered prior to implementing any adaptive management plan to address resource concerns.

Response: Thank you for your comment. The Forest Service has a responsibility to improve range conditions in those areas that are being negatively impacted by livestock grazing. Current management would not improve those areas. Alternative 3 and Alternative 4 would implement a rotational grazing system on all allotments and implement a livestock grazing management strategy designed to improve range conditions in areas not meeting resource objectives.

72) WDOA 3

WDOA does not support reductions in allowable use, especially not automatically or for single occurrences of missed objectives. The Forest Service should review the list of potential adaptive management tools used on the Black Hills National Forest (attached). Adaptive management tools should be developed with the permittees and should include more than just a reduction in allowable use.

Response: We have reviewed the list of potential adaptive management actions and have incorporated those actions which are appropriate to the analysis. In addition, the Forest Service has met with the permittees within the project area to discuss livestock grazing management strategies and areas of resource concerns.

73) WDOA 4

Commenter strongly opposes Alternative C - the No Livestock Grazing Alternative [now Alternative 1 in the 2016 DEIS]. It conflicts with the Forest Plan.

Response: Alternative 1 does not conflict with the Forest Plan. The Forest Plan encourages grazing on the Forest (Forest Plan Goal 1.1, Objective 1.1h) but does not require it in any particular area. For example, allotments have been retired in some areas due to predator conflicts.

74) WDOA 5

The 2016 DEIS should include a description of the negative effects that would occur with implementation of the No Grazing Alternative. They include increased litter, decreased light filtration,

decreased seed germination, decreased plant diversity, decreased species richness, increased fuel loads, increased risk of wildfire, and others.

Response: The effects of the No Action/No Grazing Alternative (some of which may be considered positive for some resource areas) have been discussed in the 2016 DEIS.

75) WWP 10

Desired conditions for anything other than groundcover is not quantified but only mentioned in general form. Therefore only groundcover will be used to measure results despite the fact that the project area contains significant other issues for which no measurable "desired conditions" have been defined. Upland groundcover is probably one of the least significant issues within the allotments.

Response: Based upon this and other comments, desired conditions for the project have been expanded upon and discussed in Chapter 1 of the 2016 DEIS (see Gap between Desired and Existing Conditions section in Chapter 1).

76) WWP 16

The design features of the proposed action, as well as Forest Plan standards and guidelines have been in place as requirements for nearly 20 years. If they have been effective and if they had been implemented, impacts discussed would already have been mitigated. So it is hard to justify that "now" they will "mitigate" the effects of livestock grazing and associated activities.

Response: Most of the key areas meet the range desired conditions (Table 1 of the 2016 DEIS identifies areas not meeting resource objectives); therefore, the design features that have been in place were generally successful. New and more restrictive design features, including allowable use standards and structural improvements, were proposed for every area that does not meet desired conditions. The new design features are designed to achieve desired conditions, and monitoring is established to test the effectiveness of their ability to meet desired conditions. Reduction in forage utilization to 35 percent, an increase in minimum stubble height to 6 inches or applying a 20 percent streambank alteration are examples of new design features/allowable use standards that would be implemented at specific focus areas or pastures not meeting resource objectives under Alternative 3 and Alternative 4.

77) WWP 20

In the description of Alternative B [Alternative 3 in the 2010 DSEIS], the document states that "Alternative B specifies additional grazing management to improve resource conditions and sustain current livestock operations" but does not discuss exactly what these "additional grazing management" actions are.

Response: In this portion of the document, additional grazing management referred to management strategies beyond the existing season-long strategies. However, numerous design features are included in the description of Alternatives 3 and 4 in Table 6 and Table 13 of Chapter 2 in the 2016 DEIS.

78) WWP 21

The document states "the AMPs [Allotment Management Plans] would list specific objectives and management practices needed to restore resource conditions towards goals and desired future conditions". While this sounds nice, this needs to be done within this document itself not left to a future AMP.

Response: A summary of resource objectives was added to Chapter 1 in the 2016 DEIS. The management practices are described in Chapter 2 by alternative and listed in Table 6 and Table 13.

79) WWP 22

The document states "27 critical areas that require some form of rehabilitation have also been identified on the allotments" but we do not find within the document any coherent description of what this "rehabilitation" will entail, where these locations actually are, or when and how this rehabilitation will be implemented.

Response: There was an error in the DSEIS that incorrectly stated that there were 27 critical areas within the project area. The 2016 DEIS identifies seven focus areas (formerly referred to as “critical areas”) within the project area. The seven focus areas are: Waterdog Lake in North Beaver Pasture of Beaver-Twin Creeks Allotment; Tosi Creek in Pasture 1 and Klondike Creek Exclosure in Pasture 4 of Noble Pastures Allotment; Roaring Fork in Roaring Fork West Pasture in Roaring Fork Allotment; Fish Creek in Fish Creek Pasture, Wagon Creek in the Mosquito SE Pasture, and Tepee Creek in the Tosi-Tepee Red Pasture of the Upper Green River Allotment. The locations of the focus areas are identified on Figure 3 of the 2016 DEIS and description of how each focus area would be managed under Alternative 3 and Alternative 4 is found in Chapter 2 and summarized in Table 6 and Table 13 of the 2016 DEIS.

80) WWP 26

The document implements a 10 percent reduction in upland utilization "when objectives are not met". Firstly, the objectives are not measurable, with the exception of groundcover, and so how do we know when they are not measured in any definitive manner? Secondly, the monitoring methods proposed do not have the statistical rigor to determine the difference between 50 percent and 40 percent utilization.

Response: Please refer to the Monitoring Plan (Appendix C) for the method of determining how utilization monitoring will be applied. The action alternatives authorize livestock grazing. The primary effects of livestock grazing are associated with consumption of forage. Limiting forage consumption is the primary method for avoiding adverse effects of livestock grazing. Ground cover is a useful indicator of the long term effects of the prescribed forage use levels. This reasoning is documented in the analyses in Chapters 3 and 4 of the DSEIS. In addition, species composition and streambank stability are measureable objectives that have been incorporated into Chapter 1 of the 2016 DEIS.

Regarding statistical rigor of utilization estimates, funding is rarely available to provide for statistically adequate sample sizes in all pastures. Emphasis is placed on professional judgment of experienced journey level rangeland management specialists familiar with application of height-weight utilization gauges and landscape appearance monitoring techniques. To insure accuracy, specialists regularly compare estimates derived from these techniques to those derived from clipped and weighed vegetation samples.

81) WWP 27

Page 31 provides a table listing allotment names, total acres, seasons of use, permitted AUMs [animal unit months] and grazing management systems. But while the chart lists "rotational" as the grazing system, the document does not provide enough information to determine exactly how that system will be implemented given the current conditions, lack of fences, lack of herding and the like.

Response: The table you refer to is a summary that gives the reader some scope and scale of the project. Additional information is included on pages 61-66 of the 2010 DSEIS. In the 2016 DEIS, this table was updated (Tables 3, 5, 4 in Chapter 2) to include the number of pastures and the kind of rotational grazing system (i.e., deferred rotation or rest rotation) for each allotment. Under Alternative 3 and Alternative 4, the construction of proposed structural improvements would improve the distribution of livestock, reduce forage use in sensitive areas, and/or improve resource conditions. For example, proposed fences would divide the Beaver-Twin Allotment into three pastures, and incorporate the Kinky Creek Pasture into the Upper Green Allotment. Proposed fences would tie into topographic features and forested vegetation that are natural barriers to cattle movement. Again, existing conditions indicate that the majority of the project area contains fencing or sustains herding sufficient to meet desired condition objectives. Additional information on the rotational grazing system, existing fencing and proposed fencing is provided for each alternative in the "Detailed Descriptions by Allotment" section.

82) WWP 28

A review of the 1978 EA [Environmental Assessment] and AMP [Allotment Management Plan] seemed to indicate that none of the alternatives looked at within that EA allowed for upland utilization greater than 50 percent. It is unclear which of the alternatives was implemented in the AMP but if this is the case the logic that the current need for process is somehow reducing upland utilization levels is not correct.

Response: The information you refer to in the 1978 EA and AMP is not allowable use of 50 percent. There were no allowable use limits associated with those documents. They did, however, contain a grazing capacity analysis that was based on counting only half of the most desirable forage species as available forage for livestock. So we really do not know how much forage was actually used by livestock until more recent monitoring efforts were established.

Additionally, most of the key areas meet the desired objectives. Therefore, the design features that have been in place were successful in terms of our analysis in meeting Forest Plan and other direction; thus it is appropriate to continue the existing management. Under Alternative 3 and Alternative 4, new adaptive management actions were proposed for every area that does not meet desired objectives. These are designed to achieve desired conditions, and monitoring is established to test the effectiveness of their ability to meet desired conditions.

83) WWP 29

The proposed action fails to implement logical use triggers for the entire area, so for instance on the Beaver-Twin allotment there is no riparian key area and so no riparian use requirements. In addition, no annual travel limits have been established.

Response: Key areas have been established in each of the pastures and design features have been applied to achieve resource objectives. Under Alternative 3 and Alternative 4 in the 2016 DEIS, allowable use standards (forage utilization and stubble height) apply to all pastures, except for Noble Pastures 2 and 3 where stubble height is not applicable because there are no streams within these pastures. A maximum 50 percent forage utilization and minimum 4-inch stubble height generally applies across the allotments unless more restrictive allowable use measures are identified. With respect to the Beaver-Twin Allotment, a minimum 4-inch stubble height is proposed in the 2016 DEIS to measure allowable use in riparian areas compared to the DSEIS in which no stubble height requirement was specified for this allotment. We assume that your comment "In addition, no annual

travel limits have been established" you meant that "no annual trampling or alteration limits have been established." This would be true for the Beaver-Twin Allotment; instead of a streambank alteration standard, a minimum of a 4-inch stubble height is proposed as a trigger to move cattle from the pasture.

84) WWP 30

The document provides no rationale regarding the connection with the "proposed range improvements" and the issues discussed.

Response: The effects of the proposed range improvements with respect to the issues have been explained in specialist's reports and in the 2016 DEIS, Chapter 3 under Alternative 3 and Alternative 4 by resource. For example, the effects of proposed structural improvements on Issue 1: Effects on threatened, endangered, sensitive species, and species of concern was addressed in the Wildlife Resources section of Chapter 3 by species. In brief, installing stream crossings would likely decrease the amount of sediment being introduced into the creeks and reduce streambank alteration. This would likely lead to long-term increase in streambank stability and resulting improvement in fish habitat on Big Twin, Little Twin and Wagon Creeks. Reconstruction of the Klondike Creek exclosure with hardened water gaps and the potential installation of an electric fence exclosure on Tosi Creek would decrease streambank alteration and have positive effects on streambank stability. The potential installation of an electric fence along Tepee Creek below the bridge would decrease streambank alteration and allow for increased streambank stability. Reconstruction of the Rock Creek Buttes fence and construction of a drift fence in Beaver-Twin Allotment would provide for a three pasture system and likely improve distribution, timing, intensity, duration and frequency of livestock grazing within the allotment and have beneficial effects on ground cover and species composition. Installation of temporary electric boundary fences in the Kinky Creek Pasture would allow for the incorporation of the pasture into the Tosi-Tepee rotation and would likely result in improved ground cover and species composition by improving livestock distribution, timing, intensity, duration and frequency of livestock grazing. Installation and maintenance of structural improvements by the permittees would be expected to increase the level of their effort and expense, but it is not expected to measurably change local communities in terms of agriculture related employment, spending, effects on the real estate market and other related impacts.

85) WWP 46

Another critical component is permittee compliance. If the permittee has failed to properly comply with their permit terms and conditions and AMP and AOI requirements, including utilization requirements, rotation requirements and fence maintenance, then it is absolutely critical to discuss this in the document and its effects on the proposed action. Given that documents obtained from the Forest Service over the last many years clearly show routine lack of compliance over most of these allotments, such analysis is even more critical.

Response: Permit administration is an administrative function that is not subject to NEPA. If there was a case where lack of compliance caused resource problems, it would be reflected in existing conditions. Any problems that resulted in resource problems in the future would be reflected in our monitoring and subject to design features as specified in the alternative description and Monitoring Plan. Although disclosure of permittee compliance is not required, permittees for the six allotments in the project area have a record of operating in compliance with Annual Operating Instructions (AOI) and grizzly bear conservation measures. District records from the past five years (2009-2013) period that describes current management) were reviewed for Badger Allotment, Beaver-Twin Allotment, Noble Pastures Allotment, Roaring Fork Allotment, Wagon Creek Allotment and the Upper Green

River Allotment. There were no letters of non-compliance issued to any permittee within the project area during this time period. Permittee compliance has been a consistent pattern over the years. The Upper Green River Allotment permittees have also been involved in a cooperative monitoring program with the Forest Service since 1996.

86) WWP 49

"Identification of resource management needs is simply the comparison of desired conditions with existing conditions to determine the extent and rate at which current management is meeting or moving toward those desired conditions." The EIS failed to meet this requirement. To say conditions are "moving toward" is meaningless without this information.

Response: Resource management needs or the comparison between desired conditions and existing conditions is discussed in the 2016 DEIS, Chapter 1, "Gap between Existing and Desired Conditions" section. Areas that are not meeting resource objectives have been identified in this section.

87) WWP 57

The DSEIS fails to discuss actual use within the allotments. Actual use is critical because frequently actual use is significantly lower than permitted use. Therefore the analyses of current conditions must be based on the fact of actual use not permitted use.

Response: Alternative 2 in Chapter 2 of the 2016 DEIS discusses actual use. Table 3 gives details of the difference between permitted use and actual use. The number of livestock and duration that livestock actually graze are often less than the permitted use. Permitted use refers to the Term Grazing Permit held by each permittee. That permit defines a maximum number of livestock that may graze on the allotment, and it also defines the duration that the livestock can be present on the allotment. Again, these are maximum figures that may only be exceeded in special situations. We cannot recall authorizing additional use in the project area in the last decade. So, generally the actual use is equal to or less than what is permitted. However, this is irrelevant to the decision because we are basing the allowable use that may occur on the allotment primarily on the amount of use that is measured on the forage that the livestock consume. The main reason for this is because it is a direct measure of the environmental effects that are caused by livestock grazing. In the past, we counted the actual amount of cattle that were placed on the allotment and made adjustments in numbers - that is the method the commenter is referring to. The drawback of this method is that 1) it is labor intensive to count all livestock on every allotment during every year, and 2) it is not difficult for someone to place additional livestock on the allotment without being detected.

The method we now use requires that the livestock be removed from the pasture or removed from the allotment once allowable use, as measured on forage, is approached or reached. While permitted numbers, season of use and maximum limits are still enforced, if excess livestock were placed on the allotment that would just result in the permittee having to remove livestock sooner. The administrative requirements that remain in place are that permitted use must not be exceeded, allowable use (as measured on forage) must not be exceeded, and in subsequent years permitted use may be adjusted downward based on the ability to meet allowable use. For example, if the livestock were required to be removed from the allotment due to meeting allowable use a week early over a few years, the permitted use could be reduced by a week and this would be an administrative action that is within the range of effects that were disclosed in the NEPA document. It should not be assumed that full permitted use would cause unacceptable environmental impacts. As long as actual use does not exceed allowable

use, we have considered the environmental consequences and we have monitoring plans in place to insure that we do not exceed proper use.

The comment also addresses the question that arises in a few selected sites within the project area. Namely, how can improvements in vegetation condition be expected to occur as a result of implementing a lower allowable use when that lower use level may have already been occurring due to other circumstances. Certainly, if that were the only design feature being applied we may not expect improvement in those instances. However, additional design features such as providing rotational grazing, applying streambank alteration limits, implementing range improvements, and providing an opportunity to defer use rather than rest a pasture have been applied in these instances.

88) WWP 64

Although the NEPA document states that "the project's main focus is to determine whether or not livestock grazing should continue on the proposed allotments", but nowhere within the NEPA document is there any examination regarding whether livestock grazing should be discontinued. Even in areas such as developed recreation sites, where the Forest Plan specifically states livestock grazing should not occur, no analysis of continuing livestock grazing in these areas was done.

Response: The discontinuation of livestock grazing from the project area is analyzed in detail in the 2016 DEIS, Chapter 3 “Environmental Consequences” section: Alternative 1: No Livestock Grazing Alternative. In addition, a capability and suitability analysis was conducted for the project area and is summarized in Chapter 3 of the 2016 DEIS, “Rangeland Vegetation, Grazing Capability and Suitability” section. This analysis determined lands capable of supporting livestock grazing (74,263 acres) based on a set of criteria and lands suitable for livestock grazing. In this analysis, the Whiskey Grove and Green River campgrounds (Developed Recreation Sites) were identified as not suitable for livestock grazing. All campgrounds within the analysis area are effectively fenced to exclude livestock grazing and none of the alternatives within the 2016 DEIS allow livestock grazing in developed campgrounds. Other sites were also identified as not suitable for livestock grazing (see Chapter 3 of the 2016 DEIS, under “Rangeland Vegetation” the “Grazing Capability and Suitability” section).

Recreation

89) WWP 38

The road management standards require maximum road density in DFC 10 as 1 mile per square mile in DFC 12 as 0.25 miles per square mile. Nearly the entire project area significantly exceeds the standards and nearly all of the roads in question are used for livestock management purposes.

Response: Road density standards were analyzed in the *1994 Motorized Travel Plan Environmental Assessment* (EA) for the Pinedale Ranger District. The 1996 Decision Notice for this EA identified total road density standards for Management Area 72, which includes the majority of the analysis area for the Upper Green Range project. Road densities in DFC 12 (18 percent of the project area) exceed Forest Plan standards within Management Area 72, and this is recognized in the 1996 Travel Management decision document. Road densities in DFC 10 (66 percent of the project area) do not exceed Forest Plan standards in Management Area 72. No new roads are being proposed in the *Upper Green River Area Rangeland Project* and no additional roads are being proposed to be re-opened. There is therefore no effect, positive or negative, to road density within the analysis area with this project. Roads within the project area are primarily used for recreational purposes rather than for livestock management purposes.

90) WWP 73

The recreation section in the document states "user-friendly gates are needed wherever forest system trails intersect livestock fences" but this has not been translated into action within the proposed action.

Response: This was not included in the action alternatives because it is a minor action which has already been implemented on Forest System Trails within the assessment area and will continue to be implemented in cooperation between the Pinedale Recreation Management and Range Management programs.

91) WWP 74

The recreation section states "several salting sites within the Bridger Wilderness… have caused visual impacts and riparian concerns" but no actions have been implemented to correct this nor are there management requirements implemented to avoid this in the future.

Response: Salting requirements are identified as a Design Feature Common to Action Alternatives (Chapter 2 of the 2016 DEIS) and are specified in the Annual Operating Instructions (AOI) for all allotments within the analysis area. Salt would be placed a minimum of ¼ mile from riparian areas and at least 200 yards from Forest System trails. This action has already been taken to remedy salting concerns identified within the Bridger Wilderness.

92) WWP 75

The NEPA document discusses briefly Inventoried Roadless Areas but fails to provide information regarding road density within these areas or why the roads exist. In particular the Mosquito Lake roadless area has very high road density with most of the roads having been created for and being used for livestock management purposes.

Response: The five Inventoried Roadless Areas within the project area have contained a developed road system since the Inventoried Roadless Areas were established. The *2001 Roadless Area Conservation Rule* (36 CFR 294) prohibits any new road construction and reconstruction in Inventoried Roadless Areas with certain exceptions, but does not establish road densities. There is no road construction, reconstruction or designation of new roads proposed under any alternative in the Upper Green River Area Rangeland Project. In addition, there are no known conditions related to livestock grazing that threaten the natural function or wilderness characteristics within the five Inventoried Roadless Areas (Recreation, Wilderness, and Related Resources section, Chapter 3 of the 2016 DEIS).

Road density standards were analyzed by Forest Plan Management Area and Desired Future Condition (DFC) in the 1994 Motorized Travel Plan EA for the Pinedale Ranger District. The 1996 Decision Notice for this EA identified total road density standards for Management Area 72, which includes the majority of the analysis area, but did not break out specific road density standards by area, such as the Mosquito Lake area. No new roads are being proposed in the Upper Green River Area Rangeland Project and no previously closed roads are being proposed to be reopened. There is therefore no effect, positive or negative, to road density within the analysis area with this project, including within the Mosquito Lake area. Roads within the Mosquito Lake area are primarily used for recreational purposes rather than for livestock management purposes. In addition, the entire Mosquito Lake Pastures are within DFC 10 and are within road density standards.

Riparian

93) UW4

Regarding stream bank stubble height guidelines and bank alteration, the recommendations of USFS researchers, Hall and Bryant 1995, PNW-GTR-362 [USFS 1995], might be of benefit to permittees in addressing streambank issues.

Response: We reviewed the General Technical Report (USFS 1995) that you refer to. The authors recommend that in order to avoid unacceptable impacts to riparian areas, grazing managers should recognize the point in time where stubble height approaches 3 inches. They assert that most unacceptable impacts occur when stubble height on the most palatable species is between 3/4 of an inch and 3 inches. They also observed that as palatable species such as Kentucky bluegrass dry out, impacts to riparian areas are more likely. Both Alternatives 3 and 4 apply a minimum of 4-inch stubble height to riparian areas and is consistent with the recommendations of Hall and Bryant (1995). In the few instances where Alternatives 3 and 4 apply a 6-inch stubble height, this additional protective measure is needed to address specific concerns.

94) EPA 8

Long-term goals should be established for achieving positive trends and desired conditions for currently degraded streams and riparian areas.

Response: In Chapter 1 of the 2016 DEIS, desired conditions for streams are described and a long-term objective of streambank stability by stream type is identified.

95) EPA 17

The DSEIS notes that additional stream bank stability/trampling measurements are needed. If these are not completed in time for inclusion in the 2016 DEIS, a schedule for conducting such assessments should be included in the Monitoring Plan.

Response: The Interdisciplinary Team determined that the field surveys completed, adequately covered the analysis area after looking at the stream reaches most used by livestock. Additional stream bank stability and alteration data was collected at existing Multiple Indicator Monitoring (MIM) sites in 2012 and the results were included in the 2016 DEIS. The Monitoring Plan specifies that stream monitoring would be conducted every three to five years.

96) WWP 16

The design features of the proposed action, as well as Forest Plan standards and guidelines have been in place as requirements for nearly 20 years. If they had been effective and if they had been implemented, impacts discussed would already have been mitigated. So it is hard to justify that "now" they will "mitigate the effects of livestock grazing and associated activities.

Response: Most of the areas meet the desired condition; therefore, the design features that have been in place were successful. Adaptive management actions were proposed for every area that does not meet desired conditions. The new adaptive management actions are designed to achieve desired conditions, and monitoring is established to test the effectiveness of their ability to meet desired conditions.

97) WWP 32

Some of the so-called key area prescriptions for stubble height only apply in "true carex dominated riparian" but this ignores the fact that many of the riparian areas, due to excessive livestock impacts, have been converted to Kentucky bluegrass and dandelion. The result is that the Forest Service has written in an out to any stubble high requirements.

Response: Through our monitoring of the Upper Green analysis area, there were no sites that were identified as being dominated by Kentucky bluegrass/dandelion. Dominant vegetation types identified during the Multiple Indicator Monitoring (MIM) and greenline monitoring found a mixture of willows, grasses, and hydric vegetation such as sedges. These types of vegetation are important in maintaining channel stability and riparian and wetland vegetation (Burton et al. 2011, GTR 1737-23). If a change-over in vegetation was observed through monitoring over time from a riparian dominate to a drier dominate plant mixture which could include Kentucky bluegrass, then an Interdisciplinary Team would consider implementing the adaptive management such as implementing a 6-inch stubble height to decrease the impacts of grazing on the identified section of stream with riparian vegetation concerns. With this in mind, at this time all riparian key areas are appropriate sites for applying the stubble height restrictions.

If the presence of Kentucky bluegrass was observed in a key area, a 4-inch stubble height would be adequate to prevent riparian damage based on Hall and Bryant's (1995) research. They found that as stubble height approaches 3 inches for the most palatable species (e.g. Kentucky bluegrass) cattle preferences changed and unacceptable grazing-use began. They also noted no damage to some riparian areas when livestock were removed with as little as ¾ inch of stubble remaining. Thus, even if Kentucky bluegrass were present in the key area, a 4-inch stubble height would be more than adequate to prevent damage.

98) WWP 33

Despite the resource conditions on many of the riparian areas, the Forest Service implements a 4-inch stubble height, even on degraded streams but fails to provide logic or references that would support a 4-inch stubble height requirement for riparian recovery.

Response: In cases where current riparian conditions were identified as a concern, additional protective measures were designed for both Alternatives 3 and 4 (Tables 6 and 13, Chapter 2, 2016 DEIS). These additional protective measures include: 1) Installing a permanent exclosure fence along Tepee Creek downstream of the bridge to the change in gradient; 2)Implement a maximum 20 percent current grazing season stream bank alteration and a 6-inch riparian stubble height utilization limit on Tosi Creek within the Noble Pastures Allotment; 3) Installing a permanent fence with water gaps on Klondike Creek within Pasture 4 of Noble Pastures; 4) Implementing a 6-inch stubble height utilization limit in the Fish Creek Pasture until riparian objectives are met; 5) Closing a spur road off of Forest Road #691 to motorized use and rehabilitate the road (rip and seed); 6) Implementing a minimum 6-inch stubble height utilization limit on South Gypsum Creek, Fish Creek, and Wagon Creek focus area. All of these adaptive management actions are listed in Table 6 for Alternative 3: Modified Grazing Management, and Table 13 for Alternative 4: Modified Grazing Management with Riparian Emphasis (Chapter 2 of the 2016 DEIS).

However, it was identified through monitoring that in most cases, the 4-inch stubble height was sufficient to protect riparian attributes. A guidance document for planning riparian grazing procedures on National Forests of the Intermountain Region of the Forest Service suggests that the level of utilization occurring on a site, including riparian areas, is the most important consideration in grazing

management (Clary and Webster 1989). The authors of this study provide a general recommendation that 4-6 inches of stubble vegetation remain on all streamside areas at the end of the growing season to provide sufficient herbaceous forage biomass to meet the requirements of plant vigor, bank protection and sediment entrapment. While this publication talks about utilization in terms of stubble height, it goes on to draw a relationship between stubble height and percent utilization. Average utilization levels of 24 to 32 percent were associated with a 6-inch stubble height, 37 to 44 percent when grazed to 4-inch, and 47 to 51 percent use was obtained when grazing to 3-inch stubble height. They go on to say that special situations, such as critical fisheries or easily eroded stream banks may require stubble heights of greater than 6 inches. However, more recent information suggests that in situations where stream banks need additional protection beyond that provided by limiting use to a stubble height of 6 inches, some form of monitoring of stream bank alteration in addition to residual stubble height would be appropriate (grazing module, 2000). Stream bank alteration limits are included in selected areas under Alternatives 3 and 4.

Additional scientific literature that supports adoption of a 4-6 inches end-of-season stubble height to improve riparian areas includes the following: (Clary and Leininger 2000) in which the authors recommended a 10-centimeter (approximately 4-inches) residual stubble height as a starting point for improved riparian grazing management. Clary and Kinney 2002 concluded that there were no differences between the no-grazing and moderate-grazing treatments (designed to represent the total impact the cattle would have while grazing foliage to a 10-centimeter height) for change in stream width, bank angle, bank retreat, or root biomass. In another study, Clary concluded that most measurements of streamside variables moved closer to those beneficial for salmonid fisheries when pastures were grazed to a 10-centimeter stubble height. Virtually all measurements improved when pastures were grazed to a 14-centimeter (approximately 5 ½ inches) stubble height (Clary 1999). Elmore (1988) suggested that 3 to 4-inches of stubble height would maintain plant vigor, provide stream bank protection, and aid in deposition of sediments to rebuild degraded stream banks. Myers (1989) evaluated 34 grazing systems in place for 10-20 years. Vigorous woody plant growth and at least 6 inches of residual herbaceous plant height at the end of the growing/grazing season typified the riparian areas in excellent, good, or rapidly improving condition. This residual plant cover appeared to provide adequate streambank protection and sediment entrapment during high stream flow periods.

99) WGFD 11

While we generally support the use of riparian stubble height measurements as a method to monitor utilization in riparian areas, this method must be properly applied to get a true measure of use across the entire riparian zone and properly control livestock impacts. Stubble heights are frequently measured erroneously only along the “greenline” (water’s edge), rather than across the entire flood prone zone. This often skews the data to indicate a lower utilization level (higher stubble heights) than when measurements are taken throughout the riparian zone. Furthermore, limiting use to appropriate levels on woody riparian vegetation is frequently more important than, monitoring stubble heights.

Response: Riparian stubble height measurements are properly located along both sides of a stream segment (greenline) in order to ensure that the site where erosive hydrologic forces are applied is being adequately protected according to the MIMs protocol (Burton et al. 2011). In addition to the MIM protocol, we use the stubble height monitoring protocol that is described in the *Wyoming Rangeland Monitoring Guide* (August 2001).

We are unaware of any protocol that calls for measuring stubble heights across the entire flood prone zone. Utilization limits apply “across the entire floodplain zone”.

100) WWP 35

The livestock grazing and riparian areas' standard requires that "livestock grazing and riparian areas would be managed to protect stream banks" but only one key area in one small pasture contains even minimal bank alteration standards.

Response: Riparian allowable use standards are established for all allotments within the project area (Alternatives 3 and 4, Tables 6 and 13, Chapter 2 of the 2016 DEIS). A 20 percent current-year stream bank alteration was identified for Tosi Creek within the Noble Pastures allotment and is identified as a focus area. While this objective does apply to all allotments in the analysis area, a 4-inch stubble height prescription was identified as the annual indicator for most of the allotments with the exception given to Noble Pastures Allotment, Fish Creek Pasture, Mosquito Lake SE Pasture and Upper and Lower Tepee within the Upper Green Allotment. Monitoring of these three allotments has identified riparian resource concerns. The allotments that have been identified as having resource concerns are assigned a focus area prescription of a 6-inch stubble height utilization limit and/or a maximum 20 percent stream bank alteration. If through monitoring, it is shown that stream bank stability objectives are not being reached with this annual indicator of a 4-inch stubble height in the allotments otherwise not identified as having riparian concerns, we will implement our prescription to a more restrictive 6-inch riparian vegetation stubble height trigger. Bank alteration objectives are described in more detail in the Hydrology Specialist Report which can be found in the project record and also in the Stream Bank Stability Guideline (Simon 2008). Scientific literature (Simon 2008; Clary and Webster 1989; Elmore 1988; Clary and Kinney 2002; Clary and Leininger 2000) supports that these riparian allowable use standards are sufficient to protect stream banks and/or allow for stream bank enhancement. Please see response to comment # 99 (WWP #33) above.

101) WWP 47

Another critical component is an examination of the effectiveness of the actions taken in previous decisions. A classic example of this is fences and water developments. Often, new fences and water developments are proposed to solve riparian issues in spite of the fact that these have been used for many decades without correcting riparian issues. Doing more of the same that has not led to good results is not an effective strategy for public lands management.

Response: There is only one water development in the project area; it was not constructed to address riparian issues. The Forest Service would consider water development(s) from up to two water sources in the Mud Lake East Pasture, a water source from Crow Creek and/or a spring to the east of Crow Creek. The proposal to implement water developments would be scoped pursuant to Forest Service Handbook 1909.15.31.3 and analyzed under NEPA in a separate document.

None of the existing fences were constructed to solve riparian issues, with the exception of fences that completely exclude livestock from riparian areas (i.e., Wagon Creek exclosure). It is safe to say that exclosures are generally effective; such is the case with the Wagon Creek electric fence exclosure which has demonstrated riparian improvement since its installation in 1992. Alternatives 3 and 4 propose the reconstruction of the Klondike exclosure with water gaps along the entire length of the creek in Noble Pasture #4 (i.e., Klondike focus area). In addition, if an increase in streambank stability is not met within the next monitoring cycle (approximately five years), then temporary electric fences would be installed along streams segments identified as Tosi Creek focus area, and Wagon Creek focus area. These proposed fences would address riparian issues by addressing the frequency and duration aspects of livestock grazing effects, and these forms of mitigation are well documented in scientific literature (Clary 1989; Bengeyfield 1998; Mosley 1997). However, stubble height limits and stream

bank stability are the primary allowable use standards proposed to address riparian issues in this project. Two permanent fences, one exclosure within the Klondike focus area and one exclosure on Tepee Creek, are proposed for immediate construction.

102) WWP 65

The Forest Service's GTR-INT-263 specifically states "a six step planning process for grazing riparian zones has been suggested (in part from Dwyer and others 1984): 1) determine what factor, such as bank instability or loss of woody plants, is the primary concern, 2) determine site potential in capability, 3) determine the suitability of the affected sites for livestock grazing, 4) determine the kind in class of livestock in duration and intensity of livestock grazing best suited to the area, 5) determine the best grazing strategy, and 6) apply the proper grazing intensity in keeping with animal distribution patterns". This was not done.

Response: The Forest Service planning and analysis of riparian areas for the Upper Green River Area Rangeland Project closely follows this six step process. Bank stability and woody plants were analyzed in the Hydrology and Fisheries specialist reports. Capability and suitability is addressed in the Range Specialist Report (Booth and Hayward 2015) and a new suitability/capability GIS analysis was conducted for the project (project record). Duration and intensity of grazing was analyzed and changes proposed where resource objectives were not being met. Grazing strategies were analyzed and new strategies proposed where objectives were not being met. Grazing intensity was addressed where objectives were not being met.

103) WWP 66

The Forest Service's GTR-INT-263 also states "special situations such as critical fisheries habitats or easily eroded stream banks may require stubble heights of greater than 6 inches". It further goes on to state "degraded riparian areas may require complete rest to initiate the recovery process. In systems requiring long-term rest, the rest will be highly variable depending on the situation. It may be as short as one year or it may be 15 years or longer. Recovery of degraded stream banks usually will require more time than the recovery of plant community composition, in some cases much more time, particularly if the channel has become incised and confined." It continues "however, no rotation system will allow recovery or maintenance of the riparian system unless all livestock are removed after the use period. In any event, rest rotation or any other conventional grazing system should not be considered the sole answer to riparian grazing needs."

Response: Please refer to the following excerpt from the Rangeland Vegetation Specialist Report. "A guidance document [GTR-INT 263] for planning riparian grazing procedures on National Forests of this Intermountain Region of the Forest Service suggests that the level of utilization occurring on a site, including riparian areas, is the most important consideration in grazing management (Clary and Webster 1989). The authors of this study provide a general recommendation that 4-6 inches of stubble vegetation remain on all streamside areas at the end of the growing season to provide sufficient herbaceous forage biomass to meet the requirements of plant vigor, bank protection and sediment entrapment. While this publication talks about utilization in terms of stubble height, it goes on to draw a relationship between stubble height and percent utilization. They state that average utilization levels of 24 to 32 percent were associated with a 6-inch stubble height, 37 to 44 percent when grazed to 4-inch, and 47 to 51 percent use was obtained when grazing to 3-inch stubble height. They go on to say that special situations, such as critical fisheries or easily eroded stream banks may require stubble heights of greater than 6 inches. However, more recent information suggests that in situations where stream banks need additional protection beyond that provided by limiting use to a stubble height of 6

inches, some form of monitoring of stream bank alteration in addition to residual stubble height would be appropriate (grazing module, 2000)." Stream bank alteration limits are included in selected areas under Alternatives 3 and 4. In addition, rest rotation is not the sole answer to riparian management as designed in these alternatives. Please refer to the descriptions of Alternatives 3 and 4 as well as Alternative 1.

104) WWP 67

The Forest Service's GTR-INT-263 (on page 3) lists "suggested initial actions" based on ecological status and channel type. It states that for "B channel types with medium to fine easily eroded soil materials and most C channel types: apply rest until the ecological status improves". This is where many of the streams within the project area fall. It continues for areas with habitats where threatened, endangered or sensitive species "or where stream banks/channels are highly erodible; the herbaceous stubble height criterion may need to be increased to greater than 6 inches".

Response: The stubble height requirement in Alternatives 3 and 4 were increased to 6 inches in areas that were identified as not meeting the streambank stability objective due to effects from grazing and the areas identified were Lower Tosi Creek in Noble Pastures, South Gypsum Creek in Lower Gypsum Pasture, Wagon Creek in the Mosquito South East Pasture, Fish Creek in the Fish Creek Pasture and Upper Tepee Creek in the Tosi-Tepee Red Pasture. One area that was identified as not meeting the 80 percent stability objective which did not receive the 6-inch stubble height prescription was Klondike Creek. Klondike Creek has a prescription of fencing the stream out of the pasture and would be managed as a small separate riparian pasture with brief grazing allowed to stimulate willow establishment by reducing competing grasses and sedges. The Klondike Creek riparian pasture would be grazed at a maximum forage utilization of 0.5 animal unit month per acre per year. Retaining a 6-inch riparian stubble height is also listed as an adaptive management action for both Alternatives 3 and 4, which would be implemented when the riparian objectives are not being met on any of the allotments and pastures within the Upper Green analysis area.

105) WWP 68

BLM researcher Lewis H. Myers conducted a review of grazing systems and their success in improving riparian conditions stated that "insist upon strict grazing system compliance. A few cattle remaining in a pasture after the prescribed use can negate the benefit of a good system. Stray animals invariably spend the bulk of their time in stream bottoms. Ninety percent compliance with a grazing system is not adequate."

Response: We agree with this assessment. All livestock is to be removed from a pasture once proper use is approached or reached under all action alternatives.

106) WWP 69

Forest Service researcher William S. Platts in *Compatibility of Livestock Grazing Strategies with Fisheries* (1989) found that deferred-rotation to be only "fair" at restoring degraded riparian conditions. It also found this system rated as 4 on a scale of 1 to 10.

Response: We reviewed the research that the commenter refers to. The deferred-rotation strategy analyzed in the study did not incorporate utilization limits in riparian areas. The study goes on to say that using a combination of practices such as control of season of use (timing) and control of utilization is necessary for strategies to be compatible with fisheries. A combination of these practices is incorporated into Alternatives 3 and 4.

107) WWP 70

In the recently issued BLM/FS publication TR 1737-20 *Grazing Management Processes and Strategies for Riparian and Wetland Areas*, which states "He (Myers 1989a) found that successful treatments averaged only 12.5 days whereas successful treatments averaged 33.4 days" discussing the duration of hot season grazing used within riparian areas. This document also goes into detail regarding the development of riparian objectives and monitoring programs which have been ignored in the current process.

Response: We reviewed the research that the commenter refers to. The Myers study did not incorporate utilization limits, although willow utilization information was available. The publication goes on to say that some form of indicator or trigger is needed to monitor and reduce frequency, intensity, and duration of riparian use in riparian areas. Alternatives 3 and 4 incorporate these triggers (i.e. forage utilization, stubble height and streambank alteration).

Socio-economic

108) WDOA 7

The 2016 DEIS Socio-Economic impact analysis should include information developed in the Economic Profile document prepared for the Forest Plan revision in 2008. It should also consider wildlife and view-shed effects that would occur if a ranch failed and was sold and subdivided.

Response: The data sources for the economic effects section included the document prepared for the Forest Plan revision (Taylor and Foulke 2008; Taylor 2003). The economic effects were analyzed in sufficient detail ("Socio-Economic Resources" section in Chapter 4 of the 2016 DEIS and in the Economic Specialist Report) for the decision-maker to make a reasoned choice among the alternatives. The potential disposition and development of private land is beyond what is reasonably predictable as a consequence of the alternatives analyzed in the 2016 DEIS.

109) WWP 40

The Affected Environment section falsely claims that "agriculture has been, and continues to be an important industry in Sublette County and in the state of Wyoming". This is false. Agriculture as a whole makes up an insignificant 1.5 percent of the state's economy as of 2007. Within Sublette County the figure is nearly identical. Only 2 or 3 percent (104 people) of the Sublette County's workforce works in agriculture. In no sense can this be seen as important other than from the perspective of a particular individual. The bias of the author towards livestock production is abundantly evident.

Response: The Affected Environment section has been re-worded to reflect the commenters concerns about overstating the importance of the agriculture sector of the economy. While agriculture makes up a relatively small percent of employment in Sublette County (approximately 7 percent), it is the 6th largest sector of employment. Sublette County is lacking in terms of manufacturing, management service, finance and insurance and wholesale sector employment. Thus, Sublette County has a low level of economic diversity in the county economy (Taylor and Foulke 2008). Agriculture has contributed a relatively stable source of economic base to the County.

Even when agriculture is a small component of the economy, the industry can represent a large portion of the land base. Farms and ranches on private lands can also have important implications for the management of public lands. For example, agricultural operations often rely on public lands for summer grazing pasture and irrigation water (Headwaters.org, 2013). In Sublette County,

approximately 17.7 percent of land area is under private ownership, about 78.3 percent is federal and 3.9 percent is state ownership.

Local industry reliance on outputs from National Forest Service land within the project area is greatest for livestock production, outfitting and tourist-related industry, and removal of forest products. The project area is also important to people for recreation opportunities, hunting, and amenity values.

In places where agriculture increasingly operates alongside a larger, non-agricultural economy and greater range of adjacent land uses, farms and ranches continue to be important. They contribute to local economic diversity, the scenery they provide can be part of the mix of amenities that attract and retain people and businesses across a range of industries, and they are often an important part of local culture and community vitality (Headwaters.org, 2013).

The high proportion of federal ownership and rural nature of the area reduces the opportunity for industry as well as reducing the tax base for local governments. This, in turn, increases the dependence on products and services derived from National Forest System lands.

While the agriculture segment makes up a small percentage of the state's economy, it is important for the decision maker to consider when choosing among alternatives, for the reasons stated above.

110) WWP 2

It appears that the Forest Service values the interests of the permittees far more than the needs of the land and the species dependent on it. This is deeply disappointing.

Response: The Forest Service strives to balance multiple uses. The primary purpose for authorizing continued livestock grazing on the six allotments would be to contribute to Goal 1.1 of the Forest Plan (USFS 1990, page 112) which directs that the BTNF supports community prosperity; specifically Objective 1.1(h) states that the BTNF will provide forage for about 260,000 animal unit months (AUMs) of livestock grazing annually. The Forest Plan also directs the BTNF to avoid unacceptable effects from livestock use as outlined in Goal 4.7 (USFS 1990, page 120) which directs that grazing-use of the National Forest sustain or improve overall range, soils, water, wildlife, and recreation values or experiences. Specific objectives include: (a) Retain or improve forage and overall range condition; (b) Retain or enhance riparian vegetation, stream-channel stability, sensitive soils, and water quality where livestock are present; (c) Coordinate the management of livestock with recreation use; and (d) Require that suitable and adequate amounts of forage and cover be retained for wildlife and fish (USFS 1990, page 120). The analysis in this 2016 DEIS (Chapter 4) indicates that livestock grazing, as proposed under Alternatives 3 and 4 would contribute to these two Forest Plan Goals and the purposes of the project.

Soils

111) WWP 72

Most of the soils within the project area have a moderate to severe compaction hazard but there is no translation of this fact into specific management direction to deal with that. The same is true for erosion.

Response: The extent of soils with moderate to severe potential erosion and compaction hazards are listed by pasture in Appendix A of the Soils Specialist Report (Winthers 2015). Specific management direction to deal with areas of identified compaction and erosion are included in Alternative 3 and 4 and the effects are described in the Environmental Consequences section. Alternative 3 and 4 also

reduces the utilization to 50 percent and requires a minimum stubble height of 4-inches, or 6 inches at certain locations, along with site-specific range improvements, and adaptive management actions to meet resource objectives. Alternative 3 and 4 provides the most specific management direction to deal with soil compaction and erosion concerns.

Wildlife

112) UW 2

The assumption that Alternative C (No Action) [Alternative 1 in the 2010 DEIS] would be beneficial to wildlife is overstated with the exception of bears.

Response: The respondent does not provide an explanation for why he/she thinks benefits of the No Action (No Grazing) Alternative are overstated. The effects of the No Grazing Alternative are thoroughly described in the section in Chapter 3 (Affected Environment and Environmental Consequences) for wildlife in the 2010 DSEIS. The No Grazing Alternative would carry many benefits to species such as amphibians and Greater Sage-grouse. For example, this alternative provides for greater cover of herbaceous vegetation at ground level, and reduced trampling mortality and disturbance caused by livestock and livestock operators as compared to the grazing alternatives. Statements of these and similar effects are well supported with discussion and references in the 2010 DSEIS (e.g. Table 30). In some cases, the No Grazing Alternative carries negative effects on species; these are identified in the 2016 DEIS as well. For example, grazing can open dense vegetation that blocks sunlight needed for thermoregulation of frogs and toads, or egg development.

113) WWP 1

Overall we are disappointed by the lack of improvement that has taken place over the last decade, particularly by the lack of leadership displayed in the DSEIS in the significant areas of predator conflicts and recovery of Colorado River cutthroat trout.

Response: The effects of the grazing alternatives on predators (grizzly bears, wolves, and Canada lynx) are fully disclosed in the Wildlife Resources section, Chapter 3, of the 2016 DEIS. We manage livestock grazing activities in the project area to minimize adverse effects on federally listed predators, and in a manner consistent with our Forest Plan and the Endangered Species Act. These efforts are evident in our repeated Section 7 consultations with the U.S. Fish and Wildlife Service. Some losses to grizzly bears and wolves are expected—and acceptable with respect to our Forest Plan—in the course of livestock management in the project area. However, such losses still provide for the continued recovery of both species, a view consistent with the biological opinions provided by the U.S. Fish and Wildlife Service during formal and informal consultation. We implement the conservation measures listed in our biological assessment, as well as the terms and conditions identified in the Service's biological opinions.

Project effects on Colorado River cutthroat trout are displayed in the Fisheries section, Chapter 3 of the 2016 DEIS. Numerous elements of Alternatives 3 and 4 have been designed specifically to reduce livestock grazing impacts to fisheries habitat, including utilization and focus area prescriptions, with particular emphasis on those streams with native cutthroat trout conservation populations. Conservation actions that are unrelated to livestock grazing are beyond the scope of this EIS. However, extensive Colorado River cutthroat trout conservation and enhancement efforts, prioritized at the Forest scale, have been completed on the BTNF in cooperation with WGFD over the past decade. Colorado River cutthroat trout conservation will remain a top priority for the fisheries program.

114) WWP 13

Ninety-two percent of the project area is within DFCs which prioritize wildlife and natural processes over private profit extraction but this is not reflected in the document. The proposed action clearly places livestock grazing over the needs of wildlife even to the extent of impacting *Endangered Species Act* listed species and Forest Service Sensitive Species. This does not comply with the Forest Plan.

Response: The consistency of each project alternative with the Forest-wide goals and objectives, and/or the management prescriptions, standards, and guidelines for the DFCs provided by the Forest Plan are evaluated in the 2016 DEIS in Table 43, including those that are federally listed and sensitive.

With regard to federally listed (*Endangered Species Act*) wildlife, the consistency of the alternatives with the purpose and need of the project; the extent that the alternatives address key issues; and the compliance of the alternatives with the prescriptive policies, standards, and guidelines at both the Forest-wide and DFC scales are addressed in detail in Appendix 2 of the wildlife specialist report for carnivores (grizzly bear, wolf, and Canada lynx) and amphibians (Murphy 2016). The grazing alternatives are consistent with the Forest Plan standards and guidelines, including those for the relevant DFC areas. The management emphasis statement for DFC 10 states "All surface-disturbing activities are designed to have no affect or beneficial effects on wildlife" (Forest Plan, page 235). Individual grizzly bears and wolves would continue to be removed in livestock-related control actions under all action alternatives. However, the management emphasis for DFC 10 also reads "…emphasis is to provide long-term and short-term habitat to meet the needs of wildlife managed in balance with timber harvest, grazing and minerals development. The grazing alternatives are consistent with the emphasis statement for DFC 10 because they provide for the long-term and short-term habitat needs of grizzly bears and wolves overall, and provide for the future recovery and delisting of the species' in spite of the livestock-related control actions. The analysis presented in the 2016 DEIS concerning the effects on grizzly bears and wolves clearly concludes that the predator removals and the collective Forest Service activities to conserve these species are consistent with the Forest Plan goal of contributing to the species' recovery and allowing for their future delisting. As per requirements of Section 7 in the *Endangered Species Act*, we manage National Forest activities to conserve federally listed species and their habitats. As part of these efforts, we have formally consulted with the U.S. Fish and Wildlife Service regarding the effects of permitting livestock grazing in the Upper Green River watershed, and received the Service's biological opinion that includes terms and conditions that we implement to minimize adverse effects on listed species. The Service has not opined that current livestock management in the Upper Green River jeopardizes the continued existence of any listed species or constitutes an adverse modification of their critical habitat.

The management emphasis statements for the other DFCs do not state that surface disturbing activities must have no affect or beneficial effects on wildlife. The management emphasis in DFC 12 is on providing "important habitat for big-game as winter ranges, feedgrounds, calving areas, and security areas" and states "Management provides for habitat capability and escape cover and maintained semi-primitive, non-motorized opportunities that emphasize big-game hunting activities" (Forest Plan, page 242). The management emphasis in DFC 6 is "to provide for the protection and perpetuation of natural biophysical conditions and a high degree of solitude for visitors, but with some perceptible evidence of past human use" (Forest Plan, page 192). The prescriptions, standards, and guidelines in the Forest Plan (Forest-wide and/or for specific DFCs) provide the definitive direction for land management on the Forest (Forest Plan, page 145).

115) EPA 19

The results of threatened, endangered and sensitive species consultation with USFWS including any project requirements should be discussed in detail in the FEIS.

Response: All necessary information regarding the most current and past consultations with the U.S. Fish and Wildlife Service, including the application of conservation measures and terms and conditions for grizzly bears, is disclosed in the 2010 DSEIS and the 2016 DEIS, and will be incorporated into the FEIS and final Record of Decision.

116) WWP 9

An objective for reduction in predator conflicts is ignored because it may inconvenience permittees.

Response: The 2016 DEIS does not ignore the impacts to grizzly bears and wolves as a result of the proposed alternatives. For example, Alternative 1: the No Grazing Alternative would eliminate predator-livestock conflicts after a short-term phase-out of cattle and horse grazing on the project area, an effect objectively disclosed in the 2016 DEIS.

With regard to the grazing alternatives, the Forest's conservation measures for grizzly bears provided in its 2014 Biological Assessment, and the terms and conditions provided in the corresponding 2014 Biological Opinion provided by the Fish and Wildlife Service (DEIS page 147–149), represent deliberate efforts to reduce grizzly bear-livestock conflicts. Although they were focused on helping grizzly bears, several elements also serve to reduce conflicts with wolves in the project area as well.

In addition, other measures to reduce grizzly bear-livestock conflicts were considered in a bear friendly alternative described in Chapter 2 of the 2016 DEIS. However, these measures were unfeasible for livestock permittees, or of uncertain effectiveness, in reducing conflicts in the project area. For these reasons, this alternative was eliminated from detailed study.

117) WWP 14

Indicators for Issue 1 state "condition of habitat for threatened and endangered species, management indicator species, ecological indicator species and sensitive species" but the document ignores the fact that grazing renders grizzly and wolf habitat unsuitable by its very nature.

Response:

Issue # 1 was changed in the 2016 DEIS to address the effects of grazing on wildlife more generally than just habitat: "Effects on Threatened, Endangered, and Sensitive Species (TES), as well as Other Species of Interest." We recognize that grazing and other anthropogenic factors that operate on Forest Service lands affect the survival of grizzly bears and wolves (see Schwartz et al. 2010, project record) and that these are important issues.

The 2016 DEIS does not ignore the adverse effects of the grazing alternatives on individual grizzly bears and wolves that will likely result from implementation of the grazing alternatives (see the sections for these species in Chapter 3). In the management indicator analyses for the grazing alternatives, we acknowledged that the presence of livestock on lands capable and suitable for livestock grazing renders habitat unsuitable for the individual grizzly bears that elect to prey on livestock. However, some bears do not prey on livestock (and even benefit from carcasses provided by depredating bears), and all bears benefit from the herbaceous food and mast crops that are available in their habitat.

The conservation measures and terms and conditions that resulted from formal Section 7 (*Endangered Species Act*) consultation with the U.S. Fish and Wildlife Service are measures we are

currently using to minimize removals and relocations of grizzly bears and wolves, recognizing that adverse effects on the predators will continue if a grazing alternative is selected. However, our analysis (Chapter 3 of the 2016 DEIS) supported that the predator losses are consistent with the recovery and federal delisting of these species, and are thus consistent with the goals and objectives for endangered species recovery and the management of indicator species in the Forest Plan (U.S. Forest Service 1990 p. 116–117; p. 149).

In conclusion, despite that habitat is unsuitable for individuals when bears and wolves prey on livestock, habitat is not rendered unsuitable at the broader scale of the project area because many favorable components of habitat are retained, and due to Forest Service efforts through the consultation process with the U.S. Fish and Wildlife Service to minimize losses of depredating grizzly bears.

118) WWP 15

The Forest Plan requires the Forest Service "prevent grizzly bears from gaining access to such attractants as food and garbage", but nearly all grizzly conflicts in the area are due to providing large numbers of "attractants" (cow/calves) to the bears. Grazing livestock on National Forests is a discretionary action and is not required. It is irrational to allow grazing of cow/calf pairs in this area and conflicts that occur are needless. The Forest Service could reduce predator conflicts dramatically by not permitting calves within the Upper Green area. This option was not discussed in the document and this violates NEPA, FLPMA and the *Endangered Species Act*.

Response: We acknowledge that large numbers of cattle on the project area may serve as food attractants for large predators, especially when calves are present (Anderson et al. 2002). However, not all grizzly bears that use the same habitats as cattle also prey on them (Anderson et al. 2002).

The deciding officer considered, but rejected, a requirement that permittees range only yearlings on the project area. Although depredating bears select calves, they also kill older age classes of livestock, including yearlings (Anderson et al. 2002). Thus, a change to yearlings may not appreciably reduce grizzly bear-livestock conflicts if the bears switch to this age-class of prey.

The deciding officer also concluded that it was not reasonable to require permittees re-tool their operations to range yearlings. A significant change in their operations would be required for a measure that posed new livestock control problems, with uncertain benefits. For example, being prone to flee erratically from predators, yearlings may run into and through fences when chased by wolves, injuring themselves and damaging fences. Movements of yearlings are also more difficult to control because they lack familiarity with the area and tend to range widely, even off the project area. These two problems do not characterize cow-calf pairs—they tend not to flee from wolves and do not wander widely on allotments. See the Bear-Friendly Alternative under “Alternatives Considered but Eliminated from Detailed Study” section in Chapter 2.

With regard to grazing as a discretionary activity on Forest Service lands, the justification for grazing, including relevant Acts, Forest Plan goals and objectives, and regulations, is discussed in the Purpose and Need for Action section, Chapter 1 of the 2016 DEIS.

119) WWP 18

In the wildlife section the document states "a biological assessment would be prepared for all threatened and endangered species and submitted to the USFWS" but this consultation process is critical to a valid NEPA analysis and needs to be completed prior to the release of the DSEIS and its information incorporated in the document in order for the analyses to be valid.

Response: As stated in several locations (grizzly bears, page 350; wolves, page 362; lynx, page 374) in the 2010 DEIS [see new text in the 2016 DEIS and the corresponding sections in the Wildlife Report], we have completed several formal or informal consultations with the U.S. Fish and Wildlife Service concerning the effects of livestock grazing on federally listed species in the project area and adjacent grazing allotments. Informal consultation regarding the effects of grazing on wolves, lynx, and lynx critical habitat were completed in 2011. The latest consultation for grizzly bears was completed in 2014. The Conservation Measures and terms and conditions that resulted from these consultations (grizzly bears) remain in effect until a new alternative is selected and a record of decision is prepared. At the time an alternative is selected, we will consult with the U.S. Fish and Wildlife Service if new effects on listed species are likely to occur, that is, any not previously identified. In this case, a new Biological Assessment will be prepared and consultation initiated with the Service. If the selected alternative has the same effects as those previously identified, we will simply provide this information to the Service in a letter, but not re-initiate consultation.

120) WWP 19

For the protection of grizzly bears in compliance with various Forest Plan requirements, proposed action and current management implements "existing food storage and livestock carcass removal measures would continue to be required and enforced to minimize grizzly bear/livestock and grizzly bears/human safety concerns". This food storage order has been in effect for quite some time yet the data provided in the document does not indicate that this order has been effective in reducing grizzly conflicts. It ignores the fact that grizzlies consider livestock as food and no actions have been implemented within the document that would reduce conflicts with this food source.

Response: In the 2016 DEIS, any statements that might suggest food storage regulations reduce livestock-grizzly bear conflicts have been removed. Thus, the 2016 DEIS does not imply that food storage regulations are effective in reducing livestock-grizzly bear conflicts. The Wildlife Specialist Report for federally listed carnivores (Murphy 2016; page 100) does oppositely state that by concentrating livestock, the grazing alternatives could indirectly contribute to property damage; surprise encounters with big game hunters, black bear hunters, fisherman, and campers; and recreational livestock losses that indirectly lead to bear injuries or mortalities through management removals in and near the project area.

We acknowledge that grizzly bears regard livestock as food sources. Our actions that are intended to minimize grizzly bear-livestock conflicts on the allotments are described as Conservations Measures and terms and conditions identified during formal consultation with the U.S. Fish and Wildlife Service (see 2016 DEIS pages 147–149 and our response above to WWP 9).

121) WWP 36

The fish, wildlife and threatened, endangered and sensitive species standards requires that "management activities… would be coordinated with and designed to help meet fish and wildlife habitat needs… Special emphasis will be placed in helping to meet the needs of threatened, endangered and sensitive species". The proposed action does not comply with this.

Response: The Fish; Wildlife; and Threatened, Endangered, and Sensitive Species Standard reads in its entirety “Range improvements, management activities, and trailing will be coordinated with and designed to help meet fish and wildlife habitat needs, especially on key habitat areas such as crucial winter range, seasonal calving areas, riparian areas, Greater Sage-grouse leks, and nesting sites.

Special emphasis will be placed on helping to meet the needs of threatened, endangered, and sensitive species." (USFS 1990, page 129)

The grazing alternatives variously include management activities, range improvements, Conservations Measures (Section 7 endangered species consultation) and beneficial terms and condition (consultation) to meet fish and wildlife habitat needs. The following are examples:

- Maintain fenced enclosure at Kendall Warm Springs to prevent livestock use of the endangered Kendall Warm Springs dace habitat.
- A livestock (fence) exclosure to protect riparian habitat at Tepee Creek
- Installation of culverts and hardened crossings to reduce erosion at high-use livestock sites and to protect riparian areas and species
- Improved herding and salt placement to reduce effects on riparian zones
- Minimum stubble height and limits on streambank alteration
- Minimize use of livestock in some critical areas such as the elk feedground
- A road decommission that reduces wildlife disturbance and improves habitat
- Implement Food Storage Order 04-00-104
- Removal of cattle carcasses within ½ mile of designated areas
- Grizzly bear studies to improve information on their populations, seasonal movements, and predation patterns in the project area

Compliance of the alternatives with the Fish, Wildlife, and Threatened, Endangered, and Sensitive Species standards was evaluated in the Wildlife Specialist Reports. For example, Alternative 2 did not meet the standard for lynx and amphibians.

122) WWP 37

The sensitive species management standard requires that "quantifiable objectives will be developed" this has not been accomplished.

Response: During 2013, we developed quantifiable objectives for sensitive species, as required in the Forest Plan (see memo from Forest Supervisor, September, 2013, project record). Substantial progress has been made toward completing the conservation assessments, habitat modeling, and other work identified in the objectives. The Forest is cooperating with the Wyoming Game and Fish Department and the Wyoming Natural Diversity Database staff to conduct Forest-wide population surveys for species such as amphibians, common loons, and goshawks.

123) WWP 62

The MIS section fails to comply with the extensive case law regarding management and analysis of MIS species. We request that they Forest Service read through this wide range of case law and correct its analysis in order to comply with NEPA and [*National Forest Management Act*] NFMA.

Response: The case law provided by the respondent, and other relevant laws were read and understood by the Forest Service. Management indicators are a means to evaluate trends in wildlife, fish, and plant populations and habitats for the purpose of resource production, population recovery, maintenance of population viability, or ecosystem diversity (references in 2016 DEIS). Population changes of MIS are believed to indicate the effects of management activities (2016 DEIS).

The management indicator species on the Bridger-Teton National Forest are identified in the 2016 DEIS, and the management indicators that would be affected by the alternatives, with rationale, are identified. Per guidance in the Forest Service Region 2 MIS Decision-maker checklist (attachment

provided by the respondent), the 2016 DEIS discloses the distribution, population trends, and the effects of the alternatives on the relevant management indicator wildlife, fish, and plant populations and/or habitats at the project and forest scales. Information that was incomplete and/or unavailable concerning the effects of the alternatives was identified. Each analysis discussed how the alternatives affected population trends of management indicators Forest-wide, including their viability, and how the alternatives affected the trend in condition of habitats the management indicator represents (Region 2 MIS decision-maker checklist).

124) WGFD 6

There is conflicting information regarding aspen in this document. Page 171, paragraph two, indicates that aspen is mostly early successional aspen. Page 182, paragraph one, indicates that most of the aspen is mature and in late stages of succession. Our experience indicates that the majority of aspen in the assessment area is not early succession and there is a mix of climax aspen and aspen being encroached upon by conifers. There are some locations where early succession aspen stands are present, but this does not dominate the landscape.

Response: Thank you for pointing out this error. Concerning the age class distribution of aspen, the 2016 DEIS was modified to state: "The majority of aspen in the assessment area is mid or late succession. Aspen stands in early stages of succession are present on some sites, but this age class is not dominant. Aspen grows in both pure stands as well as stands which are mixed with conifers in the project area."

125) WGFD 15

Page 45: 4th Bullet: Include Gypsum Creek as a monitoring site for boreal toads as past breeding sites have been located within this watershed. Columbia spotted frogs have also been located within the Gypsum Creek watershed.

Response: The Forest Service agrees with your comment. The 2016 DEIS was modified to indicate that Gypsum Creek was a monitoring site for boreal toads and Columbia spotted.

126) WGFD 17

Page 163: Columbia Spotted Frog — Refer to Figure 1 which indicates locations of Columbia spotted frogs found during 2002 surveys (WGFD). Final administrative report available upon request (Wright and Zafft 2003)

Response: This information was updated in the 2016 DEIS. However, the report was apparently published in 2004 (see project record, Wright and Zafft 2004).

127) WGFD 18

Page 165: Western Boreal Toad — Refer to Figure 1 which indicates locations of boreal toads found during 2002 surveys (WGFD). Final administrative report is available upon request (Wright and Zafft 2003).

Response: This information was updated in the 2016 DEIS. The report was apparently published in 2004 (see project record, Wright and Zafft 2004).

128) WGFD 12

Preventing the spread of Aquatic Invasive Species (AIS) is a priority to the Wyoming Game and Fish and the U.S. Forest Service. Although the spread of AIS may seem low with this project it still should

be addressed as a potential issue. It should also be noted that Didymo (*Didymospenia geminate*) a species of diatoms, is found in the Green River within the project area. This diatom can have severe impacts on the aquatic habitats, aquatic organisms, and recreational activities.

Response: We are unaware of any literature that suggests that livestock grazing is a significant factor in AIS spread, and there is little occurrence of AIS in the project area. Didymo blooms have been observed in the project area. There have been important findings regarding Didymo since this comment was posted. Didymo has been found to be a native species that becomes a nuisance species under specific water chemistry conditions. These blooms can affect the aquatic ecosystem, but it is not clear what the impacts of these blooms are to fisheries because they do not have massive die offs and associated low dissolved oxygen episodes that are common with other types of algae blooms. The Forest is interested in monitoring our streams for Didymo blooms and increasing our understanding of the reason we may be observing more blooms now than in the past.

129) WGFD 5

Utilization of woody species including willows and aspen by livestock directly competes with wildlife. Wintering moose and elk in particular utilize these species for forage through the winter months. The health and vigor of these communities can be greatly compromised with excessive browse levels. Greenline transects or Live-Dead Index monitoring can be used to measure utilization on these species. The *Sublette Moose Habitat Assessment: Upper Green River to LaBarge Creek Study Areas* (Smith and Younkin 2010) should be utilized to assess areas of significance to wintering wildlife such as the Green River corridor and Pinyon Ridge/Roaring Fork areas and the current habitat conditions of browse species in these locations.

Response: Smith and Younkin 2010 was reviewed and incorporated into the analysis of the effects of the alternatives on moose and elk. They reported 95 percent of willow in the upper green corridor as being intensively browsed, which may describe some degree of livestock grazing impact on moose habitat under current grazing conditions. The average relative densities of ungulate pellets in willow were 44 percent for moose, 22 percent for elk, and 34 percent for cattle, but it is not clear what proportion of willow grazing should be attributed to livestock. These proportions describe heavy use by moose, and less but significant use by elk and livestock. Based on Live-Dead Index monitoring and leader-length averages, they concluded that willow regeneration was below an arbitrary growth threshold of 50 cm, which signifies willow stems are not able to escape the browse zone, thus a downward trend of regeneration and a potential impact on moose and elk due to reduced winter foraging conditions.

130) WGFD 7

Building a fence around the Green River Lakes Feedground if use levels continue to exceed 5 percent utilization (pages 30, 34, 214, 247, etc.), is identified as an adaptive management element in the Preferred Alternative (Alternative 3). We do not support fencing this feedground due to frequent daily movements of elk during the winter, which could lead to increased potential for entanglement mortalities and high fence maintenance costs. Additionally, fencing the feedground could increase impacts to elk due to current wolf activity.

Response: The fence around the Upper Green River Elk Feedground was dropped from the grazing alternatives in the 2016 DEIS in response to Wyoming Game and Fish Department and Forest Service's concerns with difficult implementation and negative effects on wildlife. The Upper Green River Elk Feedground (Mud Lake East and Upper Gypsum Pastures) would be managed to minimize

livestock use of the area. No salting would be allowed and livestock would not intentionally be placed in this area. Any stray cattle would be actively herded away.

131) WGFD 8

We support allowable use levels on the Green River Lakes Feedground, similar to that identified for adjacent pastures. Increasing forage availability on the native winter range, located from Pinyon Ridge south to Osborn Mountain, would be more beneficial to the elk herd than greater protection of forage on the feedground itself.

Response: The proposed action limits key forage utilization on the Roaring Fork focus area to less than 50 percent, the same as the allowable use in adjacent pastures. Active herding off the focus site would occur, particularly during the spring when cattle begin using the area, if key forage utilization reached or exceeded 50 percent. Livestock grazing in the focus area would not be allowed when elk and any subsequent cattle-use approached the allowable limit. No salting would be allowed. Stray cattle would be actively herded away. Allowable use on the focus area would be 60 percent under Alternative 2.

The feedground site and its vicinity have been identified as a critical area because of high levels of forage use, primarily by elk, during the spring. The scope of the proposed action is limited to the authorization and evaluation of effects from livestock grazing, while the scope of the analysis of elk feeding operation and associated effects of elk grazing in this vicinity has been addressed in the 2008 Elk Feedground EIS. The Forest Service seeks to insure that the collective forage utilization by both livestock and elk provides for good range condition. Thus, the proposed action addresses the issues associated with livestock grazing in the area, and as well as cumulative effects of elk grazing by limiting the direct and indirect effects associated with livestock grazing.

The issue of increasing forage availability for wildlife within the Pinyon-Osborn Mountain area is currently being considered through a separate NEPA analysis. However, livestock grazing in this area is not impacting elk forage availability over this larger area due to low stocking rates and low utilization levels.

132) WGFD 9

Habitat protection, habitat management, and population management are vital components of the *Colorado River Cutthroat Trout Conservation Agreement and Strategy*. In order for the EIS to meet the commitments in the agreement and strategy, habitat should be managed to meet the goal and objectives. The proposed alternative will assist with meeting these goals, but it may still result in some loss of habitat and individuals. At this time, all Colorado River cutthroat trout populations are of value, and it is important that habitat is maintained at a high quality or enhanced.

Response: Colorado River cutthroat trout (CRCT) are on the Forest Service Region 4 list of sensitive species, and the conservation of CRCT populations and habitat are a high priority for the Forest. There are numerous CRCT conservation population streams in the project area. Any of the action alternatives will continue grazing in the project area and therefore will have some on-going impacts on CRCT populations and habitat. There are numerous elements in Alternatives 3 and 4 specifically designed to reduce grazing impacts on streams and riparian areas, including focus area prescriptions, minimum stubble height and bank alteration limits, and reduced utilization limits. These elements would maintain or improve riparian conditions across the project area including those streams that provide habitat for CRCT. However, CRCT populations would likely continue to decline in this project area

as a result of past non-native fish introductions. Although it is outside of the scope of this project, the Forest would strongly support efforts to secure native CRCT populations within this project area.

133) WWP 78

In the wildlife section, the Forest Service defines "secure habitat" for grizzly bears as being "areas free of motorized access". While this is true for grizzly bear management in the far northern Rockies where timber sales are the primary factor impacting grizzly bear habitat, in this location, obviously, the primary impact to grizzly bears is livestock grazing which provides large-scale food sources to grizzlies. The application of "areas free of motorized access" to equate with "secure habitat" is not correct in this location. Livestock grazing within occupied grizzly bear habitat renders that habitat unsuitable and insecure for grizzly bears.

Response: When we use the term secure habitat, we are not implying that there are no risks to grizzly bears associated with cattle grazing. In the DEIS, we properly used the term “secure habitat” as defined by the 2007 Conservation Strategy: areas greater than 500 meters from an open or gated motorized access route or reoccurring helicopter flight line, and more than 10 acres in size. To use secure habitat terminology to the risks of grizzly bear removals resulting from livestock depredation would be improper and confusing to readers.

We acknowledge that the presence of cattle in the project area may lead to the removal of grizzly bears. The adverse effect of cattle grazing on grizzly bears was clearly stated in the DEIS and identified during the several past formal, Section 7 consultations with the U.S. Fish and Wildlife Service.

134) WWP 79

While the documents briefly discusses white bark pine seeds as an important food source it fails to discuss the fact that white bark pine within and surrounding the project area has experienced nearly 100 percent mortality over the last 2 to 3 years from pine bark beetle infestations.

Response: As pointed out in the 2010 DEIS, the decline in whitebark pine in the project area is due to the mountain pine beetle epidemic, fire suppression, and climate change. Livestock grazing has no negative direct or indirect impact on whitebark pine. Whitebark pine grows in areas that cattle use as transition areas between meadows and cattle may take cover in mixed conifer forest (which can include whitebark pine) at night. However, whitebark pine is generally not used as a browse species by livestock. The disturbance from hoof-action is unlikely to damage individual plants and may create the disturbance required for seedling establishment. A detailed analysis of whitebark pine status in the project area and mortality caused by the mountain pine beetle and other non-livestock factors is outside the scope of this analysis.

135) WWP 80

The wildlife section discusses road density and bear mortality issues but fails to implement Forest Plan standards for road density within DFC 12 and 10.

Response: This project will not increase or decrease the total length of Forest system roads in the project area and, therefore, will not change road density. In Alternatives 2 and 3, an 875-foot, two-track spur off of Forest Road # 370691 would be ripped, seeded, and barricaded. This spur occurs within overlapping, 500-meter buffers of insecure habitat associated with two existing roads that would remain open to motorized use. Thus, removal of the spur would not increase secure grizzly bear habitat within the project area. Likewise, the spur’s removal would not affect open and total motorized route densities in the project area because these parameters are not calculated using user-created routes such

as this spur. The reduction in the number and mileage of user-created routes in the project area due to closure of the spur would be very minor because the spur is very short.

Because the alternatives would not affect road densities or the acreage of secure bear habitat, the compliance of project with road management standards for DFC 10 and 12 is beyond the scope of the EIS. However, the Forest's current transportation analysis analyzes the roads in this area. (Pinedale Ranger District Travel Management Decision Notice, 1996)

136) WWP 84

The document fails to provide a rationale as to how a 4-inch stubble height applied to only a few key areas within the allotments will protect the habitat needs for spotted frogs, boreal toads and other small riparian species.

Response: The DEIS uses two metrics to identify desired conditions for riparian habitats, used by amphibians: riparian function and post-grazing retention of herbaceous vegetation. These metrics were used to evaluate the extent that implementation of an alternative would achieve desired conditions in focal and non-focal areas. Although the DEIS includes stubble heights in the amphibian analysis under Alternatives 3 and 4, grazing forage utilization and the expected corresponding herbaceous retention were the primary means by which the alternatives were evaluated for providing amphibian habitat. Thus the application of a minimum 4-inch stubble height was not cited as a means to estimate herbaceous retention, but does contribute to protect amphibian habitats in terms of riparian function. Clary and Kinney (2000) states "Maintaining a minimum stubble height helps preserve forage plant vigor, retain sufficient forage to reduce cattle browsing of willows, stabilize sediments, and indirectly limit stream bank trampling…" Retaining an overall 4-inch stubble height along the greenline of riparian areas would maintain the riparian function in areas currently meeting the riparian function and stream bank stability objectives or adaptive management would be implemented under Alternatives 3 and 4. See the discussion for Riparian Areas in Chapter 3.

137) WWP 56

In the species calls sections, the Forest Service lists most species as "may adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or loss of species or viability range wide" but the document fails to provide any information regarding current populations or trends which is of course fundamental to a supportable call.

Response: The DEIS fully discloses the expected effects of the alternatives on all federally listed, sensitive, management indicator, and migratory bird species or their habitats known to occur in the project area, including effects on wildlife population trends. Information on the current distribution and population trend of species' in the project area, the local hunting unit on the Forest, and/or in the ecosystem is provided at the appropriate spatial scale.

Appendix C: Monitoring Plan

The objectives of this monitoring plan are to ensure that: 1) the selected alternative is implemented as described, 2) anticipated results are achieved, and 3) necessary adjustments are made to achieve desired results. (See FSH 1909.15 Chapter 50).

Implementation monitoring is the short-term monitoring used to determine if the management practices are implemented as detailed in the decision. Allotment administrators and permittee will make field observations and their findings will be documented in the individual permit files. These observations could include, for example, whether livestock were moved to other pastures or removed from an allotment before the maximum prescribed utilization parameters (pertaining to forage and browse utilization, stubble height, and stream bank alteration) are exceeded.

Effectiveness monitoring is used to identify whether the actual effects of implementing the selected alternative are consistent with the effects originally projected, and/or whether adjustments are needed to attain intended outcomes. The methods used to conduct effectiveness monitoring include establishing and monitoring long-term or permanent monitoring sites, such as MIM sites, riparian photo points, greenline and groundcover transects, as well as habitat monitoring for Greater Sage-grouse and other species of concern.

Range Vegetation Monitoring

Interagency Monitoring Technical References provide the range vegetation monitoring methodologies that will be used in this project. Technical references may be supplemented by regional handbooks (FSH 2209.13) or Wyoming Rangeland Monitoring Guide (as updated).

Utilization is measured on key species and is defined as the percentage of use by all herbivores, on current year's growth, by weight, at the end of the growing season. Use prescriptions expressed as stubble height apply to riparian areas. Stubble height is measured at the greenline on vegetative parts of key species, at the end of the growing season, and expressed as the median height of the plants. Where long-standing protocols are in place that express stubble height as average height, those protocols may continue to be employed if they are contributing to meet long-term objectives.

Vegetation utilization monitoring will take place primarily on key areas, however, should other areas be determined necessary to insure that long term desired conditions will be achieved they could also be monitored. At least one long term trend study will be established in each pasture. Additional effectiveness monitoring studies may be established on focus areas as determined necessary. If a key site does not continue to represent grazing use of the pasture for which it was chosen, a new key site may be selected. It is essential to note that this management strategy is not to be used as an alternative to meeting desired conditions. There must be credible evidence that this re-evaluation is a necessary step to deal with unanticipated results.

Long term trend studies will be re-read every 5-10 years, preferably during the rest cycle on pastures with regularly scheduled rest years. Long term trend transects may be read prior to the rest year if deemed necessary by the District Ranger. The long term trend studies for each allotment will be used to determine if the objectives are being met, however, administrative action may be taken for exceeding short term use standards, because those annual standards are designed to meet long term objectives. The objective is for ground cover, species composition, or other long-term trend parameter to be meeting or trending toward the respective desired condition. Emphasis will be placed on obtaining trend data for those areas that are not currently meeting desired conditions. Failure to meet long-term objectives should be demonstrated by a statistically significant measured change in ground cover or other long-term trend indicator. The parameter would show a declining change from desired condition, as specified in the Allotment Management Plan. The latest measured value must be outside of the threshold for properly functioning or desired condition. Values that vary less than 5 percent from minimum desired condition will not be considered a departure from desired condition due to variability of natural

distribution and specific sample location. The consequence of failing to meet long-term objectives will be either to implement the design features, adaptive management, or to require management changes that are determined by an inter-disciplinary team to be likely to result in improvement.

Failure to meet long-term objectives should be demonstrated by a statistically significant measured change in ground cover or other long-term trend indicator, a result that does not meet minimum desired condition and departs more than 5 percent from desired. The parameter will show a declining trend change from the desired condition specified in the design of the alternative. Statistical significance for changes in plant species composition are already defined in the Range Analysis Handbook (essentially a change must be detectable at 80 percent probability with one degree of freedom). While the desired condition will be defined according to ecological status, namely mid-seral or higher ecological status, those sideboards may be met by specifying in the Allotment Management Plan (AMP) the degree of change necessary in the frequency of key desirable species or species assemblages, on a certain key site within a pasture to meet the desired ecological status.

Livestock Grazing System Monitoring

Periodic examinations will take place to insure all livestock management, maintenance of range improvements, and herding practices are being followed as outlined in the Annual Operating Instructions.

Riparian Condition Monitoring

Stream bank alteration will be measured at least once in every two years at the following focus areas: Tosi, Fish Creek #1, and Fish Creek #2 (if added because bank instability). Stubble height monitoring described above in the range section also provides information pertinent to stream bank alternation. Key sites in each allotment will be monitored at least once every five years using multiple indicator monitoring protocol to evaluate bank stability and riparian vegetation condition.

Threatened, Endangered, and Sensitive Species Monitoring

Kendall Warm Spring Dace – Annually check the integrity of the exclosure fence.

Grizzly bear – Grizzly bear/livestock conflicts and grizzly bear relocations and removals will be documented and reported as described in the 2014 Biological Opinion for Livestock Grazing on the Northern Portions of the Pinedale Ranger District (USFWS 2014). If the grizzly bear is removed from the Endangered Species list, monitoring described in the revised Grizzly Bear Conservation Strategy will be followed in place of this direction.

Heritage Resource Monitoring

Proposed locations will be inspected, evaluated, and cleared by a heritage resource specialist prior to construction of range improvements. Existing heritage resource sites will be inspected at least once every five years to ensure grazing is not affecting their integrity.

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