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Draft
Environmental Impact Statement

Teton to Snake Fuels Management Project

Forest Service

Bridger-Teton National Forest

Jackson Ranger District

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Draft Environmental Impact Statement
Teton to Snake Fuels Management Project
Teton and Lincoln Counties, Wyoming

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The following abstract and summary, though lengthy, is intended to provide the reader a consolidated view of the purpose and need, the proposed actions, and the findings regarding potential social and resource impacts. Our intent is to provide an overview that can be used as a rapid assessment of the project to facilitate public understanding and review. For those seeking more information, additional project and analysis details can be found in the main body of the EIS as well as the project file, which includes the in depth specialist reports.

Abstract: This environmental impact statement evaluates and discloses the predicted environmental effects of the Teton to Snake Fuels Management project, which proposes mechanical thinning, prescribed fire, and snag removal in a wildland-urban interface just west of Jackson, Wyoming, on the Bridger-Teton National Forest. The project goals are to reduce the likelihood of high-intensity wildfire moving onto state and private lands adjacent to the national forest; manage future wildfires less intrusively, especially to promote wilderness character in the Palisades Wilderness Study Area; and to enhance public and firefighter safety in the defense zone near private land by removing selected hazardous snags. Activities under alternative 2, the proposed action, include mechanical thinning on 2,526 acres, prescribed fire on 19,991 acres, selected snag removal in 37 treatment units, and associated road work, landings, and fire control lines. Alternative 3 is similar but proposes to treat fewer acres and includes modifications to address project issues related to special areas and wildlife that have been identified by the interdisciplinary team and the public. **No permanent or temporary road construction or commercial timber harvest would occur within the wilderness study rea under any of the alternatives.**

Compliance with Forest Plan standards and guidelines and all applicable law, regulation, and policy, as well as development of site-specific project design features would protect all resources, including threatened, endangered, and sensitive species and critical habitat.

Chapter 3 of this document summarizes the environmental consequences of the three alternatives to a variety of natural resources, landscape conditions, and uses: special areas, wildlife, fire and fuels, air quality, fires regimes and ecosystem processes, vegetation, hydrology, soils, fisheries, botany, noxious weeds, cultural resources, recreation, and visual quality. Detailed data and information supporting the effects conclusions in chapter 3 are in the project record. The analysis indicates that while short-term adverse effects in some areas are likely during and immediately following project implementation, overall, the project would not cause significant adverse effects and the purpose and need would be accomplished while continuing to protector improve resources. See chapter 3 for full discussions of the environmental consequences of the three alternatives.

The Responsible Official, District Ranger Dale Deiter, has identified alternative 3 as the preferred alternative. Comments received on the DEIS will be used to further refine the preferred alternative and final decision.

Executive Summary

The Teton to Snake wildland-urban interface area is one of the highest fire risk areas on the Bridger-Teton National Forest. The existing forest fuel conditions and prevailing winds can create and push severe wildfire toward high-density residential areas located along almost 40 miles of the national forest boundary. The 2001 Green Knoll wildfire that burned about 4,700 acres in the area highlighted the threat, hazard to humans, resource damage, and cost incurred with these conditions. The aggressive suppression response and cost required to control the Green Knoll fire while protecting public and firefighter safety underscored for the Forest Service and the local wildland fire community that more proactive actions were needed to manage fuels and address the wildfire threat. Additionally, because a portion of the Palisades Wilderness Study Area occurs within this wildland-urban interface, the current need to aggressively suppress fires counters the wilderness study area management objective to maintain the wilderness character in the wilderness study area by stifling the role that wildfire plays in freely operating ecosystems. Finally, current fuel conditions and the potential for intense fire behavior pose an ongoing threat to public and firefighter safety, particularly with respect to standing snags in areas near private lands.

Project Area

The project area is located on the Bridger-Teton National Forest in Teton County, west of Jackson, Wyoming. The eastern edge of the project area is adjacent to or near private residential developments in the communities of Teton Village, Northern and Southern Fish Creek Homes, Heidelberg, Trail Creek, Town of Wilson, Heck of a Hill, Indian Paintbrush, Crescent H, Singing Trees/River Meadows, Taylor Creek, Highland Creek Hills, Red Top Meadows, Trails End, Fall Creek Ranch, and Hog Island. Additional parcels of private land as well as the Bonneville Power Administration powerline corridor are in the project area. The national forest land within the project area supports habitat and populations of threatened, endangered, and sensitive plants, wildlife, and fish; and a network of forest system roads and trails. Portions of the Palisades Wilderness Study Area, and Munger Mountain and Phillips Ridge inventoried roadless areas are within the project area. Much of the project area lies within the wildland-urban interface, which is defined partly as an area where human development intermingles with undeveloped wildland or vegetative fuels (Teton County 2014).

To aid in prioritizing treatment efforts, the Forest Service divided the wildland-urban interface lands into the defense zone and the threat zone. The defense zone is a one-quarter mile zone of national forest lands adjacent to private land (most occupied by residences or summer homes), and lands around the BPA powerline. The threat zone includes the remaining area within the wildland-urban interface boundary. The defense zone is where the most aggressive fire suppression efforts often occur.

Chapter 1 – Purpose and Need and Proposed Action

Chapter 1 of the DEIS describes the need for action that initiated this project. Fuel conditions vary widely throughout the project area. Field surveys and modelling indicate that 42 percent of the defense zone and 44 percent of the threat zone have potential fire behavior characteristics that would require aggressive suppression methods rather than less-intrusive ground crews and hand tools, particularly in areas close to homes and critical infrastructure. In the defense zone, many of the areas proposed for treatment are densely stocked and have developed ladder fuels as well as increased concentrations of surface fuels due to insect and disease mortality and natural forest succession. With concentrations of fuels, individual trees or groups of trees may torch and fire could continue through the tree crowns aided by high winds. Ignition in many of these areas could produce extreme fire behavior and threaten private land and other valued resources. In addition, concentrations of fuels may hinder the ability of firefighters to construct fireline and control fires.

The Forest Service identified the following need for action in the project area:

The Forest Service is bound by law and policy to be a good neighbor. The National Fire Plan, the National Cohesive Wildland Fire Management Strategy, and the Healthy Forests Restoration Act commit the Forest Service to protecting human communities from wildfires originating on public lands by implementing hazardous fuel reduction projects on federal lands within the wildland-urban interface.

Firefighter safety cannot be compromised. Falling snags and hazard trees are currently the second leading cause of fatalities and serious injury during wildland firefighting operations, and high-intensity fire behavior (flame lengths above four feet and active crown fire) is dangerous and difficult to fight.

The rising cost of suppression and resource impacts associated with suppression activities is unacceptable. The aggressive fire suppression response required in the wildland-urban interface under the existing conditions is costly, dangerous, and damaging to natural resources. Suppression under high fire behavior requires heavy equipment and aircraft, with little opportunity for less intrusive methods using ground crews and hand tools. Often there are direct impacts to soil, water, wildlife, and other natural resources which require intensive and costly rehabilitation efforts later.

Continuing to suppress all fires within the Palisades Wilderness Study Area does not meet the obligation to maintain wilderness character. Fires are routinely suppressed in the wilderness study area at this time because the existing fuels conditions create an unacceptably high risk of fire burning onto adjacent private land. The wilderness character of the wilderness study area, including natural and untrammeled qualities, is harmed because fire cannot be left to operate freely as a natural ecosystem function.

Proposed Action, Issues, and Alternatives

To address the need for action described above, the Forest Service proposes to reduce potential fire behavior and enhance public and firefighter safety using mechanical thinning (commercial and noncommercial) and prescribed fire methods in selected areas in the wildland-urban interface. These actions would include the road work, landings, and fire control lines needed to conduct the proposed thinning and prescribed fire treatments. A detailed description of the proposed action was provided to the public for review and comment to help the Forest Service identify potential unintended consequences of the proposed action (issues), alternative actions that would address the need for action, and any new information not previously considered by the Forest Service.

Public feedback during two comment periods included support for managing fuels and reducing the threat, resource harm, and costs associated with high-intensity fire and aggressive suppression in the project area. Respondents also expressed concerns that the proposed treatments constitute human manipulation in the wilderness study area and inventoried roadless areas which could adversely affect wilderness character(istics), natural resources, and eligibility for future designation in the National Wilderness Preservation System. The requested modifications include reduced levels or elimination of all treatment in the wilderness study area and inventoried roadless areas. In addition, some commenters noted that the proposed activities could have adverse effects to wildlife habitat. The Forest Service identified these concerns as issues to be addressed in the analysis, and developed an alternative to the proposed action, alternative 3, which would reduce potential impacts to special areas and wildlife habitat. Changes to the proposed action to address these issues include dropping, reconfiguring, and reducing the size of units, and changing treatment prescriptions. Units were also modified or dropped if they also had potential impacts to visual quality, implementation difficulty, or to take advantage of topography that could slow an advancing wildfire. Also considered was the proximity to homes and to other fuel reduction projects that could contribute to reducing fire behavior across the project area.

Based on the need for action in the project area and public input, three alternatives were studied in detail and their environmental consequences documented in this environmental impact statement:

- Alternative 1 (No Action) describes the existing conditions and how conditions are predicted to change over time if no action to address the purpose and need for the project is taken.
- Alternative 2 (Proposed Action) was developed to address the need for action as described above.
- Alternative 3 (Reduce Potential Impacts to Special Areas and Wildlife Habitat) was developed to address the public issues of potential effects to the Palisades Wilderness Study Area, and the Phillips Ridge and Munger Mountain inventoried roadless areas, and to wildlife species and habitat. This alternative reduces the extent of the proposed activities to eliminate the potential for significant effects to these resources.

The extent of the proposed activities for each alternative is displayed in table 1.

Table 1. Proposed activities by alternative

Proposed Activities	Alternative 1	Alternative 2	Alternative 3	Change from Alternative 2 to 3
Thinning (acres)	0	2,526	1,757	-769
Prescribed fire (acres)	0	19,991	12,524	-7,467
Reduced snag density in defense zone (# units)	0	37	27	-10
Road maintenance and reconstruction (miles)	0	15.69	13.53	-2.16
Temporary road construction and obliteration (miles)	0	1.07	1.07	0
Fire control line construction (miles)	0	11.1	6.8	-4.3
Landings (#)	0	32	27	-5

Thinning would favor large tree retention using the general priority order of whitebark and limber pine, aspen, Douglas-fir, lodgepole pine, Engelmann spruce, and subalpine fir. Thinning would be commercial and noncommercial and would leave 70 to 200 trees per acre in the noncommercial units, and 60 to 140 trees per acre in the commercial units. All conifers in and around aspen clones would be thinned to release suppressed aspen. Ladder fuels would be pruned in some units. Activity fuels (logging slash) would be hand- or machine-piled and burned in the units or on the landings, or scattered to further reduce fuel concentrations in the project area. A small amount of broadcast burning may occur in thinned areas to further meet the project objectives. Selected snags (those posing a direct threat to firefighters) would be removed in a 200-foot corridor in units close to residential areas (defense zone). Some road work is needed to remove wood products in commercial thin units. Maintenance and reconstruction would occur on forest system roads as needed to accommodate equipment; temporary roads would be built to minimum standards necessary for equipment; and landings would be constructed up to three-quarter acre in size. Temporary roads, landings, and skid trails would be obliterated after use, which includes ripping, re-contouring, and seeding exposed mineral soil to reduce compaction; placing slash and other large woody debris on the surface to reduce soil erosion; constructing waterbars to reduce erosion; and effectively closing them to off-highway vehicle use. **No permanent or temporary road construction or commercial timber harvest would occur within the wilderness study area under any of the alternatives**. Prescribed fire would reduce potential fire behavior while creating a mosaic of burned and unburned areas to promote diversity of vegetative composition and structure. Ignition would be by ground

or air and would adhere to site-specific burn plans that identify parameters for weather, air quality, contingency resources, other resource concerns, equipment needs, and responses for potential escapes. Fire control lines would be built using minimum impact techniques as needed to contain prescribed fire and rehabilitated appropriately following their use.

alternatives 2 and 3 include comprehensive project design features developed to avoid or reduce impacts to natural resources. Design features address resource protection related to cultural resources, fire regimes and ecosystem processes, fire prevention, fuels management, hydrology, noxious weeds, range, recreation, roads and skid trails, visual quality, sensitive plants, silviculture, smoke management, soils, special areas, fish, and wildlife.

Chapter 3 -- Regulatory Framework and Environmental Consequences

Chapter 3 describes the analytical framework used by each resource to determine the potential environmental consequences of the three alternatives studied in detail. The project was designed and analyzed in accordance with many laws, regulations, and policies, including the National Forest Management Act, National Environmental Policy Act, Endangered Species Act, Clean Water Act, Bridger-Teton National Forest Land and Resource Management Plan, Northern Rockies Lynx Management Direction, National Fire Plan, National Cohesive Wildland Fire Management Strategy, Wyoming Wilderness Act, Wilderness Act, Roadless Area Conservation Rule, and others. Compliance with resource-specific management direction, including Forest Plan standards and guidelines, is discussed in the individual resource reports in the project record. Overall, the analysis shows that the alternatives comply with Forest Plan direction and law, regulation, policy, and plans for each resource with the following exceptions:

1. Alternative 1 is inconsistent with National Fire Plan or Forest Plan goals and objectives for fire and wilderness study area management because continued fire suppression at current levels adversely affect wilderness character and eliminates fire's role in a freely operating ecosystem. Alternative 1 is also inconsistent with National Fire Plan goals to reduce fire threat within the wildland-urban interface, and Forest Service policy to prevent wildfires from crossing onto other jurisdictions.
2. Alternative 1 does not meet Forest Plan goals for aspen perpetuation or sensitive plant species management (whitebark pine).
3. Implementing the magnitude of mechanical treatments under alternative 2 may not meet the Wyoming Wilderness Act's direction to maintain "presently existing wilderness character" within the wilderness study area in the short-term.

Chapter 3 summarizes the predicted direct, indirect, and cumulative environmental effects, by alternative, related to the following resources: special areas, wildlife, fire and fuels, air quality, fire regimes and ecosystem processes, vegetation, hydrology, soils, fisheries, botany, noxious weeds, cultural resources, recreation, and visual quality.

Effects conclusions assume the implementation of the proposed actions and project design features as described and incorporated into each action alternative. Overall, the resource analyses indicate that the proposed activities may benefit some resources while creating some degree of short-term adverse effect on others, as follows:

<u>Alternative 1</u>: Taking no action to manage fuels in the project area may result in large and severe wildfires, aggressive suppression methods, and subsequent adverse effects to most resources.

Alternatives 2 and 3: Several resource areas may experience unavoidable short-term adverse effects, primarily during and just after project operations:

- Wilderness character -- There would be an unavoidable short-term adverse effect on some aspects of wilderness character during the fuel treatment operations but wilderness character would improve in the long term due to less fire suppression and the increased ability to use light-hand tactics when fires must be suppressed.
- Naturalness – There would be some adverse effect on apparent naturalness in the Phillips Ridge inventoried roadless area in the short term (3 percent or less affected in each alternative).
- Lynx and lynx habitat -- Implementing alternative 2 or 3 would have adverse effects to lynx and lynx habitat. This determination is analogous to “likely to adversely affect” in Section 7 consultation (Endangered Species Act) with the U.S. Fish and Wildlife Service, and is appropriate in situations where multi-storied stands and snowshoe hare horizontal cover are affected (standard VEG-S6). However, the affected area is in a wildland-urban interface and below the allowable exception of 6 percent of mapped lynx habitat on the planning unit.
- Water quality – There would be short-term potential sediment input in localized areas during road work.
- Recreation – There would be short-term adverse effects to trail access due to temporary closures during prescribed fire operations.
- Sensitive plants –Some individual plants may be lost during project operations but these effects are not likely to result in a loss of viability or cause a trend toward federal listing or a loss of species viability range-wide.
- Wildlife – Individuals may be disturbed or killed during project operations and habitat modified to some degree, but no negative effects on species viability are predicted.
- Fire Regimes and Ecosystem Processes – Prescribed fire could damage or kill plants, insects, and other animals. These unavoidable adverse effects are part of an ecosystem process that ultimately leads to renewal.

Table 2 and table 3 summarize the environmental consequences, by alternative, related to the issues identified for this project – potential effects to special areas and wildlife. Alternative 3 reduces impacts to the wilderness study area and the inventoried roadless areas by reducing the amount of acres treated, reconfiguring boundaries, and modifying prescriptions in some units to reduce potential impacts.

Table 2. Comparison of alternatives in addressing issue 1, effects to special areas

Indicator	Alternative 1	Alternative 2	Alternative 3
wilderness study area			
Acres of mechanical fuel treatment including new acres compared to 2003 treatment	0	825 acres (approximately 721 new treatment acres and 104 re-treatment acres)	391 acres (approximately 294 new treatment acres and 97 re-treatment acres)
Acres of prescribing burning including miles of fireline	0	12,042 acres (3.0 miles of fire line)	7,910 acres (1.6 miles of fire line)
Effect on potential for inclusion in National Wilderness Preservation System	Little effect	Little effect	Little effect
Effect on “presently existing wilderness character”	No effect in short-term; increasing decline in untrammeled and natural quality over long-term; 100 percent suppression but no active vegetation alternation	Short-term decline but long-term improvement in aspects of wilderness character; 50 percent suppression but more acres altered by cutting than baseline condition in 1984	Short-term decline but long-term improvement in aspects of wilderness character; 60 percent suppression but less acres altered by cutting than baseline condition in 1984
inventoried roadless areas			
Acres of mechanical fuel treatment	0	291 acres (all in Phillips inventoried roadless area)	273 acres (all in Phillips inventoried roadless area)
Acres of prescribing burning including miles of fireline	0	6,857 acres (in both inventoried roadless areas; 5.3 miles of fireline)	4,106 acres (in both inventoried roadless areas; 4.0 miles of fireline)
Miles of road work	0	1.5 miles (Phillips inventoried roadless area) (All maintenance)	0.4 miles (Phillips inventoried roadless area) (All maintenance)
Amount of commercial timber cut	0 MBF	0.2 MBF	0 MBF

Indicator	Alternative 1	Alternative 2	Alternative 3
Effect on wilderness attributes	No effect in near term, increasing effect on natural integrity in long term.	Beneficial effect on natural integrity in Munger Mountain inventoried roadless area: some adverse effect on apparent naturalness in Phillips Ridge inventoried roadless area in the short term (3 percent of area)	Beneficial effect on natural integrity in Munger Mountain inventoried roadless area; some adverse effect on apparent naturalness in Phillips Ridge inventoried roadless area in the short-term (2.7 percent of the area but no use of ground-based machinery)

Table 3. Comparison of alternatives in addressing issue 2, effects to wildlife (MIIH (determination): project may impact individuals or habitat, but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species on the forest.)

Species	Primary Habitat Need and Limiting Factor	Alternative 1	Alternative 2	Alternative 3	Comments
Canada lynx	Lynx analysis unit condition	No short-term effect on lynx habitat; long-term detrimental effect of fire suppression	Detrimental in the short-term to snowshoe hares, but compliant with Northern Rockies Lynx Management Direction based on wildland-urban interface.	The direct effects of alternative 3 on lynx would be less project-related disturbance (truck and helicopter traffic) and mortality risk (vehicle-strike) because fewer acres are proposed for both prescribed fire and mechanical treatment.	Mechanical treatments are more detrimental to hares and lynx than prescribed fires. Both action alternatives are compliant with Northern Rockies Lynx Management Direction based on wildland-urban interface.
Gray wolf	Available prey	No short-term changes in available prey; long-term detrimental effect of fire suppression.	Same for alternatives 2 and 3. Improved availability of prey for wolves.		
Grizzly bear	Large unroaded landscapes with a variety of foraging habitats	No potential disturbances of individual bears. No foraging habitat improvement.	Same for alternatives 2 and 3. Foraging habitat improvement. The mechanical and prescribed fire treatments would produce favorable early seral habitat conditions within the historic range experienced by the species. Project is consistent with the recovery and delisting of grizzly bears in the Yellowstone Ecosystem and the Forest Plan objective of supporting the recovery of listed species.		
Yellow-billed cuckoo	Large cottonwood galleries with tall willows	No effect	Same for alternatives 2 and 3. Suitable habitat consists of large cottonwood galleries with tall willows. None of these habitats would be modified. Cuckoos are not known or expected to be present within treatment areas.		

Species	Primary Habitat Need and Limiting Factor	Alternative 1	Alternative 2	Alternative 3	Comments
Bald eagle	Nesting along large lakes and rivers	No short-term effect; detrimental long-term effect on bald eagle hunting and scavenging through fire suppression.	No short-term effect; detrimental long-term effect on bald eagle hunting and scavenging through fire suppression.		
Three –toed woodpecker	Decadent timber	No short-term effect; mixed positive and negative effects of long-term fire suppression.	No short-term effect; mixed positive and negative effects of long-term fire suppression.	Preferred for woodpecker. Treats 27 percent fewer safety corridors in defense zone units for snag removal (36 percent fewer acres) compared to alternative 2.	The small losses of snags that may occur through mechanical treatments are expected to be offset by retention of existing large snags, new foraging and nesting habitat created by prescribed fire, and new habitat that is being created across the landscape by the current mountain pine beetle epidemic.
Northern goshawk	Nesting habitat in dense mid-size timber with minimal understory	No short-term effect; contributed to long-term risk of high-intensity fires that reduce nesting habitat.	2,806 acres negatively affected by prescribed burn and mechanical treatments. Determination: MIIH	Preferred for goshawk. 272 acres negatively affected by modified through prescribed burn and mechanical treatments. Determination: MIIH	In alternative 3, boundaries of some prescribed fire and mechanical treatments were redrawn and some units dropped completely to avoid treatments (66 percent fewer than alternative 2) in forested areas of goshawk nesting habitat.
Boreal owl	Dense spruce-fir and nesting cavities in forested areas.	No short-term effect; contributes to long-term risk of high-intensity fires that reduce nesting habitat.	385 acres of mature subalpine forests affected (more important habitat to boreal owls). 2,516 total acres of subalpine forest affected.	Preferred for boreal owls. 97 acres of mature subalpine forests affected (more important habitat to boreal owls), 77 percent reduction from alternative 2 1,730 total acres of treated subalpine forest; a 31 percent reduction from alternative 2. Determination: MIIH.	Both action alternatives may impact individuals, but no trend toward loss of viability.

Species	Primary Habitat Need and Limiting Factor	Alternative 1	Alternative 2	Alternative 3	Comments
Great gray owl	Mature forest with moderate to lower stand densities and adjacent to large meadows.	No short-term effect; mixed positive and negative effects of long-term fire suppression.	Slightly preferred for great gray owls. Treats and improves 6,800 acres in lodgepole pine habitat preferred by great gray owls.	Treats and improves 3,600 acres in lodgepole pine habitat preferred by great gray owls. Determination: MIIH	Both alternatives result in small to moderate improvements of great gray owl habitat by improving foraging opportunities through a reduction in stand density within forested habitat. Design features (WL-6, WL-7) would be implemented to protect the great gray owl and its habitat.
Flammulated owl	Open pine forests with cavities.	No short-term effect Long-term habitat loss through succession and/or high intensity fire.	Slightly preferred for flammulated owls. Treats and improves 13,389 acres of forested habitat. This is 71 percent more than alternative 3; however, the degree to which the species would benefit is undetermined. Determination: MIIH.	Treats and improves 7,823 acres of forested habitat.	Both alternatives result in small to moderate improvements of flammulated owl habitat by improving foraging opportunities through a reduction in stand density within forested habitat.
Columbia spotted frog; boreal toad	Streams and ponds where present.	No short-term effect; mixed positive and negative effects of long-term fire suppression.	Minimal negative effects of alternatives 2 and 3. The project is designed to include no-treatment buffers within 100 to 300 feet of wetlands, streams, and riparian areas which is the habitat most occupied by amphibians and most important to reproduction. Known breeding areas are avoided. Determination for both alternatives: MIIH.		
Wolverine	High alpine talus slopes and tundra.	No short-term effect; negative long-term effect of fire suppression on prey and carrion.	Minimal negative effects of alternatives 2 and 3. The project poses no risk of mortality to individuals, nor do they pose a risk of modifying occupancy or use within a home range. Determination both alternatives: MIIH.		

Species	Primary Habitat Need and Limiting Factor	Alternative 1	Alternative 2	Alternative 3	Comments
Brewer's sparrow	Sagebrush shrublands	No short-term effect; long term decline in habitat through encroachment and successional changes.	Minimal negative effects of alternatives 2 and 3. Slight improvements in potential habitat where low- to moderate-severity prescribed fire would enhance age class diversity of sagebrush communities by removing encroaching tree species and some late/old seral and decadent sagebrush. A design feature would reduce the extent of sagebrush burning in large stands. Potential Brewer's sparrow habitat is of sufficient quality and abundance across the project area and forest to allow the species to continue to be well distributed across the planning unit (Bridger-Teton National Forest).		
Elk	Grass/shrub winter ranges and forests	Maintains stable populations within Wyoming Game and Fish Department objectives over the short-term; long-term decline in foraging conditions.	Maintains stable populations within Wyoming Game and Fish Department objectives.	Maintains stable populations within Wyoming Game and Fish Department objectives. Slightly preferred over alternative 2 because of fewer roads being used (2.44 miles fewer).	Action alternatives have offsetting effects related to improved forage verses loss of cover for hiding and thermal protection.
Mule deer	Winter range shrublands	Maintains stable population below Wyoming Game and Fish Department objectives; long-term decline in foraging conditions.	Contributes positively toward achieving Wyoming Game and Fish Department objectives.	Contributes positively toward achieving Wyoming Game and Fish Department objectives. Slightly preferred over alternative 2 because of fewer roads being used (2.44 fewer miles).	Action alternatives have offsetting effects related to improved forage verses loss of cover for hiding and thermal protection. Herd population of 23,000 animals is primarily influenced by winter range conditions and disturbances caused by human and industry development that is off the project area.
Bighorn sheep	Winter range open areas and nutritious spring forage.	Winter range habitat would continue a steady decline related fire suppression and loss of forage. Population is at herd objective.	Minimal negative effects of alternatives 2 and 3. Treatments would not contribute measurable changes in the sheep population but could improve forage availability and nutrition in summer ranges. Few sheep presently use the project area which is at the very southern edge of their summer seasonal range. Sensitive species determination: MIIH.		

Species	Primary Habitat Need and Limiting Factor	Alternative 1	Alternative 2	Alternative 3	Comments
Moose	Willow bottoms with adjacent forest	No short-term effect; mixed positive and negative effects of long-term fire suppression. Moose populations are expected to remain stable and near herd objectives.	Maintains stable population near Wyoming Game and Fish Department objectives.	Maintains stable populations within Wyoming Game and Fish Department objectives. Slightly preferred over alternative 2 because of fewer roads being used (2.44 miles fewer).	Across the hunt area and herd unit, moose habitat is of sufficient quality and abundance to allow the species to continue to be well-distributed across federal lands. Moose populations in the Sublette herd have been stable and slightly improving since 2004 and are near objectives.
American marten	Dense spruce-fir forest with understory cover and subnivean spaces.	Perpetuates existing conifer habitats used by marten. Potential for long-term decline based on probability of high intensity wildfire.	Alternatives 2 and 3 would retain a substantial amount of the most important habitat (old growth spruce-fir) as untreated, in compliance with Forest Plan standards. The prescribed fire treatments will create a mosaic of burns characterized by light and moderate-intensity fires, and unburned sites that will retain, at a broad scale, multistory forest structure, woody debris, snags, and other components that are favorable for pine marten. Mechanical treatments would negatively affect forest structure (woody debris and cover) on 385 acres of mature subalpine forests in alternative 2 and 87 acres in alternative 3. The negative effects of the alternatives would not affect population trend on the project area or the planning unit.		
Boreal chorus frog	Streams and ponds where present.	No short-term effect; mixed positive and negative effects of long-term fire suppression.	Minimal negative effects of alternatives 2 and 3. The project is designed to include no-treatment buffers within 100 to 300 feet of wetlands, streams, and riparian areas which is the habitat most occupied by amphibians and most important to reproduction. Known breeding areas are avoided. Determination both action alternatives: MIIH.		
Migratory birds	Habitat acres treated	0	22,162 acres treated with mixed positive and negative effects to species.	14,281 acres treated; mixed positive and negative effects to species are reduced by 36 percent.	
Old growth	Old growth converted to non-old-growth status (acres) and percent of total old growth in the project area	0	962 total acres (about 5 percent of old growth in the project area). Negative effect of mechanical treatments on old-growth characteristics (87 acres).	627 total acres (about 5 percent of old growth in the project area). Negative effect of mechanical treatment old-growth characteristics (71 acres).	This assumes stand replacement prescribed fire (unlikely) on all acres.

Species	Primary Habitat Need and Limiting Factor	Alternative 1	Alternative 2	Alternative 3	Comments
Snag Habitat		No short-term effect.	Same for alternatives 2 and 3. Snags available in the defense zone and mechanical treatment areas would be reduced. Number of remaining snags would be adequate to support wildlife occupancy and movements, and new snags would be created by prescribed fire treatments and ongoing natural processes.		

It is important to determine the degree to which the alternatives meet the site-specific purpose and need that initiated this project. Meeting the purpose and need for this project is measured by the effects to modelled fire behavior, removal of hazardous snags, and acres of aspen enhancement resulting from the alternatives. To be successful, fire behavior must be reduced to allow for future wildland fires to be managed with the least intrusive methods possible and to allow fire to contribute to freely operating ecosystem processes within the wilderness study area whenever possible. Hazardous snags must be removed to allow firefighters to work safely within the defense zone as needed. Promoting healthy aspen communities to slow the spread of fire contributes to meeting the purpose and need to reduce potential impacts related to wildfire.

As displayed in table 4, alternatives 2 and 3 would result in successfully meeting the purpose and need for this project. Alternative 2 would have better outcomes due to the greater area treated to meet the need for action. Alternative 3 provides some beneficial reduction in fire behavior and increased safety while reducing potential adverse effects to special areas and wildlife as noted in table 2 and table 3 above.

Table 4. Comparison of alternatives in meeting the purpose and need

Indicator		Alternative 1		Alternative 2		Alternative 3	
		Threat Zone	Defense Zone	Threat Zone	Defense Zone	Threat Zone	Defense Zone
Modeled fire behavior	Decrease in the potential for active crown fire	0 percent	0 percent	25 percent	65 percent	12 percent	41 percent
	Decrease in the potential for flame lengths greater than 4 feet	0 percent	0 percent	30 percent	35 percent	22 percent	20 percent
Area of reduced snag density for firefighter safety in defense zone (# units)		0		37		27	
Aspen perpetuation		*Climax aspen within shrublands, grasslands, and conifer/herbland ecotones:* little short-term change, long-term shift toward multi-story aspen clones *Seral aspen:* Short-term benefits in places from recent bark beetle mortality; general long-term decline in health and presence as conifers outcompete aspen		Minimum acres treated = 3,553. Short-term increase in aspen suckering, clone vigor and size; long-term increase in aspen clone size, health, age-class diversity, and presence on the landscape; greatest changes in units with both commercial and noncommercial treatments, less in noncommercial only units, variable but positive results in prescribed burn units		Minimum acres treated = 2,211. Same effects as alternative 2, but less acreage treated	

Effects to Resources

Resource effects of the alternatives were evaluated using current accepted methodologies and best available science to ensure scientific accuracy. Project design feature are specifically developed to reduce or eliminate potential adverse effects, and are integral to the conclusions reached by each resource specialist.

Table 2 and table 3 above summarize the effects to special areas and wildlife. Major conclusions associated with the effects of the action alternatives to additional resources as summarized in Chapter 3 are:

Air Quality: Effects to air quality are measured by the predicted smoke emissions (PM-2.5) on sensitive receptors up to 30 miles downwind of the project area in comparison to appropriate Federal and state regulatory standards and requirements. While the proposed prescribed fire would have direct, short-term impacts on air quality in the project area, and possible short-term impacts to regional air quality, modeling results show there would be no significant impacts to any class 1 area, and the impacts to populations 10 miles downwind from the project area would be estimated at a 0.88 $\mu g/m^3$ of PM-2.5, well below the Federal PM-2.5 standard of 35 $\mu g/m^3$.

Fire Regimes and Ecosystem Processes: Effects to fire regimes are measured by changes to successional class compositions. Prescribed fire treatments would resemble the spatial variability and disturbance effects found in the pre-settlement fire regime, and thinning treatments would roughly approximate the fire effects of low-severity burns. Long-term balance of succession classes would be maintained through increased management of lightning-ignited fires and further fire disturbance in the project area. Successional class compositions that would be most affected are:

- Aspen--Early-seral aspen would be over-represented for about 15 years, and late-seral aspen would be reduced somewhat but still over-represented.
- Douglas-fir mix—Pole-sized stands would be somewhat over-represented. Mature open strands would continue to be under-represented.
- Sagebrush -- Early-seral sagebrush would be over-represented for approximately 10 years and late-seral would continue to be over-represented. Mid-successional stages would be under-represented until recently burned areas reach that stage. Management of lightning-caused fires would introduce early-seral communities to balance sagebrush class B succession to class C.
- Mountain shrubland -- Early-seral stage would be somewhat over-represented for 10 years.

Vegetation: Effects to vegetation are measured by changes to tree species composition, stand structures, and aspen clone regeneration, vigor, and size. Thinning would open up the canopy of sub-alpine fir stands and promote shade-intolerant species such as whitebark pine, lodgepole pine, limber pine, Douglas-fir, and aspen, resulting in long-term change to this more diverse species mix. Structural diversity would improve over time as single-story stands shift toward multi-story structures. Prescribed fire would produce a mosaic of single-story, multi-story, and non-forested openings in the short term. Over time, tree regeneration in the openings would add a patchy new age class to the stand structures. Overall, aspen would show increased clone size, health, age-class diversity, and presence on the landscape. Outcomes would be best in units that include commercial thinning, and variable but positive in prescribed burn units.

Hydrology: Effects to water quality are measured by the extent of ground-disturbing activities and the proximity of proposed activities to streams, using modelling to determine the potential for erosion and sediment delivery. Modelled erosion, sediment rates, and effects to turbidity and stream temperature

would be minimal and lowered further with the application of project design features and best management practices during implementation. Short-term effects (less than one year) would occur in streams near road work and use. No measurable effects would occur to stream channel conditions, wetlands and springs, riparian areas, and floodplains. Watershed condition classes would be maintained or improved by reduced fire behavior and drainage improvements to existing roads. No measurable change in water quantity would occur from reducing forest canopy.

Soils: Effects to soils are measured by the potential for new detrimental soil disturbance resulting from the proposed activities, most notably from creating new skid trails, machine piling slash, and prescribed fire. The greatest increase in detrimental disturbance would occur where there is no network of existing skid trails to re-use in this project. Soil productivity lost through compaction, rutting, erosion, decreased litter and coarse woody debris, and noxious weed spread is a concern where soils are disturbed. The project, including project design features and best management practices implemented to protect soils, complies with Forest Service standards to maintain long-term soil productivity. Soil disturbance would be limited to skid trails, landings, hand line, and temporary roads. Treatment units are expected to maintain forest floor across greater than 85 percent of the area and large wood would remain on site at levels specified by Graham et al. (1994).

Fisheries: Effects to the finespotted Snake River cutthroat trout and rainbow trout were examined. Snake River cutthroat is a Forest Service sensitive species as well as a Bridger-Teton National Forest management indicator species. Rainbow trout is a Bridger-Teton National Forest management indicator species. Effects are measured by the potential for impacts to aquatic habitat from sediment and ash delivery to streams. As noted in the hydrology and soils analyses, there would be minimal if any adverse effects to water quality because the treatment units and roads have been located away from streams; the riparian buffers have filtering effects, and the application of an array of project design features and best management practices would protect water quality. There could be beneficial effects from improved drainage on roads, with no measurable long-term (greater than 1 year) direct impacts to Snake River cutthroat trout populations or habitat. There may be short-term direct effects (less than 1 year) from initial road improvements to individual fish, but they would be limited in time and intensity. The effects determination for finespotted Snake River cutthroat trout from the action alternatives is “may impact individuals but not likely to cause a trend to Federal listing or a loss of viability.” Rivers and streams in the project area meet the Wyoming Game and Fish Department and Bridger-Teton National Forest management objective of maintaining viable populations of Snake River cutthroat. The project would have no effect on rainbow trout because they are likely not present in the project area, and no effects to aquatic habitat would reach the small population in the Snake River.

Botany: The effects to 11 Forest Service sensitive plant species, one candidate for federal listing under the Endangered Species Act (whitebark pine) and one Bridger-Teton National Forest management indicator species (aspen) were evaluated. Effects are measured by the potential of project activities to directly harm plants or habitat, habitat degradation from noxious weed spread, acres of aspen treated, and the potential for whitebark pine to be replaced by shade-tolerant conifers. Overall, the populations and habitats of the examined plants are not within treatment units or areas of connected activities. Where they do occur, project design features are in place to protect them. The threat to habitat from noxious weeds persists wherever there is ground disturbance. However, project design features would reduce this threat. The specific treatments designed to enhance aspen are expected to be successful, with positive benefits to aspen communities. Reduced fire behavior and future fire intensity moving across the landscape would contribute to perpetuating aspen in the long term. Individual whitebark pine trees may be damaged or killed during prescribed fire treatments. However, the objective to reduce fire behavior and promote future mixed-intensity fires would benefit whitebark pine because it would reduce inter-specific competition and create a mosaic of open and thinned patches. Project design features would minimize loss

of whitebark pine through fire, and retain it during thinning operations. Overall, the effects determination for all Forest Service sensitive species is “may impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend toward Federal listing,” and beneficial effects to whitebark pine and aspen are expected.

Noxious Weeds: Fourteen species of noxious weeds exist in the project area. These are categorized by priority for control, ranging from priority 1, meaning eradication upon detection, to priority 4, meaning no tolerance for further spread, control and maintain the current weed infestations. Weed populations located within one-quarter mile of treatment areas were used for analysis because most wind dispersed seed would fall within this radius, design features would address human-caused dispersal, and there is little control or predictability of animal dispersal. The introduction and spread of noxious weeds is possible as a result of the proposed actions. While project design features would be applied to reduce or eliminate the risks, it is likely that not all weeds would be found and controlled, and that further introductions of weed propagules would occur in the near future under circumstances beyond our control. Therefore those alternatives that cause the least disturbance (no action and then alternative 3) would have the least likelihood of introducing and spreading noxious weeds. Burn plans for the prescribed fire units could be used to prioritize weed infestations to be treated prior to burning where large acreages of noxious weeds exist.

Cultural Resources: The potential for effects to cultural resources either listed on or eligible for listing on the National Register of Historic Places was measured by the location of sites in relation to areas of ground disturbance or altered fuel loads. There are no significant historic or prehistoric sites within the proposed treatment units, so no direct effects to recorded eligible sites would occur; however, there is the potential for direct and indirect effects to undetected sites. Project design features require that activities cease and evaluation occurs if any cultural resource sites are discovered during implementation. The Forest Service consulted with the Wyoming State Historic Preservation Office, which concurred that all significant historic properties would be avoided by project implementation and that no historic properties would be affected by the project.

Recreation: Effects to recreation are evaluated by changes in access to trails and trail corridors, and the potential for unauthorized motorized use that may occur within or adjacent to treatment units in close proximity to designated motorized vehicle routes. In the Snake River Range, effects to access would be minimal in the areas near thinning units where there are alternate access points unaffected by project operations. Fall use is higher due to outfitters and hunters and so the effects to access caused by prescribed fire operations would be greater in the fall than in the spring. In the Munger Mountain area, access to about 3 miles of trail would be affected by prescribed fire. In the high-use Teton Pass area, access to 13 miles of trails could be affected by thinning units and 14 miles by prescribed fire treatments. In all of these areas, project design features would minimize effects on recreation but implementation would require considerable advance public notification and close coordination among Forest Service staff to reduce road and trail closures to the maximum extent possible and to protect trail corridors.

Designated motorized vehicle routes occur in and near treatment units in several locations across the project area, and in some cases, user-created unauthorized routes exist as well. The potential for more unauthorized motorized use as a result of the proposed activities would be minimized by the project design feature to create effective motor vehicle barriers.

Visual Quality: Effects to visual quality are measured by changes related to visual quality objectives, which vary by location across the project area. These objectives allow for varying levels of modification to the natural environment depending on the desired levels of scenic quality and diversity of natural features based on physical and sociological characteristics of an area. For example, “foreground retention” is the most restrictive objective, requiring that management actions within one-half mile from

the viewer should not be evident to casual visitors, while the least restrictive objective, “background modification,” allows for management actions more than four miles from the viewer to visually dominate the original characteristic landscape. All of the views from Highway 189 and Highway 22 occur in the middle ground and background, except for the prescribed burn at Teton Pass which is in the foreground. Sensitive viewpoints along the Centennial Scenic Byway and Teton Pass were analyzed using visual simulations to identify changes to the landscape from the proposed activities. Many of the proposed activities are not visible from main roads and trails in the project area. Overall, the proposed activities may affect the visual quality in the project area while still meeting Forest Plan standards and visual quality objectives. Effects would be short term (1 to 5 years) as areas revegetate after disturbance created by project activities.

Chapter 4 -- Preparers, Contributors, and Distribution

This draft environmental impact statement was prepared by Forest Service employees and contractors in collaboration with federal, state, and local government agencies and federally recognized tribes. This document will be posted electronically on the Bridger-Teton National Forest website and notice of the opportunity to review and comment will be sent to those who submitted comments during the scoping periods or otherwise requested to be notified, and to appropriate federal agencies, federally recognized tribes, and state and local governments. A legal notice will be published in the newspaper of record, the Casper Star-Tribune, and a Notice of Availability will be published in the Federal Register which will start a 45-day comment period.

Preferred Alternative

The responsible official, District Ranger Dale Deiter, has identified alternative 3 as the preferred alternative at this time. Alternative 3 addresses the need for action in the project area in accordance with management direction and resource protection standards while providing enhanced protection for special areas and wildlife habitat over alternatives 1 and 2.

Commenting on the Draft Environmental Impact Statement

This proposed project is implementing the Bridger-Teton National Forest’s Land and Resource Management Plan and is not being authorized under the Healthy Forest Restoration Act. Thus this project is subject to the objection process pursuant to 36 CFR 218 Subparts A and B.

This project has already undergone 2 formal scoping periods and several public meetings that have helped to shape both of the action alternatives. However, for the draft EIS it is important that reviewers provide timely comments in such a way that they are useful to the Agency’s preparation of the final EIS and Record of Decision. Therefore, comments should be provided prior to the close of the comment period and should clearly articulate the reviewer’s concerns and contentions related to the proposed activities. The Forest Service will consider cited references if the articles are submitted with the comment letter, and if the reviewer identifies the relevance of the findings to specific actions and effects of this particular project and place. The submission of timely and specific comments can affect a reviewer’s ability to participate in subsequent administrative or judicial review. Comments received in response to this solicitation, including names and addresses of those who comment, will be part of the public record. Comments submitted anonymously will be accepted and considered; however, anonymous comments will not allow the respondent to have standing in subsequent administrative or judicial reviews.

Individuals and organizations wishing to be eligible to object must meet the information requirements of 36 CFR 218 Subparts A and B. It is the responsibility of persons providing comments to submit them by the close of the comment period. Only those who submit timely and specific written comments regarding

the proposed project during a public comment period established by the responsible official are eligible to file an objection under §218.

Written, facsimile, hand-delivered, and electronic comments concerning this action will be accepted for 45 calendar days following the publication of a Notice of Availability in the Federal Register. The publication date in the Federal Register is the exclusive means for calculating the comment period for this analysis. Those wishing to comment should not rely upon dates or timeframe information provided by any other source.

In cases where no identifiable name is attached to a comment, a verification of identity will be required for objection eligibility. If using an electronic message, a scanned signature is one way to provide verification. For objection eligibility each individual or representative from each entity submitting timely and specific written comments regarding the proposed project must either sign the comments or verify identity upon request.

See the attached cover letter or the Teton to Snake Fuels Management Project webpage - (http://www.fs.usda.gov/project/?project=23638) - for details on how to submit comments on this draft environmental impact statement.

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Acronyms and Abbreviations

APE	area of potential effect
AQD	Air Quality Division
ATV	all-terrain vehicle
BA	biological assessment
BE	biological evaluation
BPA	Bonneville Power Administration
BTNF	Bridger-Teton National Forest
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CT	commercial thin
CTNF	Caribou-Targhee National Forest
CWPP	Community Wildfire Protection Plan
dbh	diameter at breast height
EA	environmental assessment
E.O.	executive order
ECA	equivalent clearcut area
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
Forest Plan	Bridger-Teton National Forest Land and Resource Management Plan (1990)
FP	Forest Plan
FR	Federal Register
FR	forest road
FSH	Forest Service Handbook
FSM	Forest Service Manual
FSR	Forest Service Road
GBY	ground-based yarding
GIS	geospatial information system
GYA	Greater Yellowstone area
GYE	Greater Yellowstone Ecosystem
HC	hand cut
HPB	hand pile and burn
HUC	Hydrologic Unit Code
IDT	interdisciplinary team
IRA	inventoried roadless area
LAU	lynx analysis unit
LRMP	land and resource management plan
LS	lop and scatter
MBF	thousand board feet
MC	machine cut
MIS	management indicator species
MPB	machine pile and burn
MVUM	motor vehicle use map
NCT	noncommercial thin
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	national forest system
NI	no impact
NPS	National Park System
NRLMD	Northern Rockies Lynx Management Direction
NWPS	National Wilderness Preservation System
OHV	off-highway vehicle
PF-00	prescribed fire unit
PCA	primary conservation area
PDF	project design feature
PF	prescribed fire
PFA	post-fledgling family area
PL	public law
PM	particulate matter
PR	prune
RACR	Roadless Area Conservation Rule
RARE	Roadless Area Review and Evaluation
Rx	prescribed fire
SHPO	State Historic Preservation Office
SMP	smoke management program
TAWPC	Teton Area Wildfire Protection Coalition
T-00	thinning unit
TE	threatened and endangered
TES	threatened, endangered, and sensitive
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
VQO	visual quality objective
WCC	watershed condition class
WDEQ	Wyoming Department of Environmental Quality
WEPP	water erosion prediction project
WGFD	Wyoming Game and Fish Department
WSA	wilderness study area
WUI	wildland-urban interface
YNP	Yellowstone National Park

Chapter 1. Purpose and Need and Proposed Action

Introduction

The Forest Service prepared this environmental impact statement in compliance with the National Environmental Policy Act and other relevant Federal and state laws and regulations. This environmental impact statement discloses the predicted direct, indirect, and cumulative environmental impacts that would result from the proposed action, a no-action alternative, and a third alternative developed by the interdisciplinary team in response to issues raised from the public and as a result of further analysis by the team.

This document represents a summary of the environmental analysis conducted by the interdisciplinary team using the best available science, current data, public input, agency coordination, and observations and measurements made in the field. Detailed resource reports and additional supporting documents are in the project record located at the Jackson Ranger District office in Jackson, Wyoming, and posted on the Bridger-Teton National Forest website at http://www.fs.usda.gov/project/?project=23638.

Project Area

The project area includes the wildland urban interface as defined by the National Wildfire Coordination Group (National Wildfire Coordination Group 2011) and by Teton County's Community Wildfire Protection Plan (Teton County 2014). The wildland-urban interface consists of land along and near the following communities that are located in Teton County: Teton Village, Northern and Southern Fish Creek Homes, Heidelberg, Trail Creek, Town of Wilson, Heck of a Hill, Indian Paintbrush, Crescent H, Singing Trees/River Meadows, Taylor Creek, Highland Creek Hills, Red Top Meadows, Trails End, Fall Creek Ranch, and Hog Island. Additional parcels of private land as well as the Bonneville Power Administration powerline corridor are within the project area. The project area includes a portion of the Palisades Wilderness Study Area as well as the Munger Mountain and Phillips Ridge inventoried roadless areas (figure 1).

Treatment is proposed on only a subset of the project area shown in figure 1. The wildland urban interface is defined as: "The line, area or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. Describes an area within or adjacent to private and public property where mitigation actions can prevent damage or loss from wildfire." (National Wildfire Coordination Group 2014) by Teton County's 2014 Community Wildfire Protection Plan. Proposed treatments range from 14,253 to 22,511 acres in extent, depending on alternative, and are strategically located across those lands defined as wildland-urban interface. The community wildfire protection plan was developed by county, state, and federal fire managers in collaboration with other entities and interested publics, and reinforces that many of the residential areas adjacent to the National Forest in this project area are directly threatened from wildfire. To aid in prioritizing treatments efforts, the Forest Service divided the wildland-urban interface lands within the Teton to Snake project area into two sub-classifications: a defense zone and a threat zone. The defense zone is where the most aggressive suppression actions would likely occur and is defined as an area extending one-quarter mile from the ownership boundary between national forest and private land (most occupied by residences or summer homes), and lands around the powerline. The threat zone includes the remaining area within the wildland-urban interface boundary.

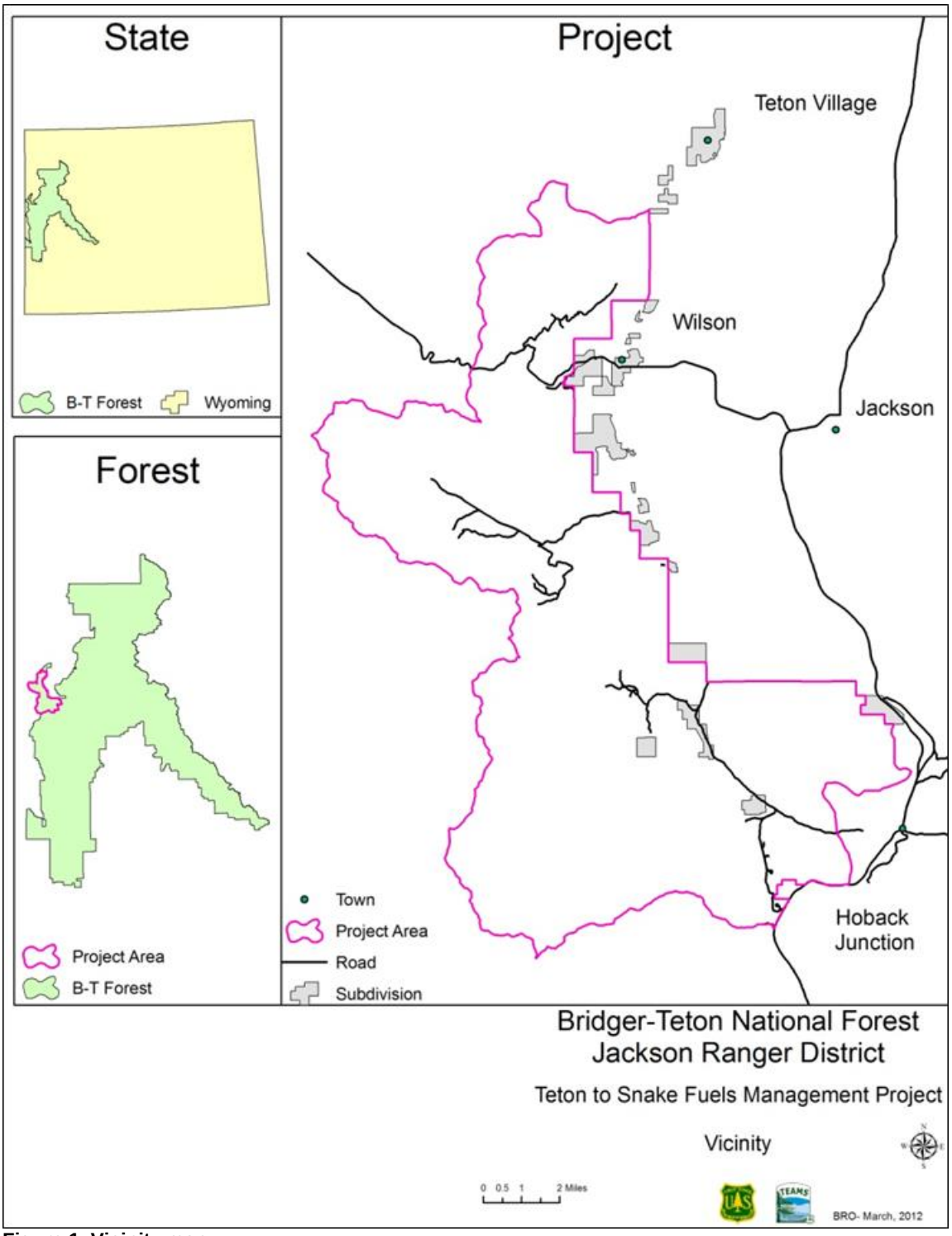


Figure 1. Vicinity map

Purpose and Need for Action

Growing evidence suggests that the Intermountain West would experience more fire on the landscape compared with the period from the 1960s through the 1990s (Stephens et. al. 2013, Girardin et. al. 2010). Faced with a future influenced by climate change that would likely include more fire, the Forest Service and Teton County share a collective goal to become a "fire-adapted community" where our valued natural resources are more resilient to the threat of wildfire (Teton County 2014). This need is especially pronounced where residential development has occurred adjacent to the national forest.

The Teton to Snake wildland-urban interface area is one of the highest fire risk areas on the Bridger-Teton National Forest (USDA Forest Service and US Department of the Interior Federal Register, Vol. 66 No.3, 2001. Urban Interface Communities within the Vicinity of Federal Lands That are at High Risk from Wildfire). The high risk is due to the combination of high density housing adjacent to the forest boundary, the forest fuel conditions in the area, and the prevailing winds that push wildfire toward residential areas. Considerable private residential development has occurred along the eastern edge of the project area since the 1990s. As a result there is almost 40 miles of wildland-urban interface boundary along national forest system lands. Wildfires occurring in the project area may be easily pushed onto adjacent lands and communities by prevailing south to southwest winds and spotting ahead of the fire front. This was readily apparent during the 2001 Green Knoll Fire that burned about 4,700 acres in the area over the course of 8 days. The fire started well within the forest boundary, however south to southwest winds quickly drove the fire onto adjacent private lands, with spotting observed one-quarter mile ahead of the fire front. Based on the aggressive suppression response and cost required to control the Green Knoll Fire while protecting public and firefighter safety, the Forest Service recognized that more proactive actions were needed to address the wildfire threat.

In response to the Green Knoll Fire, local fire managers implemented small scale mechanical thinning in 2003 along portions of the private land/national forest boundary from Red Top Meadows to Teton Village. This limited treatment is considered effective as long as no fire spotting occurs and sufficient resources (firefighters, equipment, and aircraft) are available in the event of a wildfire. However, the increase in defensible space did not appreciably reduce the overall likelihood of a wildfire escaping from the national forest onto non-federal lands. The treatments were also not extensive enough to allow sufficient time or sufficient options for firefighters to use suppression tactics that are "lighter on the land." Thus, managers must still aggressively suppress nearly all fires in the area to minimize the probability of wildfire reaching and threatening the neighboring homes. To manage wildfire in the project area with less than a full suppression response, fire managers need to have viable options for containing the spread of a fire before it leaves national forest system lands.

Project Purpose

The purpose of this project is to improve Forest Service managers' ability to successfully manage fire within the high risk Teton to Snake wildland-urban interface zone to meet our responsibilities under national law and policy and help meet Teton County goals under the Community Wildfire Protection Plan. To be successful, managers must reduce the risk of fire escaping outside of national forest boundaries while at the same time ensuring firefighter safety, controlling cost, and avoiding adverse effects from suppression activities. Specific project objectives are to:

1. **Improve firefighter and public safety; reduce expected fire flame length to less than 4 feet and reduce the potential for crown fires within the defense zone.**

When fire flame lengths are over 4 feet and fuel conditions are likely to produce crown fires, fire fighters are ineffective without support from aircraft and heavy equipment. In these situations, wildfires become very difficult, costly, and hazardous to suppress. Currently, the percent of the defense zone capable of

producing flame lengths over 4 feet or crown fires is unacceptably high. If fuel conditions within the defense zone were capable of producing flame lengths generally less than 4 feet and the area was unlikely to produce crown fires, Forest Service managers would be better able to meet our obligation to successfully manage fires within this critical zone.

Snags are also of concern in the defense zone. Falling snags and hazard trees are currently the second leading cause of fatalities and serious injury during wildland firefighting operations. Reducing the number of snags that pose a direct threat to firefighters near probable fire control lines would improve firefighter safety.

2. Reduce wildland fire spread potential to and from national forest system and state and private lands.

There is a need to reduce fuels and potential fire behavior in the wildland-urban interface threat zone to lessen wildfire threat to human life, property, and natural resources from fires starting on either side of the national forest boundary. Forest changes due to years of fire suppression and subsequent increasing fuel loads and fuel continuity have combined with the high density of homes downwind of potential fire starts to create a higher wildfire threat in this area than most any other on the Bridger-Teton National Forest. Reducing fuels and potential fire behavior increases firefighting effectiveness which increases the probability of containing fire spread in wildland-urban interface areas. The Forest Service, state, and county organizations responsible for fire management and associated costs have different management objectives when it comes to fire suppression. Thus, the Forest Service cannot unilaterally use wildfire to meet its land management objectives without consideration as to how fire would impact other jurisdictions.

3. Increase the probability that managers can respond to natural fire starts using tactics that are lighter on the land and allow fire to operate more freely in contributing to natural ecosystem processes.

Currently, nearly 100 percent of all fires within the project area are suppressed due to the probability of wildfire spreading from the national forest and Palisades Wilderness Study Area onto adjacent lands. Suppressing these fires often requires aggressive actions and considerable motorized equipment. The current need to aggressively suppress fires results in several unacceptable outcomes: the untrammeled and natural attributes of wilderness character desired in the wilderness study area are not protected; there may be unavoidable resource impacts on other lands; and fighting such fires is very costly to both the agency and taxpayers. With proactive fuel treatment in the Teton to Snake area, managers expect to see a downward trend over the next 20 years in the cost of fighting fire and a greater portion of fire perimeters managed without aggressive suppression tactics.

Project Need

Wildfires in the Teton to Snake wildland-urban interface zone are not being managed in a manner consistent with Teton County and Forest Service goals to become a “fire-adapted” community, protect firefighter safety, and maintain wilderness values within the Palisades Wilderness Study Area. There are four compelling reasons why action in the Teton to Snake wildland-urban interface area is needed:

1. The Forest Service is bound by law and policy to be a good neighbor.

Per the National Fire Plan, the National Cohesive Wildland Fire Management Strategy, and the Healthy Forests Restoration Act, the Forest Service committed to protect human communities from wildfires originating on public lands by implementing hazardous fuel reduction projects on federal lands within the wildland-urban interface. The USDA budget prioritizes hazardous fuels reduction activities in the wildland-urban interface where they are most effective, particularly in communities that (1) are on track

to meet Firewise standards, (2) have identified acres to be treated in Community Wildfire Protection Plans, and (3) have made an investment to implement local solutions for protection against wildland fire (USDA 2011). These three conditions are all in place within Teton County. Similarly, national wilderness policy also dictates that the Forest Service shall "reduce, to an acceptable level, the risks and consequences of wildfire escaping from wilderness." Along much of the Teton to Snake wildland-urban interface boundary, the national forest boundary is also the Palisades Wilderness Study Area boundary.

In 2014, Teton County completed revision of its Community Wildfire Protection Plan. An excerpt from the community wildfire protection plan (CWPP) contains a paragraph that sums up the goals for the Teton to Snake proposed project: "… The CWPP does not aim to stop fire but rather mitigate fuels where necessary to protect those identified values which would facilitate allowing fire to play its role when possible within our backcountry and wilderness areas as directed by land management plans and other applicable legislation. We recognize that all of our tools (mechanical treatments, prescribed fire, and wildland fire) must be put to work to reach our goals here in this CWPP. This recognition brings Teton County closer to becoming a truly "fire-adapted community."

There are 1,579 private lots within one-half mile of the project area boundary. Regardless of whether or not adjoining properties are developed or defensible, the Forest Service is bound by law and policy to take reasonable actions to prevent fires from crossing onto lands managed by other jurisdictions. Wildfire knows no boundaries. All land owners (private, federal, county, and state) within the wildland-urban interface area have a mutual responsibility to reduce the probability of fire escaping from their land and impacting other jurisdictions. Homeowners are responsible for meeting county code and making their homes "Firewise," not only to protect their own home from a wildfire, but also to protect their neighbors. Likewise, the Forest Service has a complementary responsibility, as a good neighbor, to reduce the probability of wildfire originating on the national forest from burning onto adjacent lands.

A recent study used the FARSITE fire growth simulation model using varying weather scenarios to determine how historic suppressed fire starts in the Palisades Wilderness Study Area may have grown if they had been allowed to burn (Rojo 2013). Results showed that under the 90th percentile burning index, 38 percent of historic fire starts that were modeled impacted the threat zone, 17 percent impacted the defense zone, and 14 percent burned onto private property. Based on social, political, and fire management objectives, this percentage of fires burning within the wildland-urban interface area poses unacceptable risk and does not meet our obligation to be a good neighbor.

2. Firefighter safety cannot be compromised.

The tragedy of firefighter injury or death is not acceptable. Falling snags and hazard trees are currently the second leading cause of fatalities and serious injury during wildland firefighting operations (11 fatalities over the last 10 years with 3 fatalities in 2013 alone), thus reducing the number of snags near probable fire control lines is important to improve firefighter safety. Additionally, firefighters cannot fight fire on the ground unless flame lengths are generally less than 4 feet and crown fires are unlikely to occur. A fire behavior assessment conducted in 2010 revealed that 42 percent of the area within the defense zone could produce flame lengths over 4 feet, and 25 percent of this same area could produce crown fires and potential spotting ahead of the fire (Helmbrecht 2010). Under these kinds of conditions, fire fighters are ineffective without support from aircraft and heavy equipment, and hence, wildfires become difficult, costly, and hazardous to suppress. The photograph in figure 2 illustrates current conditions in the project area which contribute to unacceptable potential fire behavior.

3. The rising cost of suppression and resource impacts associated with suppression activities is unacceptable.

Activities associated with fire suppression of large fires within the wildland urban interface are generally more intensive and reliant on mechanized equipment. Such a management response has a greater potential to introduce invasive species and directly impact vegetation, soil, water, and wildlife. These impacts can create resource damage that must be rehabilitated after a fire. Resource impacts are particularly unacceptable within the Palisades Wilderness Study Area where wilderness character must be maintained. The 2001 Green Knoll Fire is a good example of such impacts. The fire was burning under environmental conditions that generally led to flame lengths well in excess of 4 feet, negating the opportunity to use hand tools and ground crews. Thus, expensive suppression resources including fixed-wing planes, helicopters, bulldozers, and heavy equipment were required. Intensive effort was required to protect the Snake River fishery and eagle nesting areas during helicopter bucket operations, to limit the impact of bulldozers, helispots and crew camps, to ensure adequate food storage, to avoid introducing noxious weeds, and to limit the impact of retardant on creeks. Despite these efforts, some unavoidable impacts did occur and extensive restoration work was required post-fire, particularly to address bulldozer lines and treat noxious weeds. The total cost of the Green Knoll fire was $13.3 million which equates to about $2,830 per acre. By comparison, the national average suppression cost for large fires (over 300 acres) is roughly $500 per acre. There is growing recognition that rising cost of fighting fires, largely driven by fires within the wildland-urban interface, has unintended consequences on the Forest Service's ability to meet its mission to "care for the land and serve people." In particular, the growth in fire expenditures has resulted in two significant and negative impacts on the Forest Service budget: (1) transfer of non-fire resource appropriations to pay for fire; and (2) a long-term shift of agency resources to fire expenditures (USDA 2014).

The density of development along the wildland-urban interface boundary also increases the probability of unwanted human-caused fires that can affect public and firefighter safety, infrastructure, and natural resources on National Forest system lands in addition to creating substantial costs to taxpayers. Fires originating on non-federal lands adjacent to the project area would likely be human-caused. Federal wildland fire policy dictates that "initial action on human-caused wildfire would be to suppress the fire at the lowest cost with the fewest negative consequences with respect to firefighter and public safety." Human-caused fires are not considered to be part of the natural fire regime. Human-caused fires would nearly always have a full suppression response and subsequently could lead to unwanted suppression damage to natural resources including adverse impact to wilderness character within the wilderness study area. The 2012 Horsethief fire immediately south of the Town of Jackson is a good example of this scenario playing out.

By creating fuel conditions that would allow the Forest to manage more fires in the project area with less intensive suppression activity, fire suppression impacts could be minimized while also lowering fire costs.

4. Continuing to suppress all fires within the Palisades Wilderness Study Area does not meet the obligation to maintain wilderness character.

In the project area and particularly within the Palisades Wilderness Study Area, fires are routinely suppressed due to the proximity of developed areas such as housing subdivisions and other values at risk. This is because the risk of fire burning onto private land without pre-treating fuels to reduce the threat is currently unacceptably high. Fire occurrence data shows that 80 fires burned within the project area between 1994 and 2013, an average of 4 fires per year. All but one of these fires was immediately suppressed. By comparison, in the Gros Ventre Wilderness on the Jackson Ranger District, four out of five fires in 2010 were allowed to play a nearly natural role (not suppressed) resulting in several thousands of acres burned. As a result of years of fire suppression in the project area, the fire regime has

been altered. Most notably, moderate sized, mixed-severity types of fires no longer occur. Most ignitions today are limited to small, low-severity fires that burn less than 1 acre and occasional large, stand-replacement fires that burn under extreme dry and windy conditions, overpowering suppression efforts. This change in the fire regime is most evident in the Douglas-fir forests where fire-scarred trees show a history of frequent low- and mixed-severity burns, but no burning for approximately the last 100 years (Wyoming Game and Fish Department 2015). Ecological effects from years of fire suppression include increased densities of fire intolerant tree species, Douglas-fir encroachment into meadows, aspen decline, and buildup and continuity of hazardous fuels.

The Wyoming Wilderness Act of 1984 directs the Forest Service to maintain wilderness character in the Palisades Wilderness Study Area. Additionally, land management objectives in the Forest Plan emphasize allowing natural processes such as fire to operate as freely as possible. The practice of suppressing most fires in the wilderness study area due to the risk of fire burning onto adjoining jurisdictions precludes the Forest Service from allowing fire to play its natural ecological role, which adversely impacts wilderness character. Not allowing lightning-ignited fire starts to operate freely affects the naturalness of the area and is not consistent with the desire to maintain the untrammeled quality of wilderness where the goal is minimized human interference with natural processes.

It is important to recognize that the purpose of this project is not to restore “historic” vegetative conditions. Rather, the purpose is to allow natural fire starts to burn more naturally and shape ecological conditions with less interference from humans, including less impact from suppression activities. The proposed fuel treatments are intended to give fire managers more time and more options for managing fires so that natural processes operate more freely. If nothing is done to treat fuels, nearly all wildfires in the project area would continue to be suppressed which would continue to adversely affect wilderness character.

Meeting the purpose and need for this project is measured by the effects from the alternatives to modelled fire behavior, hazardous snags removed, and acres of aspen enhancement. To be successful, fire behavior must be reduced to a level that allows future wildland fires to be managed with the least intrusive methods possible and allows fire to contribute to freely operating ecosystem processes within the wilderness study area whenever possible. Hazardous snags must be removed to allow firefighters to work safely within the defense zone as needed. Promoting healthy aspen communities to slow the spread of fire contributes to meeting the purpose and need to reduce potential impacts related to wildfire. The success of this project in addressing the need for action and reaching project goals is measured by:

1. **Fireline Intensity expressed as flame length:** Change in potential flame length across the project area. Flame lengths generally less than 4 feet are desired, allowing for safe direct attack by hand crews. Flame lengths greater than 4 feet generally require equipment such as dozers and aircraft. Beyond 8 feet torching, crowning and spotting can occur (Rothermel 1983).
2. **Fire type:** Change in the potential fire type across the project area, measured as acres of surface fire versus passive or active crown fire[1]. Surface fire allows for safer and more effective fire suppression action than crown fire.

[1] “Surface fire” is a fire that burns loose debris on the surface, which include dead branches, leaves, and low vegetation. Surface fire burns only in the surface fuelbed. “Passive crown fire” is a fire consuming single or small groups of trees or shrubs. “Active crown fire” is a fire that ignites crowns and the fire spread is able to propagate through the tree canopy.

3. **Snag density levels**: Reducing the number of standing dead trees (snags) in units within 200 feet of homes. Reducing snag density levels would allow a better margin of safety for firefighting forces engaging in fire suppression actions.
4. **Aspen Enhancement**: Acres of aspen treated. Removing encroaching conifers from aspen clones would enhance the ability to perpetuate aspen communities across the project area. Aspen serves to slow the spread of wildfire and therefore contributes to the project goals to reduce potential fire behavior.

Figure 2. Understory ladder fuels in the project area. Ladder fuels can create high intensity crown fires by carrying wildfire into the overstory of live and dead conifers.

Summary of the Proposed Action

The proposed action is described in detail as alternative 2 in chapter 2. It meets the need for change in the project area with actions designed to reduce fire behavior to better protect threatened private property, improve firefighter safety, and to allow fire to play its natural role in the ecosystem, particularly in the Palisades wilderness study area. All of the treatment areas are within the wildland-urban interface boundary as identified by the Teton County Community Wildfire Protection Plan. For this project, the

wildland-urban interface is divided into two sub-classifications: defense zone and threat zone. The defense zone extends one-quarter mile from the ownership boundary between national forest and private land (most occupied by residences or summer homes), and lands around the Bonneville Power Administration powerline. The threat zone includes the remaining area within the wildland-urban interface boundary.

Specifically, the proposed action would implement the following management activities:

- Conduct prescribed burning, noncommercial thinning, and commercial thinning to modify potential fire behavior. This includes removing encroaching conifers from aspen clones to enhance and perpetuate aspen communities.
- Remove hazardous snags in close proximity to private property to promote firefighter safety.
- Maintain or reconstruct existing roads and construct temporary roads, landings, and fire control lines to facilitate implementation of the proposed action.

Project design features developed to eliminate or minimize potential adverse environmental effects from the proposed activities (appendix B) are an integral part of the proposed action.

The proposed action as described in the public scoping document released in December 2010 has been modified as follows due to subsequent analysis and updates by the Forest Service:

- Added potential construction of fire control lines, including 11.1 miles in alternative 2 and 6.4 miles in alternative 3.
- Better defined the removal of snags as limited removal in the defense zone. Reduction in snags would occur only where snags are within a 200-foot corridor of a probable fire control line. Within prescribed burns only those snags that pose an immediate hazard to the firefighters implementing the project would be removed.
- Added descriptions of the project design features (appendix B) developed by resource specialists to protect resources and guide implementation. Many of these also address public comment and issues.
- Better defined roads and landings proposals. Miles of general maintenance and reconstruction of existing roads, and miles of temporary road construction are listed by the commercial treatment units to be accessed. Number of landings needed by unit is listed as well.
- Corrections to project area boundary and wildland-urban interface boundaries, which were displayed inconsistently in the scoping documents. This change does not affect any treatment units or the analysis of environmental effects; it does, however, bring consistency to all project maps.
- Updated proposed miles of road maintenance and reconstruction on existing roads after further examination of needed access.
- Minor corrections in acreages and wording.

Table 5 displays a summary of the proposed action. The “Total Treatment Acres” column in table 5 includes general forest lands as well as lands in special land allocations (defense zone, roadless areas, and wilderness study area), which are broken out and displayed in the next three columns. Also of note is that because the defense zone, roadless areas, and wilderness study area overlap in places, some acres are counted in more than one column.

Table 5. Specific treatments and acreage, with acres located in special land allocations, alternative 2

Treatment	Total Treatment Acres	Treatment Acres Located in Defense Zone[a]	Treatment Acres Located in Roadless Areas	Treatment Acres Located in Wilderness Study Area
Prescribed Fire	19,991	1,207	6,857	12,042
Noncommercial Thin Hand Cut Hand Pile and Burn	1,244	1,222	267	401
Noncommercial Thin Hand Cut Hand Pile and Burn Prescribed Fire Last	252	247	0	241
Noncommercial Thin Prune Hand Cut Hand Pile and Burn Lop and Scatter	127	124	0	125
Noncommercial Thin Commercial Thin Ground-based Yarding Machine Cut/Machine Pile and Burn *or* Hand Cut/Hand Pile and Burn	728	282	24	58

a - The defense zone is the area within one-quarter mile of private property boundaries and the powerline corridor.

Connected Actions

Thinning treatment would require road maintenance, reconstruction, or construction in order to allow equipment access and to remove logs from particular units. Details are in chapter 2, table 9 and table 16.

Approximately 32 log landings would be required and may be in the form of road widening for roadside landings, or constructed clearings at the end of haul roads. Landings would be designed and located using all Forest Plan standards and guides as well as Wyoming best management practices to protect resources.

Fire control lines would be constructed if needed to contain the prescribed burns according to the prescribed fire plan for that particular unit. The Forest Service estimates that up to 11.1 miles of control line could be constructed and rehabilitated as the project is implemented over the course of 10 years.

Decision Framework

The District Ranger would examine the final environmental analysis, public response to this document, and consultations with other agencies and governments to make an informed decision about which alternative, if any, to implement. He would consider the following:

1. Are there additional issues or alternatives that should be analyzed in detail?

2. Which of the alternatives would best move the Teton to Snake Project Area toward the desired condition of the land as outlined in the Forest Plan, and which best meets the purpose and need for the project?

Public Involvement

Public Input and Coordination

The Teton to Snake Fuels Management Project was first listed in the schedule of proposed actions on April 1, 2008. The Forest Service sought public involvement in developing the proposed action through meetings conducted on July 13 and August 8, 2010, and a field trip on August 26, 2010. Interested and affected stakeholders who attended these meetings included staff from local fire organizations, the Wyoming Game and Fish Department, homeowners, and advocates for wilderness and wildlife. The meeting objectives were to share information about the project, discuss objectives and concerns, and encourage participation in the development of the proposed action. The August 26, 2010, field trip was focused on potential effects to wildlife, and was attended by Wyoming Game and Fish staff, Forest Service biologists, and a citizen advocate.

In addition, the Forest Service introduced and sought feedback on the project at Teton Area Wildfire Protection Coalition meetings on July 22 and December 16, 2010. The responsible official for the project, District Ranger Dale Deiter, and North Zone Fire Management Officer Mike Johnston, briefed the Teton County Board of County Commissioners on the project on February 7, 2011.

A scoping letter describing the proposed action and seeking public comments was mailed to approximately 156 groups, individuals, and agencies on December 1, 2010, with comments requested to be returned by January 14, 2011. In addition to the mailing, email notification of the opportunity to comment with a link to the Bridger-Teton National Forest website was sent to approximately 94 parties. Both the scoping letter and the full proposed action documents were posted on the Forest's website. A correction to the original document was made and the public notified of the correction on January 18 and 19, 2011. Further public notification was made through a press release, newspaper articles, and radio interviews. The public was invited to comment on the proposed action, identify potential conflicts or benefits, and provide any relevant information that would be useful in the subsequent environmental analysis.

Interested individuals, groups, and agencies responded with 23 letters and about 200 total comments. All comments were thoughtful narratives reacting to the proposed action with support, opposition, concerns, or requests for revision and new alternatives. Important concerns raised about impacts to the wilderness study area, inventoried roadless areas, and wildlife habitat resulted in the development of an alternative to the proposed action, alternative 3, designed to address these issues. The Forest Service also refined and added extensive project design features to action alternatives and best practices to avoid or reduce impacts to cultural resources, water resources, range, recreation, scenery, sensitive plants, air quality, soils, special areas, and wildlife. Comments and responses are documented in the "Scoping Comment Analysis and Issue Identification" report in the project record.

The Forest Service met with interested individuals on February 23, 2011, to clarify proposed activities, discuss a new alternative, respond to questions, hear concerns, and take suggestions for refining the proposed action. This meeting was followed up with a meeting on April 21, 2011, with a similar range of discussion topics.

There have been ongoing requests for project information and updates from individuals and organizations throughout the analysis process. The Forest Service responded via email and also hosted a meeting with

interested parties in March 13, 2012 to address the many ongoing questions and concerns about the project.

In addition, the Forest Service has provided project updates and/or sought public input as follows:

- Dale Deiter and Mike Johnston along with Chief Watsabaugh, County Fire Warden, met with the Teton County Commissioners on February 7, 2011 to provide project specifics and to seek feedback.
- Public meeting hosted by Dale Deiter, February 23, 2011.
- Teton Area Wildfire Protection Coalition: March 10, May 20, June 28, and December 6, 2011; February 23, 2011, and January 10, February 21, 2012; November 12, 2013.
- Wyoming Game and Fish Department: March 23, 2011, and March 22, 2012.
- Teton Conservation District: March 20, 2012.
- Caribou-Targhee National Forest: ongoing.
- Wyoming Wilderness Association's George Wuerthner Lecture: February 9, 2012.
- Regular contact via phone, email, and postal correspondence with stakeholders interested in and knowledgeable of mapping and certification of the wilderness study area boundary: ongoing since March 2012.
- Public field trip to the project area led by Dale Dieter, sponsored by the Jackson Hole Conservation Alliance: July 20, 2012.
- Meeting hosted by Jackson Hole Conservation Alliance.
- Meeting with interested stakeholders to share wilderness study area boundary information and maps: August 20, 2012, January 11, 2013, March 20, 2013.
- Media coverage by local radio and newspaper outlets; several features since July 2010.
- Open House with guest speakers for the general public and interested stakeholders focused on "Creating Defensible Space and Collaborating Efforts to Be Good Neighbors" on Wednesday August 13, 2014.
- Meeting with Jackson Hole Conservation Alliance, Oct. 27, 2014.

Teton County (Jackson Hole Fire/ EMS) and the Forest Service have promoted Firewise principles to landowners within or near the project area to augment the success of the Teton to Snake Fuels Management Project. Additionally, Jackson Hole Fire/ EMS began conducting structure assessments in 2013 for all private residences near the Teton to Snake project area as a step to enhance the objectives associated with the Teton to Snake Fuels Management Project. This work would continue until all structures have been assessed.

The environmental analysis for this project was paused in July 2012 when the Forest Service initiated the administrative process to produce a final map and perimeter boundary description for the Palisades Wilderness Study Area. The Forest Service then decided to prepare an environmental impact statement for this project. A Notice of Intent to prepare an environmental impact statement was published in the Federal Register on (Vol. 78, No. 39) on February 27, 2013. The public was asked to review and provide comments on the updated scoping document which included the purpose and need for the project, existing potential fire behavior in the project area, issues identified through previous public involvement and Forest Service analysis, and descriptions of the alternatives to be studied in detail: Alternative 1 (No

Action), Alternative 2 (Modified Proposed Action), and Alternative 3 (Reduce Potential Impacts to Special Areas and Wildlife Habitat).

Public response to the 2013 Notice of Intent and scoping document included 35 letters and numerous literature citations and submitted articles which the Forest Service carefully considered to identify additional concerns, issues, and new information. Public concerns were expressed about:

- potential for meeting project objectives;
- compliance with laws, regulations, and policies;
- analysis process and documentation;
- environmental impacts to the wilderness study area, inventoried roadless areas, wildlife, fisheries, soils, hydrology, recreation, scenery, cultural resources, and air quality;
- effects of roads and vegetation management activities on resources;
- economics, climate change, monitoring, implementation.

Commenters also expressed preferences for alternatives 1, 2, and 3; and requested additional analysis, alternatives, or information.

While many of the 2011 scoping comments were reiterated during the 2013 scoping period, new comments and requests for information, alternatives, and analysis were related to accuracy of modeling, potential for wildfire after thinning, costs of treatments; homeowners actions, natural wildfire and range of variability, the Forest Plan, the analysis process in general and also how it relates to the wilderness study area boundary mapping, and others. Public feedback during the two comment periods also included support for managing fuels and reducing the threat, resource harm, and costs associated with high-intensity fire and aggressive suppression in the project area.

Thirteen alternatives to the proposed actions were suggested by the public and considered by the Forest Service but not studied in detail. See “Alternatives Considered but Eliminated from Detailed Study” at the end of chapter 2 for more information.

The comment letters are in the project record along with Forest Service responses in the “Teton to Snake Fuels Management Project 2013 Scoping Report.”

Issues

Scoping provides an early and open process to determine the scope of issues related to the proposed action to be addressed in the environmental analysis. Issues are derived from comments that highlight adverse effects, unresolved conflicts, or unintended consequences that may occur from the proposed action. Identifying and addressing issues in the analysis provides the opportunity to reduce potential adverse effects and compare trade-offs among effects and alternatives to inform the public and the Responsible Official (USDA-FSH 1909.15 Ch. 12.4).

Significant Issues

Only significant issues – those with potential for significant effects -- are analyzed in depth in the EIS (40 CFR 1501.7). The predicted effects are determined using indicators and measures (USDA-FSH 1909.15, 12.5) that are understandable, sensitive to change, quantifiable when possible, project-specific, and related to law, regulation, and policy specific for each resource. The following two issues are highly relevant to a large part of the project area and a majority of the proposed activities.

Issue 1: Effects to Wilderness Study Area and Inventoried Roadless Areas

Potential effects identified by the public: Respondents noted that the proposed treatments constitute human manipulation in the wilderness study area and inventoried roadless areas which could adversely affect wilderness characteristics and eligibility for future wilderness designation in the National Wilderness Preservation System. Requested were either reduced levels or elimination of all treatment in the wilderness study area and inventoried roadless areas, or elimination of all proposed work across the project area.

> **Resolution:** Develop alternative 3 to reduce or eliminate treatments in the wilderness study area and inventoried roadless areas while reducing the need to interfere with natural processes through fire suppression. The no-action alternative addresses the request for elimination of all work.

Effects indicators:

Effect on Wilderness Study Area

a. Acres of mechanical treatment within the Wilderness Study Area

b. Acres of prescribed burning within the Wilderness Study Area

c. Effect on potential for inclusion of the wilderness study area in the National Wilderness Preservation System

d. Effect on “presently existing wilderness character” with focus on the untrammeled and natural qualities

Effect on Inventoried Roadless Areas

a. Acres of mechanical fuel treatment within the Inventoried Roadless Area

b. Acres of prescribed burning within the Inventoried Roadless Area

c. Miles of road maintained within Inventoried Roadless Area

d. Effect on wilderness attributes with focus on apparent naturalness and natural integrity

Issue 2: Effects to Wildlife Habitat

Potential effects identified by the public: Respondents believe that the proposed action could disturb numerous wildlife species and could harm a wide spectrum of habitat.

> **Resolution:** Develop alternative 3 to reduce effects to wildlife and wildlife habitat, and develop indicators used to measure and analyze the effects of the proposed activities on threatened, endangered, sensitive, and management indicator species as well as migratory birds.

Effects indicators:

a. Acres of mapped lynx habitat converted to stand initiation stages.

b. Acres of treated forest and non-forest cover that provide habitat for migratory birds.

c. Acres of goshawk nesting habitat converted to an unsuitable condition.

d. Number of units treated to reduce snags that occur at high density within a 200-foot corridor in defense zone units.

e. Units and acres of ungulate habitat valuable as cover, but converted to forage-producing habitat.

f. Brewer's sparrow habitat (sagebrush) converted to sparse sagebrush, grassland, or forbland.

g. Acres of old growth converted to early-successional stages (forest plan standard).

h. Acres of mature boreal forest treated; a measure of potential effects on boreal owls and other wildlife associated with mature boreal forest habitat.

i. Acres of potential forest habitat of flammulated owl, great gray and boreal owl treated by thinning and fire.

j. Miles of temporary roads potentially used by predators that compete during winter for snowshoes hares, the principal prey of Canada lynx.

k. Treated habitat (acres) for all species studied in detail.

These issues are addressed in this analysis through alternatives that would reduce or eliminate the potential significant effects identified in public comments.

- Alternative 1 – No Action. None of the activities proposed in this analysis would occur. This alternative continues current management in the project area but does not preclude future proposed actions and analyses similar to this project.
- Alternative 3 -- Reduce Potential Impacts to Special Areas and Wildlife Habitat. This alternative was developed specifically to address the public issues related to the wilderness study area and inventoried roadless areas, and concerns related to wildlife habitat in the project area. The objectives of this alternative are to (1) preserve wilderness character over the long term by reducing human manipulation in the wilderness study area and inventoried roadless areas, and (2) reduce effects to a range of habitat present in the project area.

Non-significant Issues

Many commenters predicted adverse environmental consequences resulting from the proposed activities, however these are categorized as non-significant issues because the predicted effects would be reduced or would not occur at all because of the project's design and compliance with law, regulation, and policy that protect natural resources.

Non-significant issues are addressed in the analysis with one or more of the following:

- Management direction
- Best available science
- Site-specific assessments and data
- Project design features
- Effects indicators
- No-action alternative

The analysis of effects for resources were evaluated by resource specialists using management direction, current science, data, field visits, and professional expertise are disclosed in chapter 3. The results of this analysis highlights the differences in effects among the alternatives studied in detail.

The analysis of public comments, project issues, and Forest Service responses are detailed in the two scoping reports (noted above) in the project record.

Consultation with Tribes

The schedule of proposed actions with the Teton to Snake Project listing was sent to the Eastern Shoshone Tribe at Fort Washakie, Wyoming, and the Shoshone-Bannock Tribes at Fort Hall, Idaho, in 2010 and 2011. The Forest Service discussed the project proposal with a representative of the Eastern Shoshone Tribe on September 2, 2010. The tribe's main concern was to protect the obsidian vent located in the project area, which the Forest Service addressed by dropping activities in that vicinity under alternative 3. The Shoshone-Bannock Tribes submitted no project concerns.

Chapter 2. Alternatives

Introduction

This section describes and compares the alternatives considered for the Teton to Snake Fuels Management Project. It describes alternatives considered in detail alternatives considered but eliminated from detailed study are documented in the project record and summarized at the end of this chapter.

The development of alternatives and the subsequent environmental analysis conducted for this project use geospatial data and a variety of tools that manipulate the data and contribute to the analysis. Acreages, miles, and mapping are as accurate as possible, but some minor deviations due to rounding and differences in software may occur, and may appear in this document or the supporting documentation. These differences do not affect the accuracy of the analysis or the conclusions regarding environmental effects.

Alternatives Considered in Detail

This analysis includes detailed study of the no-action alternative (alternative 1) and two action alternatives (alternatives 2 and 3).

- Alternative 1(no action) represents the current condition, including the continuation of fire suppression in the project area. This alternative serves as a baseline for comparison among the alternatives.
- Alternative 2 is the modified proposed action which was developed to meet the purpose and need as described in chapter 1.
- Alternative 3 was developed in response to issues identified during scoping. The decision to develop and study a new alternative was made by the responsible official based upon the purpose and need, the scope of the environmental impact statement, and issues raised by the public and the interdisciplinary team.

Description of Alternatives

Each action alternative (alternatives 2 and 3) is comprised of the following actions:

1. **Proposed Treatments:** thinning from below, conifer removal in aspen, snag removal in dense areas, and prescribed fire. Thinning units include follow-up treatment of activity fuels. See “Treatment Objectives and Definitions” in chapter 2 for a description of these actions.
2. **Connected Actions:** road work, landings, and fire control line activities necessary to implement the proposed treatments.
3. **Project Design Features:** Additional site-specific actions to further protect resources and enhance safety during project implementation.

Additional Information about the Alternatives

In addition to the information provided below in the alternative descriptions, further detail and maps for each alternative are found in the appendices: Appendix A: Alternative Maps; Appendix B: Project Design Features; and Appendix C: Treatment Costs and Unit Details.

Elements Common to the Action Alternatives (Alternatives 2 and 3)

1. Each alternative assumes that other adjacent Federal lands would be managed according to their existing management plans and applicable Federal laws. Each alternative also assumes that activities on state, county, and private lands would meet applicable state and Federal land use regulations.
2. Firewise—the Forest Service would continue to provide information and education to homeowners to assist them in reducing losses due to wildfire. This applies to the no-action alternative as well.
3. Accessing treatment units—thinning units would be reached via state, local, and Forest Service roads. Prescribed fire units which are not near a road would be reached primarily by foot. Helicopter transport for personnel may be used to reach the backcountry units.
4. Snag density would be reduced within a 200-foot corridor in the defense zone units where firefighters would likely be deployed in the event of a wildfire approaching the private homes on the east side of the project area. Specific units affected are listed below in the alternative descriptions.
5. Specific roads proposals are listed below in the alternative descriptions. The actions are defined as follows:
    a. *New Construction*: Temporary roads built to a minimum standard for temporary equipment and vehicle access to treatment units. These would be decommissioned and obliterated following project use.
    b. *Obliteration*: Ripping, re-contouring, and seeding exposed mineral soil to reduce compaction; placing slash and other large woody debris on the surface to reduce soil erosion; constructing waterbars to reduce erosion, and effectively closing to off-highway vehicle use. This applies to all temporary roads, landings and skid trails.
    c. *General Maintenance*: Surface blading, ditch cleaning and reshaping, roadside brushing, aggregate placement, installation of drain dips and cross drains for surface erosion control, minor culvert cleaning or installation, dust abatement, mulching and seeding of disturbed areas.
    d. *Reconstruction*: Realignment, curve widening, clearing and grubbing, excavation work to accommodate safe use of product haul and equipment transport vehicles, establishing road template, major drainage structure installation, and general maintenance activities as described above.
6. Landings—all landing locations would adhere to best management practices to protect resources. Landings are generally about one-half to three-quarter acres in size. All landings would be obliterated after use by ripping, re-contouring, water-baring as needed, scattering slash, and seeding.
7. Fire control lines—fire control lines include but is not limited to black line, hand line, pruning, mowing, saw line and hose lays. The type of control line used in prescribed fire units is dependent on the specific topography, vegetation, and proximity to structures, as well as the time of year and weather conditions. Existing trails, ridgelines, areas of thinner vegetation, and hose-lays would be used as control lines where possible, requiring little to no preparation to contain fire within the unit boundaries. If constructed control lines (handlines scraped to mineral soil) are needed to minimize fire spread or protect resources, crews would use minimum impact techniques and the soil disturbance would generally be no wider than 24 inches. Specific units affected are listed below in the alternative descriptions.

Treatment Objectives and Definitions

Mechanical thinning units would either be noncommercial or a combination of commercial and noncommercial. All thinning would be "from below," which primarily retains larger trees over smaller

trees, except to retain species in this order of priority: whitebark and limber pine, aspen, Douglas-fir, lodgepole pine, Engelmann spruce, and subalpine fir. This priority order may be adjusted to address treatment objectives and site-specific and stand-specific factors.

Thinning objectives include reducing aerial fuels (smaller trees and lower branches) to reduce the potential for ground fires to climb into larger tree canopies. Thinning objectives also include reducing the potential for active crown fires, which entails removing some commercial-sized trees to prevent fires from moving from tree to tree through overstory tree crowns.

Most to all younger trees in close proximity of large (greater than 20 inches dbh) and old Douglas-fir and Engelmann spruce would be removed. Retain whitebark and limber pine trees. The cutting distance would be established and defined in stand/unit prescriptions.

Post-thinning tree densities would vary between and within stands due to variation in tree species and sizes, but in general the noncommercial thin stands would have 70 to 200 trees per acre remaining, and the commercial thinning stands would have 60 to 140 trees per acre remaining.

All conifers in and around aspen clones would be thinned to release suppressed aspen. Cut-tree-diameter limits and cutting distance from the aspen would be established and defined in unit prescriptions, but in general conifers would be cut up to 15 inches dbh in commercial thin units and up to 9 inches dbh in noncommercial thin units. Trees would be removed up to a distance of two tree heights from the outside edge of the aspen clone.

Branches and other woody debris remaining after thinning, pruning, or cutting trees and shrubs are known as “activity fuels,” and would be treated by pile and burn, lop and scatter, or underburning as described below. Activity fuel treatments for specific units are listed in table 6 and table 13.

Commercial thin: Cut and remove trees for a commercial product. Cut trees would be yarded to landings and hauled to mills. Tree cutting would be by machines such as a track-mounted feller-buncher and/or hand cut with chainsaws. All yarding would be ground-based and woody debris created by tree cutting would be piled by hand or machine and burned.

Noncommercial thin: Cut smaller trees up to 9 inches dbh and leave them on site. Where thinning creates low amounts of woody debris, branches would be cut off and the debris scattered. Where thinning creates greater amounts of woody debris, the debris would be hand piled and burned.

Cut-to-length: Cut-to-length is a harvesting system in which trees are cut, limbed, and the tops removed so that only the tree stems are yarded to landings.

Ground-based yarding: Thinned trees would be pulled from the site to landings by the use of ground-based machine such as a rubber tired skidder, forwarders, tracked skidder (dozer), or ATV.

Hand cut: Trees and/or shrubs would be cut or pruned using hand-carried machines (e.g., chainsaws).

Hand pile and burn: Fuels created by pruning, tree thinning or shrub thinning would be piled by hand and burned during conditions when risk of fire spread is low and when smoke would be adequately dispersed. Hand piles would be up to 6-feet high and 8 feet in diameter and would be placed as far from the canopy drip-line of trees as possible to prevent scorch.

Lop and scatter: Downed trees and tree limbs would be cut by hand and the material dispersed to reduce fuel concentrations.

Machine cut: Trees would be cut by a ground-based machine such as a track-mounted feller-buncher, but on occasion, hand cutting may be necessary.

Machine pile and burn: Fuels created by tree thinning would be piled by machine and burned during conditions when risk of fire spread is low and when smoke would be adequately dispersed. Piles would be placed as far from the canopy drip-line of trees as possible to prevent scorch. The operation could use a track-mounted excavator with a grapple to pile hand-cut trees, or it could be the use of a track-mounted feller-buncher to cut and pile trees.

Prune: Remove branches in standing trees to reduce ladder fuels. Trees would be pruned by hand to a height of 10 feet or up to one-third of the tree height, whichever is less.

Underburn: Controlled burning in forest stands to reduce natural fuel loads, activity fuels, shrubs, and understory trees.

Whole tree yard: A harvesting system in which whole trees are yarded to the landing with limbs and tops attached. In the case where the entire tree is too large to be yarded as one piece, the trees would be cut into log-length sections and yarded with the tops and limbs attached.

Prescribed fire: The objectives are to reduce potential wildfire behavior using mixed-severity fire to create a mosaic of burned and unburned areas.

Burn plans would be developed for each treatment unit prior to ignition and would document site-specific objectives and implementation guidelines and would identify parameters for weather, air quality, contingency resources, other resource concerns, equipment needs, and responses for potential escapes.

Ignition of prescribed fire units would be by ground or air. Ground ignition includes hand-firing devices such as drip torches and fusees. Aerial ignition would either be by plastic sphere dispenser or helitorch.

Snag Removal: The proposed treatments would not remove all snags Most large-diameter snags would be retained as part of the project design. Individual, selected snags would be removed:

1. where they present a direct hazard to field crews,
2. in a 200-foot corridor in the defense zone for firefighter safety,
3. where it is absolutely necessary to remove a snag in order to meet fuel reduction objectives, and
4. along intermittent portions of prescribed fire boundaries where fire line construction is a necessary part of the prescription.

Alternative 1 – No-action

Under the no-action alternative, no treatments would occur in the project area as proposed. The current Forest Plan would continue to guide management activities across the project area. Of note is that although the Forest Plan allows for wildfires to burn and play their natural role in the ecosystem, direction also requires protection of utilities and property; if the no-action alternative is selected, under most circumstances managers would continue to suppress wildfires in this project area due to the site conditions and values at risk within and near the project area.

While the no-action alternative does not meet the purpose and need for the project as described in the “Purpose and Need for Action” section, it does respond to all issues raised by the public by eliminating the potential environmental effects of the proposed action, including human manipulation in the Palisades wilderness study area with the exception of continued fire suppression and the inventoried roadless areas.

In addition, the Forest's fire managers and partners would continue to provide support to landowners to enhance defensible space on private lands using the Firewise program. The no-action alternative does not preclude future proposals in the project area

Alternative 1 Includes the Following

1. **Proposed treatments:** No treatments would occur. No change would be made to existing potential fire behavior, firefighter safety would not be enhanced through snag removal, and wildfires would continue to be suppressed under most circumstances, including those within the Palisades wilderness study area.
2. **Connected actions:** No road work, landings, or construction of fire control lines would occur.
3. **Project design features:** Firewise assistance to homeowners would continue (design feature FP-1 in appendix B). No other design features would be implemented for this project; however, Forest Plan standards and guides and other law, regulation, and policy required for national forest management would continue to be implemented for other activities in the project area.

Alternative 2 – Modified Proposed Action

The proposed action was developed to meet the purpose and need to reduce fire behavior, allow natural processes to operate, and enhance firefighter safety in the project area.

Specific treatment units were selected based on site conditions including vegetation and fuel loads, potential fire behavior, access, topography, proximity to private land, subdivisions, and other values at risk, and relationship to other units and whether or not treatment would contribute to meeting the purpose and need efficiently and effectively.

Alternative 2 Proposed Treatments

All treatments contribute to the overall purpose and need to reduce fire potential in the project area to provide options in the future for allowing fire to play its natural role on the landscape (table 6). Thinning treatments are proposed primarily in the defense zone to reduce potential fire behavior (Flame lengths and Crown fire activity). Prescribed fire is proposed in the threat zone in areas chosen to reduce existing fire behavior and to enhance aspen which would make wildfires easier to suppress if needed. Aspen enhancement treatments are prescribed in areas where conifers are threatening aspen vitality and age class diversity.

Table 6. Alternative 2 proposed treatments

Map Label	Unit Name	Total Treatment Acres	Primary Treatment	Treatment of Activity Fuels in Thinning Units
PF-01	Phillips Canyon Rx Burn Unit 1	1,161	Prescribed fire	NA
PF-02	North Fork Phillips Canyon Rx Burn Unit 1	1,875	Prescribed fire	NA
T-03	Phillips Bench Unit 2	159	Non-commercial thin Hand cut	Hand pile and burn
T-04	Phillips Bench Unit 7	138	Non-commercial thin Hand cut	Hand pile and burn

Map Label	Unit Name	Total Treatment Acres	Primary Treatment	Treatment of Activity Fuels in Thinning Units
T-05	Phillips Bench Unit 1	64	Non-commercial thin; commercial thin; machine cut OR hand cut; ground-based yarding	Machine pile and burn OR hand pile and burn
T-06	Phillips Bench Unit 5	194	Non-commercial thin; commercial thin; machine cut OR hand cut; ground-based yarding	Machine pile and burn OR hand pile and burn
T-07	Phillips Bench Unit 3	8	Non-commercial thin Hand cut	Hand pile and burn
T-08	Phillips Bench Unit 4	6	Non-commercial thin Hand cut	Hand pile and burn
T-09	Phillips Bench Unit 6	104	Non-commercial thin Hand cut	Hand pile and burn
T-10	Powerline Unit 1	259	Non-commercial thin Hand cut	Hand pile and burn
T-11	Recreation Trail Unit 2	175	Non-commercial thin Prune; hand cut	Hand pile and burn; lop and scatter
PF-12	Black Canyon Rx Burn Unit 2	270	Prescribed fire	NA
PF-13	Black Canyon Rx Burn Unit 1	612	Prescribed fire	NA
T-14	Recreation Trail Unit 1	16	Non-commercial thin hand cut	Hand pile and burn
T-15	Recreation Trail Unit 4	34	Non-commercial thin; Hand cut	Hand pile and burn
T-16	Recreation Trail Unit 3	46	Non-commercial thin Hand cut	Hand pile and burn
T-17	Recreation Trail Unit 7	41	Non-commercial thin Prune; hand cut	Hand pile and burn; lop and scatter
T-18	Recreation Trail Unit 6	40	Non-commercial thin Prune; hand cut	Hand pile and burn; lop and scatter
T-19	Recreation Trail Unit 5	46	Non-commercial thin; Prune; hand cut	Hand pile and burn; lop and scatter
PF-20	Mosquito Creek North Rx Unit	2,639	Prescribed fire	NA
T-21	Singing Trees Unit 1	113	Non-commercial thin Hand cut Option to underburn to promote aspen	Hand pile and burn
PF-22	Singing Trees Rx Burn Unit 1	417	Prescribed fire	NA
T-23	Singing Trees Unit 2	70	Non-commercial thin Hand cut Option to underburn to promote aspen	Hand pile and burn

Map Label	Unit Name	Total Treatment Acres	Primary Treatment	Treatment of Activity Fuels in Thinning Units
PF-24	Singing Trees Rx Burn Unit 2	174	Prescribed fire	NA
T-25	Singing Trees Unit 4	44	Non-commercial thin; Hand cut	Hand pile and burn
PF-26	Singing Trees Rx Burn Unit 3	464	Prescribed fire	NA
PF-27	Taylor Mtn. Rx Burn Unit 5	268	Prescribed fire	NA
PF-28	Taylor Mtn. Rx Burn Unit 3	1,626	Prescribed fire	NA
PF-29	Taylor Mtn. Rx Burn Unit 4	384	Prescribed fire	NA
PF-30	Taylor Mtn. Rx Burn Unit 2	411	Prescribed fire	NA
T-31	Highland Hills Unit 1	69	Non-commercial thin Hand cut	Hand pile and burn; underburn[1]
PF-32	Highland Hills Rx Burn	298	Prescribed fire	NA
T-33	Red Top Unit 1	398	Non-commercial thin; commercial thin; machine cut OR hand cut; ground-based yarding Portion of unit within the wilderness study area would be noncommercial. Option to underburn to promote aspen	Machine pile and burn OR hand pile and burn
PF-34	Trails End Rd Rx Burn	347	Prescribed fire	NA
T-35	Red Top Unit 2	72	Non-commercial thin; commercial thin; machine cut OR hand cut; ground-based yarding	Machine pile and burn OR hand pile and burn
T-36	Red Top Unit 5	166	Non-commercial thin Hand cut	Hand pile and burn
PF-37	South Fork Fall Creek Rx Burn	1,001	Prescribed fire	NA
T-38	Trails End Unit	111	Non-commercial thin Hand cut	Hand pile and burn
PF-39	Coburn Creek Rx Burn Unit 3	115	Prescribed fire	NA
PF-40	Coburn Creek Rx Burn Unit 2	991	Prescribed fire	NA
T-41	Red Top Unit 3	120	Non-commercial thin Hand cut	Hand pile and burn
PF-42	Coburn Creek Rx Burn Unit 1	1,556	Prescribed fire	NA

Map Label	Unit Name	Total Treatment Acres	Primary Treatment	Treatment of Activity Fuels in Thinning Units
T-43	Red Top Unit 4	33	Non-commercial thin Hand cut	Hand pile and burn
PF-44	Fall Creek Ranch Rx Burn Unit 1	735	Prescribed fire	NA
PF-45	Fall Creek Ranch Rx Burn Unit 2	332	Prescribed fire	NA
PF-46	Wilson Fall Creek Rx Burn	396	Prescribed fire	NA
PF-47	Munger Mtn. Rx Unit 1	1,663	Prescribed fire	NA
PF-48	Munger Mtn. Rx Burn Unit 2	2,256	Prescribed fire	NA

Reduce Snag Density in Defense Zone for Firefighter Safety

The following units (table 7) would be treated to reduce snags in areas of high density within a 200-foot corridor in defense zone units where firefighters would likely be working in the event of a future wildfire.

Table 7. Alternative 2 units treated to reduce snag density as needed

Map Label	Unit Name
PF-02	North Fork Phillips Canyon Rx Burn Unit 1
T-03	Phillips Bench Unit 2
T-04	Phillips Bench Unit 7
T-05	Phillips Bench Unit 1
T-06	Phillips Bench Unit 5
T-07	Phillips Bench Unit 3
T-08	Phillips Bench Unit 4
T-09	Phillips Bench Unit 6
T-10	Powerline Unit 1
T-11	Recreation Trail Unit 2
PF-12	Black Canyon Rx Unit 2
T-14	Recreation Trail Unit 1
T-15	Recreation Trail Unit 4
T-16	Recreation Trail Unit 3
T-17	Recreation Trail Unit 7
T-18	Recreation Trail Unit 6
T-19	Recreation Trail Unit 5
T-21	Singing Trees Unit 1
T-23	Singing Trees Unit 2
PF-24	Singing Trees Rx Burn Unit 2
T-25	Singing Trees Unit 4
PF-26	Singing Trees Rx Burn Unit 3
PF-29	Taylor Mountain Rx Burn Unit 4
PF-30	Taylor Mountain Rx Burn Unit 2
T-31	Highland Hills Unit 1
PF-32	Highland Hills Rx Burn Unit
PF-34	Trails End Road Rx Burn Unit
T-35	Red Top Unit 2
T-36	Red Top Unit 5
T-38	Trails End Unit
PF-39	Coburn Creek Rx Burn Unit 3
PF-40	Coburn Creek Rx Burn Unit 2
T-41	Red Top Unit 3
T-43	Red Top Unit 4
PF-45	Fall Creek Ranch Rx Burn Unit 2
PF-47	Munger Mountain Rx Burn Unit 1
PF-48	Munger Mountain Rx BurnUnit 2

Treatments in Special Areas

Table 8 notes the acres of treatment proposed on national forest system lands by special land allocations. The “Total Treatment Acres” column includes general forest lands as well as lands in special land allocations (defense zone, wilderness study area, and inventoried roadless areas), which are broken out and displayed in the columns 4, 5, and 6.

Note that because the defense zone, wilderness study area, and inventoried roadless areas overlap in places, some acres are accounted for in more than one of those land allocation columns.

Figure 3 displays the proposed treatments in relation to the wilderness study area, inventoried roadless areas, and defense zone. See the alternative 2 map set in appendix A for greater detail.

Table 8. Alternative 2 proposed treatment units with acres by special land allocations

Map Label[a]	Unit Name	Total Treatment Acres	Treatment Acres in Defense Zone	Treatment Acres in Wilderness Study Area	Treatment Acres in Inventoried Roadless Areas
PF-01	Phillips Canyon Rx Burn Unit 1	1,161	0	0	1,146
PF-02	N. Fork Phillips Canyon Rx Burn Unit 1	1,875	162	0	1,867
T-03	Phillips Bench Unit 2	159	158	0	140
T-04	Phillips Bench Unit 7	138	138	0	127
T-05	Phillips Bench Unit 1	64	64	0	17
T-06	Phillips Bench Unit 5	194	146	0	7
T-07	Phillips Bench Unit 3	8	8	0	0
T-08	Phillips Bench Unit 4	6	6	0	0
T-09	Phillips Bench Unit 6	104	87	0	0
T-10	Powerline Unit 1	259	259	161	0
T-11	Recreation Trail Unit 2	175	172	0	0
PF-12	Black Canyon Rx Burn Unit 2	270	4	270	0
PF-13	Black Canyon Rx Burn Unit 1	612	0	612	0
T-14	Recreation Trail Unit 1	16	16	9	0
T-15	Recreation Trail Unit 4	34	34	0	0
T-16	Recreation Trail Unit 3	46	45	34	0
T-17	Recreation Trail Unit 7	41	40	40	0
T-18	Recreation Trail Unit 6	40	39	39	0
T-19	Recreation Trail Unit 5	46	45	46	0
PF-20	Mosquito Creek North Rx Burn Unit	2,639	0	2,630	0
T-21	Singing Trees Unit 1	113	113	112	0
PF-22	Singing Trees Rx Burn Unit 1	417	0	332	0
T-23	Singing Trees Unit 2	70	69	64	0

Map Label[a]	Unit Name	Total Treatment Acres	Treatment Acres in Defense Zone	Treatment Acres in Wilderness Study Area	Treatment Acres in Inventoried Roadless Areas
PF-24	Singing Trees Rx Burn Unit 2	174	1	173	0
T-25	Singing Trees Unit 4	44	42	2	0
PF-26	Singing Trees Rx Burn Unit 3	464	10	391	0
PF-27	Taylor Mtn. Rx Burn Unit 5	268	0	268	0
PF-28	Taylor Mtn. Rx Burn Unit 3	1,626	0	1,546	0
PF-29	Taylor Mtn. Rx Burn Unit 4	384	10	380	0
PF-30	Taylor Mtn. Rx Burn Unit 2	411	81	408	0
T-31	Highland Hills Unit 1	69	65	65	0
PF-32	Highland Hills Burn Rx	298	123	292	0
T-33	Red Top Unit 1	398	0	58	0
PF-34	Trails End Road Burn RX	347	91	122	0
T-35	Red Top Unit 2	72	72	0	0
T-36	Red Top Unit 5	166	166	86	0
PF-37	South Fork Fall Creek Rx Burn	1,001	0	1,001	0
T-38	Trails End Unit	111	110	51	0
PF-39	Coburn Creek Rx Burn Unit 3	115	46	113	0
PF-40	Coburn Creek Rx Burn Unit 2	991	160	986	0
T-41	Red Top Unit 3	120	120	58	0
PF-42	Coburn Creek Rx Burn Unit 1	1,556	0	1,556	0
T-43	Red Top Unit 4	33	33	0	0
PF-44	Fall Creek Ranch Rx Burn Unit 1	735	0	735	0
PF-45	Fall Creek Ranch Rx Burn Unit 2	332	95	162	0
PF-46	Wilson Fall Creek Rx Burn	396	0	67	0
PF-47	Munger Mtn. Rx Burn Unit 1	1,663	221	0	1,658
PF-48	Munger Mtn. Rx Burn Unit 2	2,256	203	0	2,186

a - Table Key: PF = Prescribed Fire; T = Thinning; Rx = Prescribed.

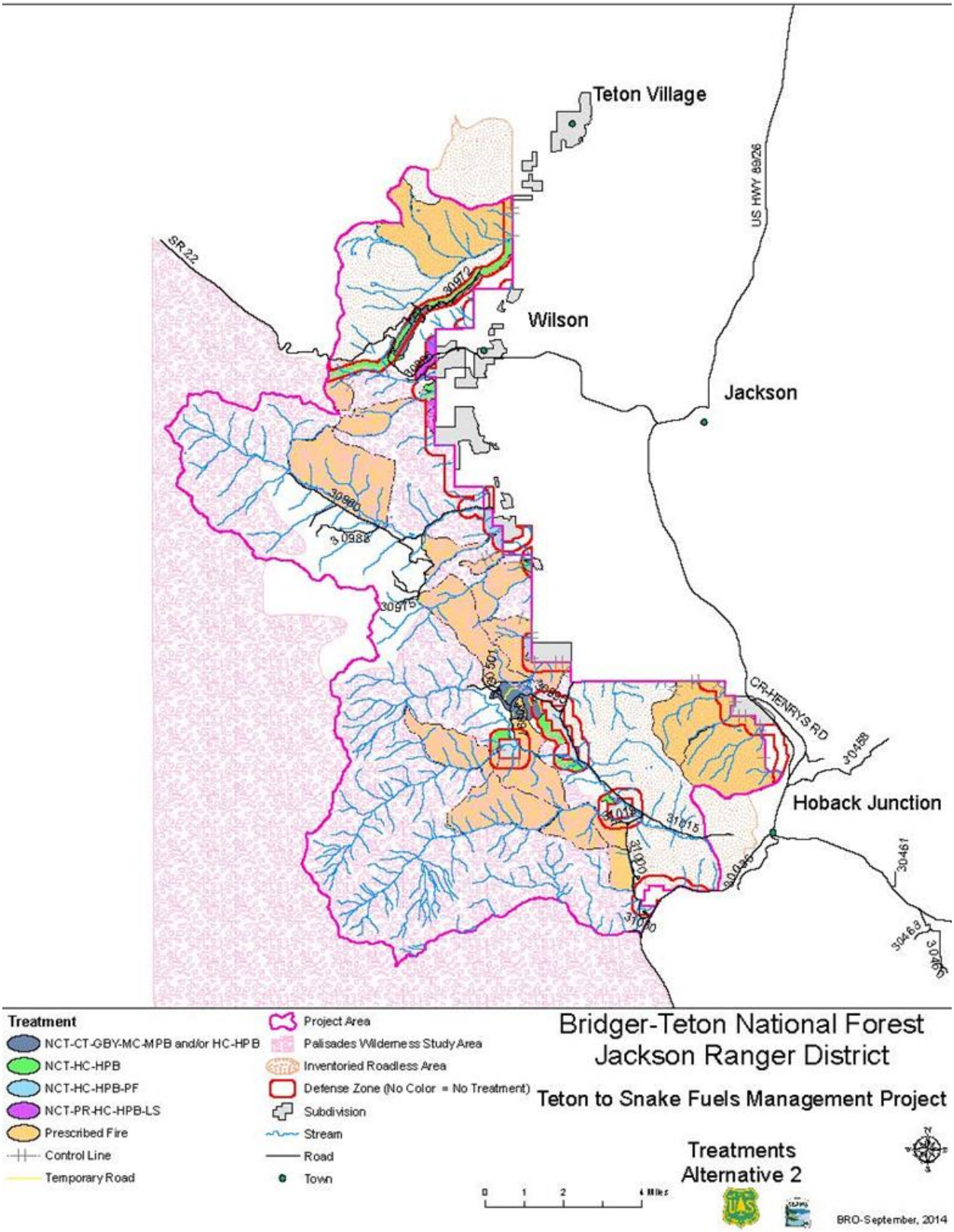


Figure 3. Overview of alternative 2 treatments

Note: See map key below and map set in appendix A for detailed unit maps.
Map Key: NTC = noncommercial thin; CT = commercial thin; HC = hand cut; MC = machine cut; HPB = hand pile and burn; MPB = machine pile and burn; PF = prescribed fire (also underburning in some noncommercial thin units); PR = prune; LS = lop and scatter; GBY = ground-based yarding. See “Treatment Objectives and Definitions” earlier in chapter 2.

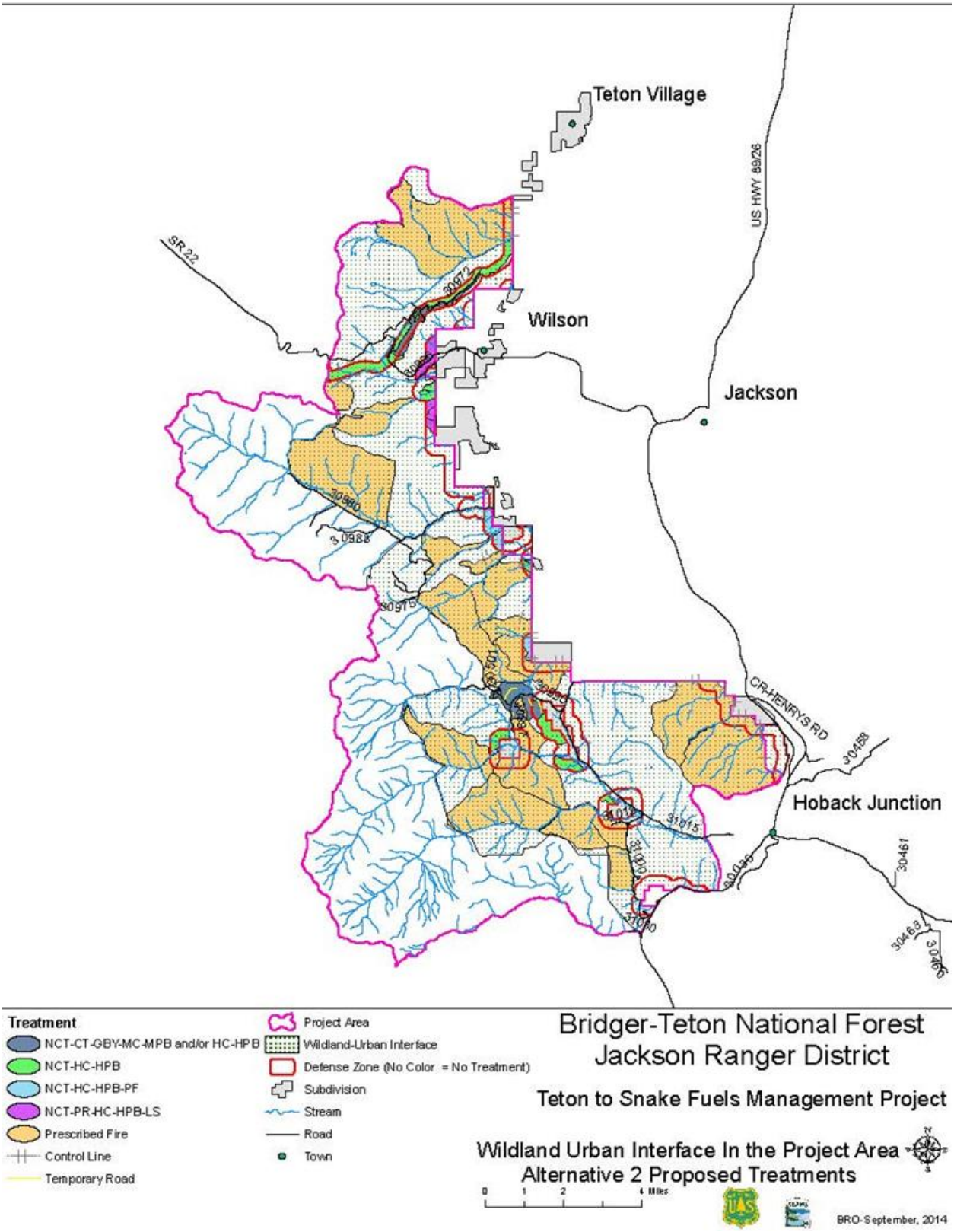


Figure 4. Overview of alternative 2 treatments showing the wildland-urban interface

Note: See map key below and map set in appendix A for detailed unit maps.
Map Key: NTC = noncommercial thin; CT = commercial thin; HC = hand cut; MC = machine cut; HPB = hand pile and burn; MPB = machine pile and burn; PF = prescribed fire (also underburning in some noncommercial thin units); PR = prune; LS = lop and scatter; GBY = ground-based yarding. See “Treatment Objectives and Definitions” earlier in chapter 2.

Connected Actions

The road work listed in table 9 is needed to implement the proposed commercial harvest units. Roads would be maintained, reconstructed, or constructed to allow access by the equipment needed to harvest trees and haul wood products from the project area. See “Elements Common to all Action Alternatives” above for a description of the road work. Refer to table 10 for estimated number of landings; table 11 shows proposed fire control lines.

Table 9. Alternative 2 proposed road work

Map Label	Access To	Road Name	Type	Road Work	Length (miles)
T-33	Red Top Unit 1	Forest Road 30992	Existing	General Maintenance	0.19
T-33	Red Top Unit 1	Forest Road 30997	Existing	General Maintenance	0.40
T-33	Red Top Unit 1	Forest Road 30995	Existing	General Maintenance	2.65
T-33 T-35	Red Top Units 1 and 2	Forest Road 31000	Existing	General Maintenance (deferred)	7.60
T-33	Red Top Unit 1	Temp. Rd. Red Top 1	New	Construction/Obliteration	0.45
T-35	Red Top Unit 2	Temp. Rd. Red Top 2	New	Construction/Obliteration	0.31
T-33	Red Top Unit 1	Short Temp. Rd. Red Top 1	New	Construction/Obliteration	0.09
T-33	Red Top Unit 1	Temp. Rd. Red Top 1	New	Construction/Obliteration	0.22
T-05 T-06	Phillips Bench Units 1 and 5	Forest Road 30972	Existing	Reconstruction/Maintenance	2.25
T-05	Phillips Bench Unit 1	Forest Road 30972B	Existing	Reconstruction/Maintenance	0.11
T-06	Phillips Bench Unit 5	Bonneville Power Administration Authorized Access Road	Existing	General Maintenance	0.99
	Phillips Bench Units 1 and 5 (access in inventoried roadless area)	Forest Road 30972	Existing	General Maintenance	1.50
Total					**16.76**

Table 10. Alternative 2 estimated number of landings

Map Label	Commercial Thin Unit	Estimated # Landings
T-06	Phillips Bench Unit 5	6
T-05	Phillips Bench Unit 1	4
T-33	Red Top Unit 1	18
T-35	Red Top Unit 2	4
Total		**32**

Table 11. Alternative 2 proposed fire control lines

Map Label	Unit Name	Length (miles)
PF-02	North Fork Phillips Canyon Rx Burn Unit 1	1.07
PF-12	Black Canyon Rx Burn Unit 2	0.50
PF-22	Singing Trees Rx Burn Unit 1	0.22
PF-24	Singing Trees Rx Burn Unit 2	1.01
PF-26	Singing Trees Rx Burn Unit 3	0.36
PF-28	Taylor Mountain Rx Burn Unit 3	0.25
PF-29	Taylor Mountain Rx Burn Unit 4	0.83
PF-30	Taylor Mountain Rx Burn Unit 2	0.36
PF-32	Highland Hills Rx Burn	1.23
PF-39	Coburn Creek Rx Burn Unit 3	0.26
PF-40	Coburn Creek Rx Burn Unit 2	0.78
PF-47	Munger Mountain Rx Burn Unit 1	2.92
PF-48	Munger Mountain Rx Burn Unit 2	1.32
Total		**11.11**

Design Features

See appendix B.

Alternative 3: Reduce Potential Impacts to Special Areas and Wildlife Habitat

Alternative 3 meets the purpose and need to reduce fire behavior and enhance firefighter safety in the project area while also addressing the following issues:

- Issue: Effects to wilderness study area and inventoried roadless areas.
- Issue: Effects to wildlife.

The remaining issues related to potential adverse effects from the proposed activities are addressed through implementation of specific design features that would reduce or eliminate adverse effects and by disclosure of effects in chapter 3 as measured by the effects indicators.

Alternative 3 was designed by modifying the proposed action (alternative 2) to reduce activities in the wilderness study area and inventoried roadless area, and to avoid goshawk habitat, whitebark pine, subalpine (boreal) forest, and old-growth habitat. Changes include dropping units, reducing the size of units, reconfiguring units, and changing treatment prescriptions. Alternative 3 results in a narrower margin of safety and a greater acceptance of risk for managing fire for resource benefit.

In addition to the above resource concerns, units were modified or dropped if they also had potential impacts to visual quality, implementation difficulty, or topography that could slow an advancing wildfire. Also considered was the proximity to homes and to other fuel reduction projects that could contribute to reducing fire behavior in the project area. Table 12 displays the unit modifications made in the development of alternative 3.

Table 12. Treatment unit modifications made to the proposed action to address issues in alternative 3

Map Label	Unit Name	Proposed Action Treatment (Alternative 2)	Modified for Alternative 3	Resource Concerns Addressed
T-04	Phillips Bench Unit 7	Non-commercial thin Hand cut Hand pile and burn	Add about 7 acres from Phillips Bench Unit 5 within the inventoried roadless area	NA
PF-42	Coburn Creek Rx Burn Unit 1	Prescribed fire	Add the southern portion of Coburn Creek Rx Burn Unit 3	NA
PF-30	Taylor Mtn. Rx Burn Unit 2	Prescribed fire	Added western portion of Highland Hills Unit 1 and the southern portion of Taylor Mtn. Rx Burn Unit 3	Goshawk habitat
T-05	Phillips Bench Unit 1	Non-commercial thin; commercial thin; machine cut OR hand cut; ground-based yarding Machine pile and burn OR hand pile and burn	Convert to noncommercial treatment only	inventoried roadless area
T-17	Recreation Trail Unit 7	Non-commercial thin prune; hand cut Hand pile and burn; lop and scatter	Drop entire unit	wilderness study area; Goshawk habitat; No homes nearby; Treated lands to the east
T-18	Recreation Trail Unit 6	Non-commercial thin Prune; hand cut Hand pile and burn; lop and scatter	Drop entire unit	wilderness study area Goshawk habitat; Treated lands to the east
PF-27	Taylor Mtn. Rx Burn Unit 5	Prescribed fire	Drop entire unit	Goshawk habitat; Boreal forest; Old growth
PF-32	Highland Hills Rx Burn	Prescribed fire	Drop entire unit	Goshawk habitat Visual quality
T-38	Trails End Unit	Non-commercial thin Hand cut Hand pile and burn	Drop entire unit	wilderness study area; Sparser vegetation to the east would slow fire spread
PF-40	Coburn Creek Rx Burn Unit 2	Prescribed fire	Drop entire unit	Goshawk habitat

Map Label	Unit Name	Proposed Action Treatment (Alternative 2)	Modified for Alternative 3	Resource Concerns Addressed
T-41	Red Top Unit 3	Non-commercial thin Hand cut Hand pile and burn	Drop entire unit	wilderness study area; Goshawk habitat Sparser vegetation in north would slow fire spread
PF-44	Fall Creek Ranch Rx Burn Unit 1	Prescribed fire	Drop entire unit	Goshawk habitat
PF-45	Fall Creek Ranch Rx Burn Unit 2	Prescribed fire	Drop entire unit	Goshawk habitat
PF-46	Wilson Fall Creek Rx Burn	Prescribed fire	Drop entire unit	No homes nearby; Treated lands to the south and west
PF-48	Munger Mtn. Rx Burn Unit 2	Prescribed fire	Drop entire unit	Goshawk habitat
PF-20	Mosquito Creek North Rx Burn Unit	Prescribed fire	Drop far western portion of the unit	Boreal forest
PF-28	Taylor Mtn. Rx Burn Unit 3	Prescribed fire	Drop middle part of the unit south of Taylor Creek drainage; shift the southern portion of the unit to Taylor Mtn. Rx Burn Unit 2	wilderness study area; Boreal forest; Old growth; Goshawk habitat
PF-01	Phillips Canyon Rx Burn Unit 1	Prescribed fire	Drop north portion (northerly aspect)	Whitebark pine; Goshawk habitat
PF-26	Singing Trees Rx Burn Unit 3	Prescribed fire	Drop northern portion of the unit	Goshawk habitat; Boreal forest
T-43	Red Top Unit 4	Non-commercial thin Hand cut Hand pile and burn	Drop northern portion of unit	wilderness study area; Goshawk habitat
T-10	Powerline Unit 1	Non-commercial thin Hand cut Hand pile and burn	Drop portion of unit within wilderness study area, and move boundary on uphill side to within 200 feet of utility corridor; add lop and scatter	wilderness study area
T-16	Recreation Trail Unit 3	Non-commercial thin Hand cut Hand pile and burn	Drop south half of the unit	wilderness study area; Goshawk habitat

Map Label	Unit Name	Proposed Action Treatment (Alternative 2)	Modified for Alternative 3	Resource Concerns Addressed
T-23	Singing Trees Unit 2	Non-commercial thin Hand cut Hand pile and burn; underburn	Drop southern half of the unit and post-thinning underburn	wilderness study area Goshawk habitat
T-19	Recreation Trail Unit 5	Non-commercial thin; Prune; hand cut Hand pile and burn; lop and scatter	Drop western half of unit	wilderness study area
T-03	Phillips Bench Unit 2	Non-commercial thin Hand cut Hand pile and burn	Drop western portion	Sparse vegetation and shrubs
PF-12	Black Canyon Rx Burn Unit 2	Prescribed fire	Goshawk, boreal, and old growth concerns	Goshawk habitat; Old growth; Visual quality; Implementation difficulty
PF-02	North Fork Phillips Canyon Rx Burn Unit 1	Prescribed fire	No change	NA
T-07	Phillips Bench Unit 3	Non-commercial thin Hand cut Hand pile and burn	No change	NA
T-08	Phillips Bench Unit 4	Non-commercial thin Hand cut hand pile and burn	No change	NA
T-09	Phillips Bench Unit 6	Non-commercial thin Hand cut Hand pile and burn	No change	NA
PF-13	Black Canyon Rx Burn Unit 1	Prescribed fire	No change	NA
T-14	Recreation Trail Unit 1	Non-commercial thin Hand cut Hand pile and burn	No change	NA

Map Label	Unit Name	Proposed Action Treatment (Alternative 2)	Modified for Alternative 3	Resource Concerns Addressed
T-15	Recreation Trail Unit 4	Non-commercial thin; Hand cut Hand pile and burn	No change	NA
PF-22	Singing Trees Rx Burn Unit 1	Prescribed fire	No change	NA
PF-24	Singing Trees Rx Burn Unit 2	Prescribed fire	No change	NA
T-25	Singing Trees Unit 4	Non-commercial thin; Hand cut Hand pile and burn	No change	NA
PF-29	Taylor Mtn. Rx Burn Unit 4	Prescribed fire	No change	NA
T-33	Red Top Unit 1	Non-commercial thin; commercial thin; machine cut OR hand cut; ground-based yarding; Portion of this unit within the wilderness study area would be noncommercial. Machine pile and burn OR hand pile and burn	No change	NA
PF-34	Trails End Rd Rx Burn	Prescribed fire	No change	NA
T-35	Red Top Unit 2	Non-commercial thin; commercial thin; machine cut OR hand cut; ground-based yarding; Machine pile and burn OR hand pile and burn	No change	NA
PF-37	South Fork Fall Creek Rx Burn	Prescribed fire	No change	NA
PF-47	Munger Mtn. Rx Unit 1	Prescribed fire	No change	NA
T-11	Recreation Trail Unit 2	Non-commercial thin Prune; hand cut Hand pile and burn; lop and scatter	Reduce portion of unit north of highway to 300 feet from private boundary; no change to unit south of highway	Fire would move uphill away from private boundary

Map Label	Unit Name	Proposed Action Treatment (Alternative 2)	Modified for Alternative 3	Resource Concerns Addressed
T-36	Red Top Unit 5	Non-commercial thin Hand cut Hand pile and burn	Reduce to 1/8 mile from private boundary	wilderness study area Goshawk habitat
T-21	Singing Trees Unit 1	Non-commercial thin Hand cut Hand pile and burn; underburn	Reduce unit to fit to wilderness study area boundary (until 600 feet of private); 600 feet of private on south; drop post-thinning underburn	wilderness study area Goshawk habitat
T-06	Phillips Bench Unit 5	Non-commercial thin; commercial thin; machine cut OR hand cut; ground-based yarding Machine pile and burn OR hand pile and burn	Shift northwest portion of the unit in the inventoried roadless area to Phillips Bench Unit 7, which is noncommercial only	inventoried roadless area; Goshawk habitat
PF-39	Coburn Creek Rx Burn Unit 3	Prescribed fire	Shift the southern portion to Coburn Creek Rx Burn Unit 1; drop the northern portion of the unit	Goshawk habitat; Implementation difficulty
T-31	Highland Hills Unit 1	Non-commercial thin Hand cut Hand pile and burn; underburn	Shift the western portion to Taylor Mtn. Rx Unit 2; drop post-thinning underburn in the eastern portion	wilderness study area Goshawk habitat

Alternative 3 Proposed Treatments

Table 13 displays the 35 treatment units proposed in alternative 3.

Table 13. Alternative 3 proposed treatments

Map Label	Unit Name	Total Treatment Acres	Primary Treatment	Treatment of Activity Fuels in Thinning Units
PF-01	Phillips Canyon Rx Burn Unit 1	594	Prescribed fire	NA
PF-02	North Fork Phillips Canyon Rx Burn Unit 1	1,875	Prescribed fire	NA
T-03	Phillips Bench Unit 2	141	Non-commercial thin Hand cut	Hand pile and burn
T-04	Phillips Bench Unit 7	145	Non-commercial thin Hand cut	Hand pile and burn
T-05	Phillips Bench Unit 1	64	Non-commercial thin Hand cut	Hand pile and burn
T-06	Phillips Bench Unit 5	188	Non-commercial thin; commercial thin; machine cut OR hand cut; ground-based yarding	Machine pile and burn OR hand pile and burn
T-07	Phillips Bench Unit 3	8	Non-commercial thin Hand cut	Hand pile and burn
T-08	Phillips Bench Unit 4	6	Non-commercial thin Hand cut	Hand pile and burn
T-09	Phillips Bench Unit 6	104	Non-commercial thin Hand cut	Hand pile and burn
T-10	Powerline Unit 1	147	Non-commercial thin Hand cut	Hand pile and burn
T-11	Recreation Trail Unit 2	97	Non-commercial thin Prune; hand cut	Hand pile and burn; lop and scatter
PF-13	Black Canyon Rx Burn Unit 1	612	Prescribed fire	NA
T-14	Recreation Trail Unit 1	16	Non-commercial thin Hand cut	Hand pile and burn
T-15	Recreation Trail Unit 4	34	Non-commercial thin; Hand cut	Hand pile and burn
T-16	Recreation Trail Unit 3	31	Non-commercial thin Hand cut	Hand pile and burn
T-19	Recreation Trail Unit 5	26	Non-commercial thin; Prune; hand cut	Hand pile and burn; lop and scatter
PF-20	Mosquito Creek North Rx Burn Unit	2,322	Prescribed fire	NA
T-21	Singing Trees Unit 1	69	Non-commercial thin Hand cut	Hand pile and burn

Map Label	Unit Name	Total Treatment Acres	Primary Treatment	Treatment of Activity Fuels in Thinning Units
PF-22	Singing Trees Rx Burn Unit 1	417	Prescribed fire	NA
T-23	Singing Trees Unit 2	40	Non-commercial thin Hand cut	Hand pile and burn
PF-24	Singing Trees Rx Burn Unit 2	174	Prescribed fire	NA
T-25	Singing Trees Unit 4	44	Non-commercial thin; Hand cut	Hand pile and burn
PF-26	Singing Trees Rx Burn Unit 3	297	Prescribed fire	NA
PF-28	Taylor Mtn. Rx Burn Unit 3	373	Prescribed fire	NA
PF-29	Taylor Mtn. Rx Burn Unit 4	384	Prescribed fire	NA
PF-30	Taylor Mtn. Rx Burn Unit 2	875	Prescribed fire	NA
T-31	Highland Hills Unit 1	29	Non-commercial thin Hand cut	Hand pile and burn
T-33	Red Top Unit 1	398	Non-commercial thin; commercial thin; machine cut OR hand cut; ground-based yarding Portion of unit within the wilderness study area would be noncommercial. Option to underburn to promote aspen	Machine pile and burn OR hand pile and burn
PF-34	Trails End Rd Rx Burn	347	Prescribed fire	NA
T-35	Red Top Unit 2	72	Non-commercial thin; commercial thin; machine cut OR hand cut; ground-based yarding	Machine pile and burn OR hand pile and burn
T-36	Red Top Unit 5	89	Non-commercial thin Hand cut	Hand pile and burn
PF-37	South Fork Fall Creek Rx Burn	1,001	Prescribed fire	NA
PF-42	Coburn Creek Rx Burn Unit 1	1,590	Prescribed fire	NA
T-43	Red Top Unit 4	8	Non-commercial thin Hand cut	Hand pile and burn
PF-47	Munger Mtn. Rx Unit 1	1,663	Prescribed fire	NA

Reduce Snag Density in Defense Zone for Firefighter Safety

The following units (table 14) would be treated to reduce snags in areas of high density within a 200-foot corridor in defense zone units where firefighters would likely be working in the event of a future wildfire.

Table 14. Alternative 3 units treated to reduce snag density as needed

Map Label	Unit
PF-02	North Fork Phillips Canyon Rx Burn Unit 1
T-03	Phillips Bench Unit 2
T-04	Phillips Bench Unit 7
T-05	Phillips Bench Unit 1
T-06	Phillips Bench Unit 5
T-07	Phillips Bench Unit 3
T-08	Phillips Bench Unit 4
T-09	Phillips Bench Unit 6
T-10	Powerline Unit 1
T-11	Recreation Trail Unit 2
T-14	Recreation Trail Unit 1
T-15	Recreation Trail Unit 4
T-16	Recreation Trail Unit 3
T-19	Recreation Trail Unit 5
T-21	Singing Trees Unit 1
T-23	Singing Trees Unit 2
PF-24	Singing Trees Rx Burn Unit 2
T-25	Singing Trees Unit 4
PF-26	Singing Trees Rx Burn Unit 3
PF-29	Taylor Mountain Rx Burn Unit 4
PF-30	Taylor Mountain Rx Burn Unit 2
T-31	Highland Hills Unit 1
PF-34	Trails End Road Rx Burn Unit
T-35	Red Top Unit 2
T-36	Red Top Unit 5
T-43	Red Top Unit 4
PF-47	Munger Mountain Rx Burn Unit 1

Treatments in Special Areas

Table 15 notes the acres of treatment proposed on national forest system lands by special land allocations. The “Total Treatment Acres” column includes general forest lands as well as lands in special land allocations (defense zone, wilderness study area, and inventoried roadless areas), which are broken out and displayed in the columns 4, 5, and 6.

Table 15 displays the proposed treatments in relation to the wilderness study area, inventoried roadless areas, and defense zone. See the alternative 3 map set in appendix A for greater detail.

Note that because the defense zone, wilderness study area, and inventoried roadless areas overlap in places, some acres are accounted for in more than one of those land allocation columns.

Table 15. Alternative 3 proposed treatment units with acres by special land allocations

Map Label[a]	Unit Name	Total Treatment Acres	Treatment Acres in Defense Zone	Treatment Acres in Wilderness Study Area	Treatment Acres in Inventoried Roadless Areas
PF-01	Phillips Canyon Rx Burn Unit 1	1,161	0	0	1,146
PF-02	N. Fork Phillips Canyon Rx Burn Unit 1	1,875	162	0	1,867
T-03	Phillips Bench Unit 2	159	158	0	140
T-04	Phillips Bench Unit 7	138	138	0	127
T-05	Phillips Bench Unit 1	64	64	0	17
T-06	Phillips Bench Unit 5	194	146	0	7
T-07	Phillips Bench Unit 3	8	8	0	0
T-08	Phillips Bench Unit 4	6	6	0	0
T-09	Phillips Bench Unit 6	104	87	0	0
T-10	Powerline Unit 1	259	259	103	0
T-11	Recreation Trail Unit 2	175	172	0	0
PF-12	Black Canyon Rx Burn Unit 2	270	4	0	0
PF-13	Black Canyon Rx Burn Unit 1	612	0	612	0
T-14	Recreation Trail Unit 1	16	16	9	0
T-15	Recreation Trail Unit 4	34	34	0	0
T-16	Recreation Trail Unit 3	46	45	20	0
T-17	Recreation Trail Unit 7	41	40	0	0
T-18	Recreation Trail Unit 6	40	39	0	0
T-19	Recreation Trail Unit 5	46	45	26	0
PF-20	Mosquito Creek North Rx Burn Unit	2,639	0	2,313	0
T-21	Singing Trees Unit 1	113	113	68	0
PF-22	Singing Trees Rx Burn Unit 1	417	0	332	0
T-23	Singing Trees Unit 2	70	69	35	0
PF-24	Singing Trees Rx Burn Unit 2	174	1	173	0
T-25	Singing Trees Unit 4	44	42	2	0
PF-26	Singing Trees Rx Burn Unit 3	464	10	223	0
PF-27	Taylor Mtn. Rx Burn Unit 5	268	0	0	0
PF-28	Taylor Mtn. Rx Burn Unit 3	1,626	0	330	0
PF-29	Taylor Mtn. Rx Burn Unit 4	384	10	380	0
PF-30	Taylor Mtn. Rx Burn Unit 2	411	81	835	0
T-31	Highland Hills Unit 1	69	65	25	0
PF-32	Highland Hills Burn Rx	298	123	0	0
T-33	Red Top Unit 1	398	0	58	0
PF-34	Trails End Road Burn RX	347	91	122	0

Map Label[a]	Unit Name	Total Treatment Acres	Treatment Acres in Defense Zone	Treatment Acres in Wilderness Study Area	Treatment Acres in Inventoried Roadless Areas
T-35	Red Top Unit 2	72	72	0	0
T-36	Red Top Unit 5	166	166	46	0
PF-37	South Fork Fall Creek Rx Burn	1,001	0	1,001	0
T-38	Trails End Unit	111	110	0	0
PF-39	Coburn Creek Rx Burn Unit 3	115	46	0	0
PF-40	Coburn Creek Rx Burn Unit 2	991	160	0	0
T-41	Red Top Unit 3	120	120	0	0
PF-42	Coburn Creek Rx Burn Unit 1	1,556	0	1,590	0
T-43	Red Top Unit 4	33	33	0	0
PF-44	Fall Creek Ranch Rx Burn Unit 1	735	0	0	0
PF-45	Fall Creek Ranch Rx Burn Unit 2	332	95	0	0
PF-46	Wilson Fall Creek Rx Burn	396	0	0	0
PF-47	Munger Mtn. Rx Burn Unit 1	1,663	221	0	1,658
PF-48	Munger Mtn. Rx Burn Unit 2	2,256	203	0	2,186

a - Table Key: PF = Prescribed Fire; T = Thinning; Rx = Prescribed.

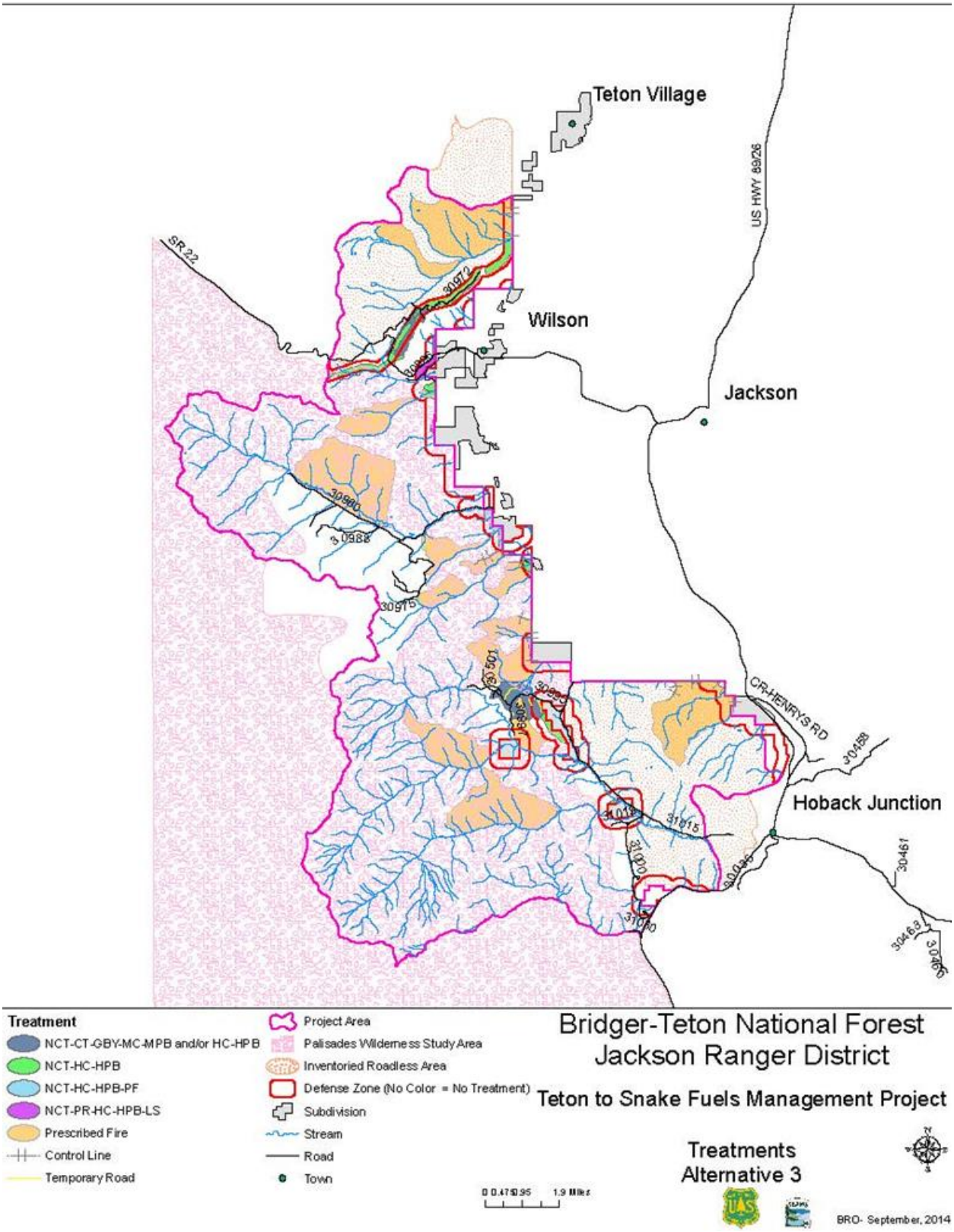


Figure 5. Overview of alternative 3 treatments with special area designations

Note: See map key below and map set in appendix A for detailed unit maps.
Map Key: NTC = noncommercial thin; CT = commercial thin; HC = hand cut; MC = machine cut; HPB = hand pile and burn; MPB = machine pile and burn; PF = prescribed fire (also underburning in some noncommercial thin units); PR = prune; LS = lop and scatter; GBY = ground-based yarding. See “Treatment Objectives and Definitions” earlier in chapter 2.

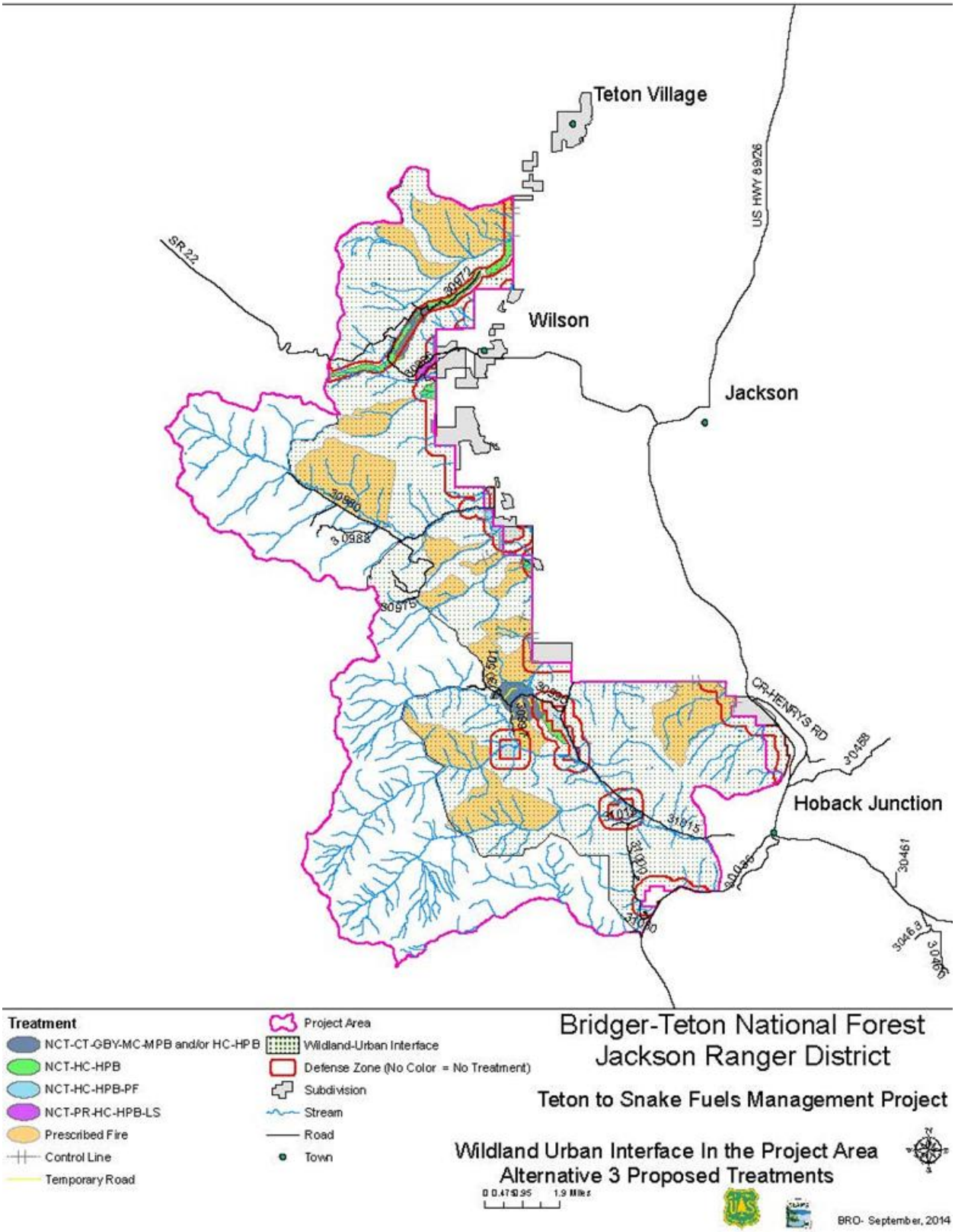


Figure 6. Overview of alternative 3 treatments showing the wildland-urban interface

Note: See map key below and map set in appendix A for detailed unit maps.
Map Key: NTC = noncommercial thin; CT = commercial thin; HC = hand cut; MC = machine cut; HPB = hand pile and burn; MPB = machine pile and burn; PF = prescribed fire (also underburning in some noncommercial thin units); PR = prune; LS = lop and scatter; GBY = ground-based yarding. See “Treatment Objectives and Definitions” earlier in chapter 2.

Connected Actions

The road work listed in table 16 is needed to implement the proposed commercial harvest units. Roads would be maintained, reconstructed, or constructed to allow access by the equipment needed to harvest trees and haul wood products from the project area. See “Elements Common to all Action Alternatives” above for a description of the road work. Refer to table 17 for estimated number of landings and proposed fire control lines.

Table 16. Alternative 3 proposed road work

Map Label	Access To	Road Name	Type	Road Work	Length (miles)
T-33	Red Top Unit 1	Temp. Rd. Red Top 1	New	Construction/Obliteration	0.45
T-35	Red Top Unit 2	Temp. Rd. Red Top 2	New	Construction/Obliteration	0.31
T-33	Red Top Unit 1	Short Temp. Rd. Red Top 1	New	Construction/Obliteration	0.09
T-33	Red Top Unit 1	Temp. Rd. Red Top 1	New	Construction/Obliteration	0.22
T-33	Red Top Unit 1	Forest Road 30992	Existing	General Maintenance	0.19
T-33	Red Top Unit 1	Forest Road 30997	Existing	General Maintenance	0.40
T-33	Red Top Unit 1	Forest Road 30995	Existing	General Maintenance	2.65
T-33 T-35	Red Top Units 1 and 2	Forest Road 31000	Existing	General Maintenance (deferred)	7.60
T-06	Phillips Bench Unit 5	Bonneville Power Administration Authorized Access Road	Existing	General Maintenance	0.99
T-05	Phillips Bench Unit 5	Forest Road 30972	Existing	Reconstruction/Maintenance	1.30
	Phillips Bench Unit 5 (access in inventoried roadless area)	Forest Road 30972	Existing	General Maintenance	0.40
Total					**14.6**

Table 17. Alternative 3 estimated number of landings and fire control lines

Map Label	Unit Designation	Amount
Landings	**Commercial Thin Unit**	**Estimated # Landings**
T-06	Phillips Bench Unit 5	5
T-33	Red Top Unit 1	18
T-35	Red Top Unit 2	4
Fire Control Lines	**Unit Name**	**Length (miles)**
PF-02	North Fork Phillips Canyon Rx Burn Unit 1	1.07
PF-22	Singing Trees Rx Burn Unit 1	0.22
PF-24	Singing Trees Rx Burn Unit 2	1.01
PF-26	Singing Trees Rx Burn Unit 3	0.36
PF-29	Taylor Mtn. Rx Burn Unit 4	0.83
PF-30	Taylor Mtn. Rx Burn Unit 2	0.36
PF-47	Munger Mtn Rx Burn Unit 1	2.92
Total Miles Fire Lines		**6.77**

Design Features Common to All Action Alternatives

See appendix B.

Comparison of Alternatives

The tables in this section (table 18 through table 21) display a variety of indicators comparing the extent of the actions, the differences among alternatives in addressing the key issues related to special areas and wildlife, and the degree to which the alternatives meet the purpose and need for this project. This is a partial list of all indicators of environmental effects used in this analysis—see the individual resource sections in chapter 3 for the remaining resource-specific alternative comparisons.

Table 18. Proposed activities by alternative

Proposed Activities	Alternative 1	Alternative 2	Alternative 3	Change from Alternative 2 to 3
Thinning (acres)	0	2,526	1,757	-769
Prescribed fire (acres)	0	19,991	12,524	-7,467
Reduced snag density in defense zone (# units)	0	37	27	-10
Road maintenance and reconstruction (miles)	0	15.69	13.53	-2.16
Temporary road construction and obliteration (miles)	0	1.07	1.07	0
Fire control line construction (miles)	0	11.1	6.8	-4.3
Landings (#)	0	32	27	-5

Table 19. Comparison of alternatives in addressing issue 1, effects to special areas

Indicator	Alternative 1	Alternative 2	Alternative 3
wilderness study area			
Acres of mechanical fuel treatment including new acres compared to 2003 treatment	0	825 acres (approximately 721 new treatment acres and 104 retreatment acres)	391 acres (approximately 294 new treatment acres and 97 retreatment acres)
Acres of prescribing burning including miles of fireline	0	12,042 acres (3.0 miles of fire line)	7,910 acres (1.6 miles of fire line)
Effect on potential for inclusion in National Wilderness Preservation System	Little effect	Little effect	Little effect
Effect on "presently existing wilderness character"	No effect in short-term; increasing decline in untrammeled and natural quality over long-term; 100 percent suppression but no active vegetation alternation	Short-term decline but long-term improvement in aspects of wilderness character; 50 percent suppression but more acres altered by cutting than baseline condition in 1984	Short-term decline but long-term improvement in aspects of wilderness character; 60 percent suppression but less acres altered by cutting than baseline condition in 1984
inventoried roadless areas			
Acres of mechanical fuel treatment	0	291 acres (all in Phillips inventoried roadless area)	273 acres (all in Phillips inventoried roadless area)
Acres of prescribing burning including miles of fireline	0	6,857 acres (in both inventoried roadless areas; 5.3 miles of fireline)	4,106 acres (in both inventoried roadless areas; (4.0 miles of fireline)
Miles of road work	0	1.5 miles (Phillips inventoried roadless area) (All maintenance)	0.4 miles (Phillips inventoried roadless area) (All maintenance)
Amount of commercial timber cut	0 MBF	0.2 MBF	0 MBF
Effect on wilderness attributes	No effect in near term, increasing effect on natural integrity in long term.	Beneficial effect on natural integrity in Munger Mountain inventoried roadless area: some adverse effect on apparent naturalness in Phillips Ridge inventoried roadless area in the short term (3 percent of area)	Beneficial effect on natural integrity in Munger Mountain inventoried roadless area; some adverse effect on apparent naturalness in Phillips Ridge inventoried roadless area in the short term (2.7 percent of the area but no use of ground-based machinery)

Table 20. Comparison of alternatives in addressing issue 2, effects to wildlife

Species	Primary Habitat Need and Limiting Factor	Alternative 1	Alternative 2	Alternative 3	Comments
Canada lynx	Lynx habitat condition in lynx analysis units	No short-term effect on lynx habitat; long-term detrimental effect of fire suppression	Detrimental in the short term to snowshoe hares, but compliant with Northern Rockies Lynx Management Direction based on wildland-urban interface.	Detrimental in the short-term to snowshoe hares, but compliant with Northern Rockies Lynx Management Direction. Preferred for Canada lynx. The direct effects of alternative 3 on lynx would be less project-related disturbance (truck and helicopter traffic) and mortality risk (vehicle-strike) because fewer acres are proposed for both prescribed fire and mechanical treatment.	Mechanical treatments are more detrimental to hares and lynx than prescribed fires.
Gray wolf	Available prey	No short-term changes in available prey; long-term detrimental effect of fire suppression.	Same for alternatives 2 and 3. Improved availability of prey for wolves.		
Grizzly bear	Large unroaded landscapes with a variety of foraging habitats	No potential project-related disturbances to bears. No foraging habitat improvement.	Same for alternatives 2 and 3. Foraging habitat improvement. The mechanical and prescribed fire treatments would produce favorable early seral habitat conditions within the historic range experienced by the species. Project is consistent with the recovery and delisting of grizzly bears in the Yellowstone Ecosystem and the Forest Plan objective of supporting the recovery of listed species.		
Yellow-billed cuckoo	Large cottonwood galleries with tall willows	No effect	Same for alternatives 2 and 3. Suitable habitat consists of large cottonwood galleries with tall willows. None of these habitats would be modified. Cuckoos are not known or expected to be present within treatment areas.		
Bald eagle	Nesting along large lakes and rivers	No short-term effect; detrimental long-term effect on bald eagle hunting and scavenging through fire suppression.	Same for alternatives 2 and 3. Prescribed fires cause some loss of snags and live trees that could be used as occasional roosts or perchs. Determination: MIIH.		

Species	Primary Habitat Need and Limiting Factor	Alternative 1	Alternative 2	Alternative 3	Comments
Three –toed woodpecker	Decadent timber	No short-term effect; mixed positive and negative effects of long-term fire suppression.	Negative effects of mechanical treatments; positive effects of prescribed fires. Determination: MIIH	Preferred for woodpecker. Treats 27 percent fewer safety corridors in defense zone units for snag removal (36 percent fewer acres) compared to alternative 2. Determination: MIIH.	The small losses of snags that may occur through mechanical treatments are expected to be offset by retention of existing large snags, new foraging and nesting habitat created by prescribed fire, and new habitat that is being created across the landscape by the current mountain pine beetle epidemic.
Northern goshawk	Nesting habitat in dense mid-size timber with minimal understory	No short-term effect; contributed to long-term risk of high-intensity fires that reduce nesting habitat.	2,806 acres negatively affected by prescribed burn and mechanical treatments. Determination: MIIH	Preferred for goshawk. 272 acres negatively affected by modified through prescribed burn and mechanical treatments. Determination: MIIH	In alternative 3, boundaries of some prescribed fire and mechanical treatments were redrawn and some units dropped completely to avoid treatments (66 percent fewer than alternative 2) in forested areas of goshawk nesting habitat.
Boreal owl	Dense spruce-fir and nesting cavities in forested areas.	No short-term effect; contributes to long-term risk of high-intensity fires that reduce nesting habitat.	385 acres of mature subalpine forests affected (more important habitat to boreal owls). 2,516 total acres of subalpine forest affected. Determination: MIIH.	Preferred for boreal owls. 87 acres of mature subalpine forests affected (more important habitat to boreal owls), 77 percent reduction from alternative 2. 1,730 total acres of treated subalpine forest; a 31 percent reduction from alternative 2. Determination: MIIH.	Both action alternatives may impact individuals, but no trend toward loss of viability.

Species	Primary Habitat Need and Limiting Factor	Alternative 1	Alternative 2	Alternative 3	Comments
Great gray owl	Mature forest with moderate to lower stand densities and adjacent to large meadows.	No short-term effect; mixed positive and negative effects of long-term fire suppression.	Slightly preferred for great gray owls. Treats and improves 6,800 acres in lodgepole pine habitat preferred by great gray	Treats and improves 3,600 acres in lodgepole pine habitat preferred by great gray owls. Determination: MIIH	Both alternatives result in small to moderate improvements of great gray owl habitat by improving foraging opportunities through a reduction in stand density within forested habitat. Design features (WL-6, WL-7) would be implemented to protect the great gray owl and its habitat.
Flammulated owl	Open pine forests with cavities.	No short-term effect Long-term habitat loss through succession and/or high intensity fire.	Slightly preferred for flammulated owls. Treats and improves 13,389 acres of forested habitat. This is 71 percent more than alternative 3; however, the degree to which the species would benefit is undetermined. Determination: MIIH.	Treats and improves 7,823 acres of forested habitat. Determination: MIIH.	Both alternatives result in small to moderate improvements of flammulated owl habitat by improving foraging opportunities through a reduction in stand density within forested habitat.
Columbia spotted frog; boreal toad	Streams and ponds where present.	No short-term effect; mixed positive and negative effects of long-term fire suppression.	Minimal negative effects of alternatives 2 and 3. The project is designed to include no-treatment buffers within 100 to 300 feet of wetlands, streams, and riparian areas which is the habitat most occupied by amphibians and most important to reproduction. Known breeding areas are avoided. Both action alternatives may impact individuals, but no trend toward loss of viability. Determination for both alternatives: MIIH.		
Wolverine	High alpine talus slopes and tundra.	No short-term effect; negative long-term effect of fire suppression on prey and carrion.	Minimal negative effects of alternatives 2 and 3. The project poses no risk of mortality to individuals, nor do they pose a risk of modifying occupancy or use within a home range. Determination for both alternatives: MIIH.		

Species	Primary Habitat Need and Limiting Factor	Alternative 1	Alternative 2	Alternative 3	Comments
Brewer's sparrow	Sagebrush shrublands	No short-term effect; long term decline in habitat through encroachment and successional changes.	Minimal negative effects of alternatives 2 and 3. Slight improvements in potential habitat where low- to moderate-severity prescribed fire would enhance age class diversity of sagebrush communities by removing encroaching tree species and some late/old seral and decadent sagebrush. A design feature would reduce the extent of sagebrush burning in large stands. Potential Brewer's sparrow habitat is of sufficient quality and abundance across the project area and forest to allow the species to continue to be well distributed across the planning unit (Bridger-Teton National Forest).		
Elk	Grass/shrub winter ranges and forests	Maintains stable populations within Wyoming Game and Fish Department objectives over the short-term; long-term decline in foraging conditions.	Maintains stable populations within Wyoming Game and Fish Department objectives.	Maintains stable populations within Wyoming Game and Fish Department objectives. Slightly preferred over alternative 2 because of fewer roads being used (2.44 miles fewer).	Action alternatives have offsetting effects related to improved forage verses loss of cover for hiding and thermal protection.
Mule deer	Winter range shrublands	Maintains stable population below Wyoming Game and Fish Department objectives; long-term decline in foraging conditions.	Contributes positively toward achieving Wyoming Game and Fish Department objectives.	Contributes positively toward achieving Wyoming Game and Fish Department objectives. Slightly preferred over alternative 2 because of fewer roads being used (2.44 fewer miles).	Action alternatives have offsetting effects related to improved forage verses loss of cover for hiding and thermal protection. Herd population of 23,000 animals is primarily influenced by winter range conditions and disturbances caused by housing and industry development within winter range that is off the project area.
Bighorn sheep	Winter range open areas and nutritious spring forage.	Winter range habitat would continue a steady decline related fire suppression and loss of forage. Population is at herd objective.	Minimal negative effects of alternatives 2 and 3. Treatments would not contribute measurable changes in the sheep population but could improve forage availability and nutrition in summer ranges. Few sheep presently use the project area which is at the very southern edge of their summer seasonal range. Sensitive species determination: MIIH.		

Species	Primary Habitat Need and Limiting Factor	Alternative 1	Alternative 2	Alternative 3	Comments
Moose	Willow bottoms with adjacent forest	No short-term effect; mixed positive and negative effects of long-term fire suppression. Moose populations are expected to remain stable and near herd objectives.	Maintains stable population near Wyoming Game and Fish Department objectives.	Determination: positively contribute toward achieving and maintaining the Sublette herd at the Wyoming population objective. Slightly preferred over alternative 2 because of fewer roads being used (2.44 miles fewer).	Across the hunt area and herd unit, moose habitat is of sufficient quality and abundance to allow the species to continue to be well-distributed across federal lands. Moose populations in the Sublette herd have been stable and slightly improving since 2004 and are near objectives.
American marten	Dense spruce-fir forest with understory cover and subnivean spaces.	Perpetuates existing conifer habitats used by marten. Potential for long-term decline based on probability of high intensity wildfire.	Alternatives 2 and 3 would retain a substantial amount of the most important habitat (old growth spruce-fir) as untreated, in compliance with Forest Plan standards. The prescribed fire treatments will create a mosaic of burns characterized by light and moderate-intensity fires, and unburned sites that will retain, at a broad scale, multistory forest structure, woody debris, snags, and other components that are favorable for pine marten. Mechanical treatments would negatively affect forest structure (woody debris and cover) on 385 acres of mature subalpine forests in altnernative 2 and 87 acres in alternative 3. The negative effects of the alternatives would not affect population trend on the project area or the planning unit.		
Boreal chorus frog	Streams and ponds where present.	No short-term effect; mixed positive and negative effects of long-term fire suppression.	Minimal negative effects of alternatives 2 and 3. The project is designed to include no-treatment buffers within 100 to 300 feet of wetlands, streams, and riparian areas which is the habitat most occupied by amphibians and most important to reproduction. Known breeding areas are avoided. Determination for both alternatives: MIIH.		
Migratory birds	Habitat acres treated	0	22,162 acres treated with mixed positive and negative effects to species	14,281 acres treated; mixed positive and negative effects to species are reduced by 36 percent.	

Species	Primary Habitat Need and Limiting Factor	Alternative 1	Alternative 2	Alternative 3	Comments
Old growth	Old growth converted to non-old-growth status (acres) and percent of total old growth in the project area	0	962 total acres (about 5 percent of old growth in the project area). Negative effect of mechanical treatments on old-growth characteristics (87 acres).	627 total acres (about 5 percent of old growth in the project area). Negative effect of mechanical treatment old-growth characteristics s (71 acres).	This assumes stand replacement prescribed fire (unlikely) on all acres.
Snag Habitat		No short-term effect.	Same for alternatives 2 and 3. Snags available in the defense zone and mechanical treatment areas would be reduced. Number of remaining snags would be adequate to support wildlife occupancy and movements, and new snags would be created by prescribed fire treatments and ongoing natural processes.		

Meeting the purpose and need for this project is measured by the effects to modelled fire behavior, removal of hazardous snags, and acres of aspen enhancement resulting from the alternatives. To be successful, fire behavior must be reduced to allow for future wildland fires to be managed with the least intrusive methods possible and to allow fire to operate freely within the wilderness study area, and hazardous snags must be removed to allow firefighters to work safely within the defense zone as needed. Promoting healthy aspen communities, which slow the spread of fire, would reduce potential impacts related to wildfire.

Table 21. Comparison of alternatives in meeting the purpose and need

Indicator		Alternative 1		Alternative 2		Alternative 3	
		Threat Zone	Defense Zone	Threat Zone	Defense Zone	Threat Zone	Defense Zone
Modeled fire behavior	Decrease in the potential for active crown fire	0 percent	0 percent	25 percent	65 percent	12 percent	41 percent
	Decrease in the potential for flame lengths greater than 4 feet	0 percent	0 percent	30 percent	35 percent	22 percent	20 percent
Area of reduced snag density for firefighter safety in defense zone (# units)		0		37		27	
Aspen perpetuation		*Climax aspen within shrublands, grasslands, and conifer/herbland ecotones:* little short-term change, long-term shift toward multi-story aspen clones *Seral aspen:* Short-term benefits in places from recent bark beetle mortality; general long-term decline in health and presence as conifers outcompete aspen		Minimum acres treated = 3,553. Short-term increase in aspen suckering, clone vigor and size; long-term increase in aspen clone size, health, age-class diversity, and presence on the landscape; greatest changes in units with both commercial and noncommercial treatments, less in noncommercial only units, variable but positive results in prescribed burn units		Minimum acres treated = 2,211. Same effects as alternative 2, but less acreage treated	

Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required to rigorously 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). Thirteen alternatives were suggested by commenters during the 2011 and 2013 scoping periods.

Consideration of these alternatives is documented in the comment analysis reports in the project record. Each alternative discussion includes details of the suggested actions, concerns or issues it would alleviate, and the Forest Service's response and rationale for not studying it in detail. Most suggested alternatives were not studied in detail because they would not effectively meet the project's purpose and need as described in chapter 1. Also, many of the concerns are addressed by the alternatives studied in detail, including the no-action alternative. Some alternatives, or components of the alternatives, could be selected in the Record of Decision without being studied as a separate alternative because they fall within the range of actions and effects that are being disclosed among the alternatives studied in detail. See the comment analysis reports in the project record for full discussions.

1. **Expand the analysis area to the north to reduce the wildfire threat to the ski area, and conserve high quality wildlife habitat beyond the defense zone and wildland-urban interface.**

The area to the north of the project area is not in need of fuel reduction at this time, and because the need for change is focused on reducing fire behavior in the wildland-urban interface. Expanding the project area would not meet the purpose and need for the project. Wildlife effects are addressed in the alternatives 2 and 3.

2. **Reduce the scope of the proposed action to create defensible space and decrease flammability in home ignition zones and around the powerline.**
3. **Create defensible space and decrease flammability in home ignition zones.**

These two proposals are the same as Alternative 1, No Action. The Forest Service does not have the authority to treat private land or require homeowners to conduct fire management activities on their land. Treating just around the powerline and just a small area near structures would not meet the purpose and need for this project to reduce fire behavior across the landscape. The Forest Service does work with homeowners through the Firewise program to provide methods to reduce losses to life and property from wildfire. Continuing Firewise outreach is an element of all alternatives.

4. **Retain snags and provide for firefighter safety through training, staffing, and equipment.**

It would not be effective in meeting the project's purpose and need, and the suggested safety strategies are already in use by the Forest Service.

5. **Retain live trees, clear only dead wood, and invest in more effective aerial fire suppression equipment.**

This alternative was not studied in detail because the purpose and need to reduce fire behavior across the project area would not be met.

6. **Eliminate all treatments, or eliminate all mechanical treatments, in the wilderness study area.**

The purpose and need to reduce fire behavior across the project area would not be met. Crown densities would not change therefore the potential for crown fire would not be reduced.

7. Treat only the defense zone.

This alternative mirrors a past project in the area that reduced fuels only in a narrow corridor along the national forest boundary with private lands to increase defensible space but did not reduce the overall probability of wildfire enough to alter fire response in the larger landscape. Managers must still suppress all fires in the area to minimize the probability of wildfire reaching and threatening the neighboring homes, because of the overall fire potential within the project area. To avoid a full suppression response, fire managers need to have viable options for containing the spread of a fire before it's in people's back yards.

8. No actions in the wilderness study area or inventoried roadless areas.

Eliminating all treatments or all mechanical treatments as suggested would reduce treatments to the point where meeting the purpose and need to reduce fire behavior across the project area would not likely be met.

9. Use mechanical thinning followed by prescribed fire in defense zone.

Dual treatments are not necessary to meet fire behavior objectives, and prescribed fire is avoided in the defense zone. Fire managers would consider the specifics of sequencing and timing and needs for risk management during development of the burn plans under either of the action alternatives.

10. Use only prescribed fire.

This would reduce the margin of safety created collectively by all of the proposed treatments, thereby reducing the degree to which the project's purpose and need is met. The mechanical and prescribed burn only treatments were located and designed to complement each other in reducing fire hazards selectively across the landscape.

11. No commercial logging.

No specific issue or concern was identified.

12. Rely on lightening fires to achieve project goals.

Currently there is an unacceptable risk that fire would spread onto adjoining private lands. A goal of the project after reducing fire behavior is to manage future fuel loads with natural fire.

13. Use only mechanical methods.

Not treating activity fuels does not meet the purpose and need for the project because it would add to accumulated fuels in the project area, therefore fire behavior would not be reduced. The mechanical and prescribed burn treatments were located and designed to complement each other in reducing fire hazards selectively across the landscape. Removing the prescribe burn only treatments would reduce the margin of safety created collectively by all of the proposed treatments, which only partially meets the purpose and need for the project.

Chapter 3. Environmental Consequences

Introduction

This section summarizes the physical, biological, and social environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives presented previously.

Project design features (appendix B) are incorporated into the alternatives and influence the effects conclusions where applicable.

The resource discussions in this chapter incorporate by reference the scientific analyses documented in individual resource reports which are available on the Bridger-Teton National Forest website and in the project record. The resource reports include the data and methodologies used; quantified analysis results; details regarding relevant law, regulations, and policies; Forest Plan goals and desired conditions, assumptions and scientific accuracy, literature cited, and additional background information.

The following resource analyses are based on the three alternatives described in chapter 2, which differ in the extent of proposed activities as displayed in table 18. In most cases the environmental effects of alternative 3 would be less than those of alternative 2 because of the reduced scope of activities, as noted in the resource analyses summarized in this chapter.

Each resource analysis is shaped by the site-specific proposals and conditions of this project as it relates to the resource. Only proposed activities that may affect the resource in some manner are analyzed in detail. Resource areas associated with the key issues and relevant to the purpose and need for action described in chapter 1 are presented first and with greater detail.

Compliance with the Forest Plan and Relevant Laws, Regulations, Policies, and Plans

Highlights of environmental consequences in relation to the regulatory framework under which specific resources are managed are listed below. More information and details are located in the resource sections later in this chapter, and in the specialists' reports in the project record.

Alternative 1 (no action) would continue current management and is consistent with Forest Plan direction and law, regulation, policy, and plans for each resource, except as follows:

1. Alternative 1 is not consistent with direction set forth in the National Fire Plan or Forest Plan goals and objectives for fire and wilderness study area management. Continuing fire suppression at the current levels opposes the intent to maintain wilderness character within the wilderness study area, and Forest Plan fire management goals, which seek to promote fire disturbance processes as part of the ecosystem.
2. Alternative 1 does not meet National Fire Plan goals and is not responsive to the Teton County Community Wildfire Protection Plan to reduce fire threat to assets within the wildland-urban interface and Forest Service policy to prevent wildfires from crossing onto other jurisdictions.
3. Alternative 1 does not meet Forest Plan goals for aspen perpetuation or sensitive plant species management (whitebark pine).

4. Implementing the magnitude of mechanical treatments under alternative 2 may not meet the Wyoming Wilderness Act's direction to maintain "presently existing wilderness character" within the wilderness study area in the short-term.

Climate Change

This analysis is consistent with Forest Service guidance for addressing climate change in project-level environmental analyses. The effects of climate change on the proposed activities and the effects of the activities on climate change are discussed in the Silviculture, Fuels and Climate Change Discussion report in the project record. The report summarizes the latest trends and science regarding climate change and wildfires, forest insects and diseases, tree mortality, and carbon sequestration.

Storm Water Permits

The appropriate regulatory agencies, including the Wyoming Department of Environmental Quality, would be consulted regarding national or state required permits associated with roads used in project implementation. Required permits would be obtained prior to implementation.

Cultural Resources

On March 9, 2011, the Wyoming State Historic Preservation Office concurred with the Forest Service's finding that no historic properties would be affected by this project.

Endangered Species Act Wildlife Species

Forest Service specialists met with representatives of the U.S. Fish and Wildlife Service for a Level 1 consultation meeting in October 2010, to exchange resource information about the proposed action, Canada lynx standards and guides, and analysis requirements and procedures. The U.S. Fish and Wildlife Service agreed with the Forest Service's analysis strategy for threatened, endangered, and candidate species. The Forest submitted a biological assessment to the U.S. Fish and Wildlife Service for formal consultation in February 2012, and received concurrence on the determinations noted below on March 29, 2012. The detailed analysis of effects in the wildlife report and biological assessment located in the project record is summarized in this document. See the Wildlife section later in this chapter for detailed information about the following determinations and supporting analyses related to species listed under the Endangered Species Act.

1. Canada lynx (*Lynx canadensis*): This project is likely to adversely affect lynx and lynx habitat due to treatments in multi-storied stands and snowshoe hare horizontal cover (standard VEG-S6 in the Northern Rockies Lynx Management Direction). However, the affected area is in a wildland-urban interface and below the allowable exception of 6 percent of mapped lynx habitat on the planning unit.
2. Gray wolf (*Canis lupus irremotus*): This project is consistent with the recovery and delisting of gray wolves in Wyoming and the Forest Plan objective of supporting recovery of listed and sensitive species. The analogous determination in Section 7 consultation with the U.S. Fish and Wildlife Service is may affect, not likely to adversely affect gray wolves. The alternatives would not contribute to a loss of population viability of wolves on the planning (Forest) unit. With regard to wolves as a sensitive species, the treatment alternatives may impact individuals or habitat, but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species on the forest.
3. Grizzly bear (*Ursus arctos horribilis*): This project is consistent with the recovery and delisting of grizzly bears in the Yellowstone Ecosystem and the Forest Plan objective of supporting the recovery of listed species. The analogous determination in Section 7 consultation with the U.S. Fish and Wildlife Service is may affect, not likely to adversely affect grizzly bears.

4. Yellow-billed cuckoo (*Coccyzus americanus*): This project would have no effects on yellow-billed cuckoo or its proposed critical habitat.

2001 Roadless Area Conservation Rule

This Rule directs management of the Munger Mountain and Phillips Ridge inventoried roadless areas. The activities proposed in this project under each alternative comply with the requirements of the Rule as codified in the Code of Federal Regulations (36 CFR 294.12 and 294.13). In summary, road construction, road reconstruction, and timber cutting, sale, or removal in inventoried roadless areas is prohibited with some exceptions. This project does not include any road construction or reconstruction in the inventoried roadless areas.

Cumulative Effects

The existing conditions serve as a proxy for the effects of past actions in cases where those effects are no longer occurring as a result of past actions and as such those actions are not listed in appendix E (36 CFR 220.4(f)). Actions that have occurred in the recent past with effects still evident are listed in appendix E. Individual resource specialists may examine specific past actions and natural events if relevant and necessary to determine environmental effects for their resource.

Cumulative effects analyses include the present and reasonably foreseeable future actions listed on the Bridger-Teton National Forest's Schedule of Proposed Actions as well as projects and ongoing activities compiled by local Forest Service staff (appendix E). Not every resource is affected by every action, so actions assessed in each resource analysis differ.

For most resource areas, the no-action alternative has no direct or measureable indirect effect and therefore would have no cumulative effects.

Short-term Uses and Long-term Productivity

NEPA requires consideration of the relationship between short-term uses of our environment and the maintenance and enhancement of long-term productivity (USDA-FSH 1909.15 Ch. 23.3 (7)). Short-term uses refer to the planned outcomes of this project and long-term productivity refers to the future capacity of resources to play their role in ecosystem processes. The resource-specific relationship between the two is discussed in the resource sections in this chapter, if applicable.

Unavoidable Adverse Effects

NEPA does not require avoiding adverse effects, however adverse effects must be identified and disclosed for each alternative (USDA-FSH 1909.15 Ch. 23.3 (7)).

Alternative 1: Taking no action to manage fuels in the project area may result in large and severe wildfires, aggressive suppression methods, and subsequent adverse effects to many resources as described in the resource sections later in this chapter.

Alternatives 2 and 3: Several resource areas may experience unavoidable short-term adverse effects, primarily during and just after project operations:

- Wilderness character -- There would be an unavoidable short-term adverse effect on some aspects of wilderness character during the fuel treatment operations but wilderness character would improve in the long term because there would be less fire suppression, and when fire suppression is needed, there would be more opportunity to use light-hand tactics.

- Naturalness -- There would be some adverse effect on apparent naturalness in Phillips Ridge inventoried roadless area in the short term (3 percent or less affected in each alternative).
- Lynx -- Implementing alternative 2 or 3 would have adverse effects to lynx and lynx habitat. This determination is analogous to “Likely to Adversely Affect” in Section 7 consultation (Endangered Species Act) with the U.S. Fish and Wildlife Service, and is appropriate in situations where multi-storied stands and snowshoe hare horizontal cover are affected (standard VEG-S6). However, the affected area is in a wildland-urban interface and below the allowable exception of 6 percent of mapped lynx habitat on the planning unit.
- Water quality – There would be short-term potential sediment input in localized areas during road work.
- Recreation – There would be short-term adverse effects to trail access due to temporary closures during prescribed fire operations.
- Sensitive plants – Some individual plants may be lost during project operations but these effects are not likely to result in a loss of viability or cause a trend toward federal listing or a loss of species viability range-wide.
- Wildlife – Individuals may be disturbed or killed during project operations and habitat modified to some degree, but no negative effects on species viability are predicted.
- Fire regimes and ecosystem processes –Prescribed fire could damage or kill plants, insects, and other animals. These unavoidable adverse effects are part of an ecosystem process that ultimately leads to renewal.

Resource-specific Environmental Consequences

The following sections summarize the analyses conducted by the interdisciplinary team for each resource that could be affected by the proposed activities. The resources related to the significant issues and the need for action (chapter 1) are discussed first and include the most detail summarized from the specialists’ reports. The analyses of special areas and wildlife include indicators of how well the alternatives address the significant issues, and the Fire and Fuels section discusses how well each alternative meets the need for action identified in chapter 1.

Special Areas

The following resource information and analysis summarizes the Special Areas Report (Merigliano 2015) which is available on the Bridger-Teton National Forest website and in the project record.

Special areas included in this analysis are:

1. Palisades Wilderness Study Area
2. Munger Mountain Inventoried Roadless Area
3. Phillips Ridge Inventoried Roadless Area

The Snake River Wild and Scenic River and the Jedediah Smith Wilderness are also discussed but are not analyzed in detail since these areas are located outside of the project area and would not be affected by project actions.

Management Framework

Wilderness Study Areas

Legislative Direction

The Wyoming Wilderness Act (PL 98-550)

The Wyoming Wilderness Act passed Congress on October 30, 1984. The purpose of the Act was to "designate certain National Forest System lands for inclusion in the National Wilderness Preservation System in order to preserve the wilderness character of the land and to protect watersheds and wildlife habitat, preserve scenic and historic resources, and promote scientific research, primitive recreation, solitude, physical and mental challenge, and inspiration for the benefit of all of the American people."

The Palisades area was designated a "Study Area" due to its potential for oil and gas resources. Within the Forest Service, a wilderness study area is a Congressional designation for an area that is not included in the National Wilderness Preservation System, but receives protections while it is being studied for possible future designation. Although a wilderness study area is not subject to all of the requirements of the Wilderness Act, the area must be managed in accordance with legislative direction in the Wyoming Wilderness Act until Congress decides whether or not to include it in the Wilderness System. Legislative direction for this area includes the following:

1. The Secretary of Agriculture "shall administer the area so as to maintain its presently existing wilderness character and potential for inclusion in the National Wilderness Preservation System."
2. The Secretary of Agriculture, "shall, upon revision of the initial land management plans for the Bridger-Teton and Targhee National Forests, review the Wilderness Study Areas as to their suitability for preservation as wilderness." This time period was considered sufficient for leasees to either prove or disprove the USGS survey assessment of the area's high potential for oil and gas. (Note: the Bridger-Teton National Forest Forest Plan revision effort has not yet begun.)

The requirement to maintain *"presently existing wilderness character"* is a central concept for stewardship of the Palisades Wilderness Study Area. Wilderness character is not explicitly defined in either the 1964 Wilderness Act or the Wyoming Wilderness Act (Section 203 of the Wyoming Wilderness Act ties administration of areas designated by the Act back to the provisions of the Wilderness Act of 1964). Wilderness character is a holistic term that includes three mutually reinforcing societal ideals: (1) natural environments relatively free from modern human manipulation and impacts, (2) personal experiences in natural environments that are relatively free from the encumbrances and signs of modern society, and (3) symbolic meanings of humility, restraint, and interdependence in how individuals and society view their relationship to nature (Landres et al. 2008). Taken together, these tangible and intangible qualities define wilderness character and distinguish Wilderness from other lands. The more tangible aspects of wilderness character are embodied in the "Definition of Wilderness" found in section 2c of the 1964 Wilderness Act.

The Wilderness Act also contains a number of special provisions for stewardship of wilderness. Most relevant to the proposed fuel treatments is the provision that *"such measures may be taken as may be necessary in the control of fire, subject to such conditions as the Secretary deems desirable"* (1964 Wilderness Act, Section 4d(1)). This provision does not negate the requirement to still maintain wilderness character but does acknowledge that some flexibility in managing fire may be necessary.

Bridger-Teton National Forest Plan Direction

Management Prescription 6S

> The Wilderness Study Areas would be managed to protect long-term wilderness attributes. No activities would be allowed that would jeopardize the eligibility of the WSAs for future Congressional designation as Wilderness. Existing uses of the WSAs, such as snowmobiling and mountain biking, would be allowed to continue (USDA Forest Service 1990).

The Bridger-Teton Forest Plan identifies no silvicultural opportunities within Desired Forest Condition 6S but does not speak to fuel treatment activities.

National Forest Policy

National policy for management of wilderness study areas or recommended wilderness is not yet available. Wilderness study areas are not managed the same as designated wilderness, however Congressional requirements for the area must be followed. In general this means that resource management activities such as fuel treatments must be evaluated to show how the activity helps maintain wilderness character and maintains the area's potential for inclusion in the National Wilderness Preservation System.

For proposed fuel treatment projects, national policy direction for managing fire in designated wilderness is particularly relevant (USDA FSM 2324.2). This direction contains the following objectives:

1. Permit lightning caused fires to play, as nearly as possible, their natural ecological role within wilderness.
2. Reduce, to an acceptable level, the risks and consequences of wildfire within wilderness or escaping from wilderness.

To meet the above objectives, management treatments are only permitted if all of the following conditions are met:

1. Fuel treatment measures outside of wilderness are not sufficient to achieve fire management objectives within wilderness.
2. An interdisciplinary team of resource specialists has evaluated and recommended the proposed action.
3. The interested public has been involved.
4. Lightning-caused fires cannot be allowed to burn because they would pose serious threats to life and/or property within wilderness or to life, property, or natural resources outside of wilderness. (FSM 2324.2)

National policy direction does exist for evaluating an area's potential for inclusion in the National Wilderness Preservation System (USDA-FSH 1909.12). This policy incorporates use of the Wilderness Attribute Rating System to inventory and evaluate an area's potential for inclusion in the National Wilderness Preservation System. The evaluation system includes consideration of the area's capability (qualities of natural, undeveloped, opportunities for solitude or primitive and unconfined recreation, special features), manageability, availability, and need. For the proposed fuel treatment project, the aspects of capability and manageability are most relevant. In particular, inventory criteria number 9 is relevant to proposed fuel projects. This criterion contains the following direction for areas that can be recommended for inclusion in the National Wilderness Preservation System:

> Timber harvest areas where logging and prior road construction is not evident. Examples include those areas containing early logging activities related to historic settlement of the vicinity, areas where stumps and skid trails or roads are substantially unrecognizable, or areas where clearcuts have regenerated to the degree that canopy closure is similar to surrounding uncut areas (USDA-FSH 1909.12 – Planning Handbook, wilderness inventory criteria 7.11).

Inventoried Roadless Areas

National Forest Law and Policy

Activities involving road construction or reconstruction and timber cutting within Inventoried Roadless Areas are subject to the requirements of the 2001 Roadless Rule. Consistent with the Rule, the Code of Federal Regulations establishes prohibitions on road construction and reconstruction and on timber cutting, sale, or removal (36 CFR 294.12 and 294.13). Prohibitions pertinent to the Teton to Snake fuel project include:

> **294.12 Prohibition on road construction and road reconstruction in inventoried roadless areas.**
>
> (a) A road may not be constructed or reconstructed in inventoried roadless areas of the National Forest System, except as provided in paragraph (b) of this section.
>
> **294.13 Prohibition on timber cutting, sale, or removal in inventoried roadless areas.**
>
> (a) Timber may not be cut, sold, or removed in inventoried roadless areas of the National Forest System, except as provided in paragraph (b) of this section.
>
> (b) Notwithstanding the prohibition in paragraph (a) of this section, timber may be cut, sold, or removed in inventoried roadless areas if the Responsible Official determines that one of the following circumstances exists.
>
> (1) The cutting, sale, or removal of generally small diameter timber is needed for one of the following purposes and would maintain or improve one or more of the roadless area characteristics
>
> (ii) To maintain or restore the characteristics of ecosystem composition and structure, such as to reduce the risk of uncharacteristic wildfire effects, within the range of variability that would be expected to occur under natural disturbance regimes of the current climatic period.

The Intermountain Region of the Forest Service has prepared guidance for analyzing the effects of proposed projects on Inventoried Roadless Areas. “The standard of analysis for impacts to Inventoried Roadless areas mandates that the potential adverse effects to wilderness potential be described. This is usually accomplished by discussing the effects to the wilderness attributes of the Inventoried Roadless Area” (USDA Forest Service 2008).

Bridger-Teton National Forest Plan Direction

Munger Mountain Inventoried Roadless Area – Management Prescription 12

Most of the Munger Mountain Inventoried Roadless Area is in management prescription 12 which focuses on providing important habitat for big game such as calving and security areas. Fire direction

within this management prescription emphasizes preservation and enhancement of habitat, particularly through prescribed fire.

Phillips Ridge Inventoried Roadless Area – Management Prescription 2B

Most of the Phillips Ridge Inventoried Roadless Area is in management prescription 2B which focuses on maintaining or enhancing dispersed recreation opportunities. Fire direction within this management prescription emphasizes a slightly modified landscape.

Issues Related to Special Areas

Effect on Wilderness Study Area

As described in chapter 1, public concern exists about the proposed fuel treatments within the Palisades Wilderness Study Area. Of particular concern are the proposed mechanical treatments. Respondents to public comment opportunities for this project are concerned that the treatments represent a human manipulation of wilderness that violates the legal protection given to the area, would reduce the potential of the area being designated as wilderness in the future, would establish a precedence for continued vegetation manipulation, and would not substantially change how fires are managed in the future. In summary, there is concern that the proposed treatments would impair the character of the Palisades Wilderness Study Area and reduce its potential for future designation with no clear benefit to wilderness values.

Effect on Inventoried Roadless Areas

Public concern exists about proposed treatments within inventoried roadless areas. Respondents are concerned that the treatments would impair the wilderness attributes of the areas and reduce the likelihood that these areas could be recommended for wilderness designation.

Issue Indicators

1. Effect on wilderness study area
    a. Acres of mechanical treatment within the wilderness study area
    b. Acres of prescribed burning within the wilderness study area
    c. Effect on potential for inclusion of the wilderness study area in the National Wilderness Preservation System
    d. Effect on “presently existing wilderness character” with focus on the untrammeled and natural qualities
2. Effect on inventoried roadless areas
    a. Acres of mechanical fuel treatment within the inventoried roadless area
    b. Acres of prescribed burning within the inventoried roadless area
    c. Miles of road maintained within inventoried roadless area
    d. Effect on wilderness attributes with focus on apparent naturalness and natural integrity

Existing Condition

Palisades Wilderness Study Area

The Palisades Wilderness Study Area is approximately 134,500 acres based on the map of record. Approximately 24 percent of the Teton to Snake fuel treatment project area is located within the Palisades Wilderness Study Area. The legislative direction for the wilderness study area states that the Forest Service "shall administer the area so as to maintain its presently existing wilderness character and potential for inclusion in the National Wilderness Preservation System."

Four qualities of wilderness character based on the definition of wilderness in the 1964 Wilderness Act are used to organize and present information in this analysis. For the Palisades Wilderness Study Area, the existing conditions described below are known.

1. ***Untrammeled quality*** – Fires have been effectively suppressed since the 1950s. Historic fire occurrence data shows that over 200 fires have burned within the project area since 1953 with an average of four fires per year, all of which were suppressed. Between 2008 and 2011, there was again an average of four fires per year, all of which were suppressed. Outside of the project area, a few fires occurring on the Caribou-Targhee and Bridger-Teton National Forest within the Palisades have recently been allowed to play their natural role. No prescribed burning has been conducted. Other modern human interventions include the introduction of non-native mountain goats in the early 1970s and timber harvest which is described under the natural quality. Other natural processes including landslides and the free-flow of water within the area are intact and retain high natural integrity.
2. ***Undeveloped*** – Much of the country is considered too rugged and geologically unstable (e.g. landslides) to lend itself to development, thus the majority of the area retains its remote and undeveloped feel. However, some old timber and 4WD roads are evident and there are some physical developments that pre-date passage of the Wyoming Wilderness Act but are within the boundary for the wilderness study area (e.g. roads/trailheads, power lines, electronic site, recreation residences). Exploratory oil and gas seismic work occurred in the 1980s but signs and seismic line have mostly been removed. Constructed facilities for domestic livestock grazing and other activities are minor and primitive in nature. Approximately 150 miles of non motorized trail provide access throughout the area, the vast majority of which is primitive in nature with few signs. The only exception is the Teton Pass area where trails and signs are maintained to a higher standard. The area was closed to wheeled motor vehicle use in 2000 due to rapidly expanding motor vehicle impacts beyond what existed in 1984 (with exceptions authorized only for emergencies and permitted use). Implementation of vehicle closures is on-going. While illegal wheeled motor vehicle use has been greatly reduced, some violations do occur. Chainsaws are used intermittently to clear trails of downfall.
3. ***Natural*** – The area is noted for its rugged terrain, scenic and watershed values (containing many small tributaries to the Snake River including a designated Wild and Scenic river – Wolf Creek). The area also contains habitat for elk, deer, moose, wolves, wolverine, and bears. Important elk calving areas exist within the area and the area is considered an important migration corridor for many species. A variety of plant communities and vegetation types exist in the area, including some that are not common in the Bridger-Teton National Forest (curl-leaf mahogany, bigtooth maple). Noxious weeds are present in localized disturbed areas but are not widespread. A rare plant inventory conducted in the Snake River Canyon found some sensitive plants (Payson's milkvetch) so it is possible that such plants would be present in the adjacent wilderness study area. Some alteration of native vegetation has occurred; for example, localized areas of pure wyethia stands (mule's ear) on old sheep beds. Historic logging occurred to provide wood for local homesteads, notably in the Teton Pass and Mosquito Creek area but the forest canopy has not been altered. In the late 1970s and early 1980s, commercial timber harvest occurred in the Mosquito Creek and North Fork Fall Creek

drainages. A review of Forest Service timber harvest records and maps show a total of 1,923 acres of clear-cut and partial cut timber harvest occurred within the Teton to Snake project area during the 1970s and early 1980s. Of these harvest areas, approximately 483 acres are located within the boundary for the wilderness study area. These harvest acres are now fully regenerated although the new trees are obviously younger compared with the surrounding landscape.

4. ***Outstanding opportunities for solitude or primitive, unconfined recreation*** - The area provides high potential for solitude, primitive recreation, and challenge by virtue of its size, dissected topography, and vegetative screening. The wild character of the area supports multi-day trips including outfitted pack trips, hunting, and backpacking. Although the area is close to Jackson and some trailheads originate along paved highways, it receives low to moderate levels of use throughout most of the area. Minor congestion and conflict can occur during the fall hunting season and in the more heavily used Teton Pass area. The area is closed to summer wheeled motorized use. Mountain bike use is allowed on existing trails but is concentrated primarily on a few trails in the Teton Pass area. Snowmobiling and limited guided heli-skiing occur during the winter months.

Munger Mountain Inventoried Roadless Area

Approximately 14 percent of the Teton to Snake fuel treatment project area is within the Munger Mountain Inventoried Roadless Area. This inventoried roadless area is estimated to contain 12,900 acres based on the Roadless Area Review and Evaluation (RARE II). At that time, the Munger Mountain area was not recommended for wilderness designation since it did not receive high public interest and was found to be deficient in some wilderness attributes, notably the opportunity for solitude. However, the area retains other wilderness attributes and remains on the list of roadless areas. Unlike the wilderness study area, inventoried roadless areas are not managed to maintain “wilderness character”, however proposed projects in these areas must be evaluated as to their potential effects on the area’s wilderness attributes. These attributes include natural integrity, apparent naturalness, remoteness, solitude, primitive and unconfined recreation, special features, and manageability.

The following conditions characterize the existing environment in the Munger Mountain Inventoried Roadless Area:

1. ***Natural Integrity and Apparent Naturalness*** – Munger Mountain is characterized by extensive aspen communities resulting from fire that burned much of the area in the 1930s. There is a resident elk population and the aspen and forb community is important for raptors, owls, and migrating songbirds. The area has a long history of grazing which has altered the native vegetation and steambanks in localized areas. Noxious weeds are considered a problem throughout the area including a patch of leafy spurge which is treated annually. Fire starts are routinely suppressed due to the small size of the area and proximity to residential development to the east, west, and north. Some past timber harvest and old roads are evident within the area. Within the Teton to Snake fuel treatment project area, a total of 84 acres of clear-cuts and partial cut timber harvest dating from the late 1970s and early 1980s occurred within the inventoried roadless area.

2. ***Remoteness and Solitude*** – Munger Mountain does not retain a remote feel due to its relatively small size and relatively easy access. The area supports diverse day use opportunities but camping and multi-day trips rarely occur. The area receives moderate use, notably on the west side where a well-developed trail system is in place. On this trail system, use is increasing and it is common to encounter other groups but congestion and conflict is not considered to be a major problem.

3. ***Primitive and unconfined recreation*** – Up until January 2009, the Munger Mountain area was open to unrestricted summer wheeled motorized use. At that time, only one 3-mile system trail was present. However, due to cattle and unrestricted horse riding, hiking, mountain biking, and motorcycle and

ATV use, the area developed an extensive network of non-system, user-created trails. In January 2009, a Record of Decision was signed restricting summer wheeled motorized use to designated trails. Motorcycles were the only motorized use allowed and the season of use was limited to July 1st – September 9th annually. ATVs and full-size vehicles are not permitted. The newly designated 18-mile trail system has been mostly reconstructed with extensive signing in place and the area is becoming increasingly popular for all the permitted uses: hiking, mountain biking, horse riding, motorcycle riding, and fall hunting.

4. ***Special Features*** – A fire lookout was located on the summit of Munger Mountain, however the tower structure no longer exists; concrete and cables are all that remain.
5. ***Manageability*** – Munger Mountain is generally not considered large and remote enough to be managed as wilderness, especially in comparison with other nearby wildernesses and roadless areas on the Bridger-Teton National Forest.

Phillips Ridge Inventoried Roadless Area

Approximately 12 percent of the Teton to Snake fuel treatment project area is within the Phillips Ridge Inventoried Roadless Area. This inventoried roadless areais estimated to contain 9,900 acres based on the Roadless Area Review and Evaluation (RARE II). The following conditions characterize the existing environment in the Phillips Ridge Inventoried Roadless Area:

1. ***Natural Integrity and Apparent Naturalness*** – The Phillips Ridge area is characterized by a mix of aspen and sub-alpine environments. It is part of the Teton Range and forms the spectacular western backdrop of Jackson Hole. Sheep grazing occurred in the area until the 1990s but vegetation alteration is not evident. Some old roads are evident in the vicinity of the powerline road but they do not extend far into the inventoried roadless area which is located north and west of the power-line road. However, the powerline corridor is quite visible from many view points within the inventoried roadless area. Within the Teton to Snake fuel treatment project area, a total of 72 acres of past clear-cut or partial-cut timber harvest occurred within the inventoried roadless area.
2. ***Remoteness and Solitude*** –It is very common to encounter other groups within the Phillips Ridge Inventoried Roadless Area, limiting opportunities for solitude. Wyoming State Highway 22 (Teton Pass) offers easy access to developed trailheads, thus the vast majority of the use is for day trips and there is not a high sense of remoteness. Backpacking trips do sometimes originate from this area to access the Jedediah Smith Wilderness on the Caribou-Targhee National Forest west of the inventoried roadless area.
3. ***Primitive and unconfined recreation*** – The Phillips Ridge area contains five heavily used trails including Ski Lake, Phillips Pass, Phillips Canyon, and portions of the Arrow and Phillips Ridge trails. These trails are managed for hiking, horse riding, and mountain biking with some separated use; bikes are not allowed on the Ski Lake and Phillips Pass trails, and horses are not allowed on the Arrow trail. An outfitted camp associated with Trail Creek Ranch operated for many years near Phillips Pass. Outfitted trips still occur but use is very limited.
4. ***Special Features*** – Ski Lake and the extensive wildflower displays in the meadows are special attractions for recreation users. There is a prehistoric obsidian quarry in the area and an old trapper cabin near Phillips Pass.
5. ***Manageability*** – Interest by wilderness proponents in the 1970s and early 1980s was primarily related to the area's common boundary with the West Slope of the Tetons, however this area was not included with designation of the Jedediah Smith Wilderness.

Environmental Consequences

Methodology

To analyze the effects of the proposed fuel treatment project on the Palisades Wilderness Study Area, two key aspects of the issue are addressed.

1. What is the effect of the proposal on the potential of the area for inclusion in the National Wilderness Preservation System?
2. What is the effect of the proposal on wilderness character and how does this compare to the wilderness character that existed in the Palisades in 1984 when the area was designated?

To address question 1, the wilderness inventory and evaluation language found in Forest Service Handbook 1909.12 is used.

To address question 2, the analysis is structured around disclosing the negative and positive effects of proposed treatments on the four tangible qualities found in the definition of wilderness from the 1964 Wilderness Act. To assess change in fire response, the analysis performed by fuels specialists is referenced along with information from current Forest Service fire management specialists.

Additionally, in accordance with the Wilderness Act, there is a need to ensure the proposed treatments are the minimum “necessary” to control fire and reduce the risk of fire burning out of the wilderness study area onto adjacent lands. What is considered the “minimum necessary” in the context of fire comes down to acceptable risk. Differing levels of risk associated with fire burning out of the wilderness study area onto adjacent lands is reflected in the three alternatives addressed in this DEIS.

To analyze the effects of the proposed fuel treatment project on inventoried roadless areas, the negative and positive effects of proposed treatments on wilderness attributes are disclosed with focus on the effects to natural integrity and apparent naturalness. Due to the prohibitions on road construction and timber cutting, the analysis discloses miles of road maintenance as well as the number of acres of mechanical fuel treatment. The Teton to Snake fuel project does not include any road construction or reconstruction in the wilderness study area or in inventoried roadless areas.

Spatial and Temporal Context for Effects Analysis

The spatial context for analyzing direct and indirect effects of the proposal on the Palisades Wilderness Study Area is the designated wilderness study area area. For the inventoried roadless areas, the direct and indirect effects of the proposal are the inventoried roadless area boundaries. This spatial and temporal scale is appropriate to determine effects because the indirect and indirect effects as measured by the analysis indicators are site-specific and reflect the unique management direction for these specific areas. The effects do not extend beyond the boundaries of the wilderness study area or inventoried roadless areas

The temporal context for analyzing direct and indirect effects of the proposal is estimated to be 5-10 years for near-term effects. This time period is considered sufficient to fully implement the project. However, with respect to change in fire management response, a 20-50 year time period is more appropriate since this avoids the yearly fluctuations in fire response due to weather and the regional and national fire situation.

Alternative 1- No-Action

Under alternative 1, there would be no fuel treatment (i.e. no mechanical treatments, no prescribed burning, and no snag removal) conducted in the Palisades Wilderness Study Area or in the two inventoried roadless areas, and no associated road work or fire control line construction.

Direct and Indirect Effects

Palisades Wilderness Study Area Effects

Effect on potential for future designation as wilderness: Implementing the no-action alternative would have little to no effect on the area's potential for future designation as wilderness. The criteria for eligibility are not as restrictive as the criteria for stewardship after designation. There would be no effect on any of the inventory criteria used to evaluate an area's capability as wilderness. However, fires would continue to be suppressed in much of the area, particularly in the area that is part of the wildland-urban interface fire protection zone. This would be a factor in evaluating the area's future manageability as wilderness, particularly from the perspective of land managers. However, continued fire suppression would not prevent the area from being eligible for wilderness designation.

Effect on "presently existing wilderness character": In comparison with other alternatives, the no-action alternative would have the least noticeable effect on "presently existing wilderness character". This does not mean that there would be no effect. All alternatives, including no action, have negative short-term or long-term effects on wilderness character. In terms of the "untrammeled" quality, continued fire suppression means that managers would be implementing suppression actions every year that would interfere with natural fire processes. On average, four "trammeling" actions would occur each year with a cumulative effect of 200 actions over a 50-year period. Fire suppression is generally viewed by the public as less manipulative than actions to mechanically treat fuels or to ignite prescribed fire, because the degree of upfront human control is less. However, given that there likely would be more fire on the landscape in the future in response to a changing climate, the need to intervene with fire processes would become a more common occurrence as would the need to use more aggressive suppression tactics due to the higher potential of forest fuels to produce crown fires and high flame lengths (Riginos and Newcomb 2015, Westerling, et al. 2011).

In terms of the "natural" quality, the no-action alternative would result in the greatest long-term adverse effect due to the combination of fire suppression and suppression activities. However, the precise magnitude of this effect is unknown due to the difficulty of determining plant community development in a dynamic system. Plant and animal communities in the wilderness study area have evolved with fire and suppressing lightning-ignited wildfires removes one of the most important natural processes known to occur in this area. Fire suppression is anticipated to have the greatest effect on moderate-sized, mixed severity fires, i.e. those that would grow to a much larger size with no human interference (refer to Fire and Fuels analysis in this chapter). These fires are the ones most effectively suppressed for the past 60 years. New studies are helping quantify the hidden consequences of fire suppression in protected areas by displaying where fires would have spread if they had been allowed to burn under known weather and fuel conditions. These studies show that past fires have a major effect on how and where future fires burn. In some cases fire spread is curtailed by previously burned areas and some ignitions would not have spread at all (Miller 2011). A similar study was done specifically for the Palisades Wilderness Study Area to model fire growth from lightning ignitions under three different weather scenarios. Under low severity burning conditions (50th percentile burning index), the model reveals that 108 natural ignitions between 1971 and 2010 would have burned an estimated 53,820 acres within the wilderness study area (Rojo 2012). To account for potential overlap in burned acres, a conservative estimate suggests at least half of these acres would have actually burned (Johnston 2012). In reality, less than 5,000 acres burned during

that time period most of which was in the Green Knoll fire. With continued fire suppression into the future, the effects of suppression would become more pronounced across all plant communities, favoring subalpine fir and other late seral species at the expense of aspen, forbs, and other early seral species. Fuel loading would also build over time creating the potential for a greater number of large fires when conditions are right. Suppression actions associated with large fires are more intense and heavy-handed which would cause localized effects associated with hand and bulldozer fire lines, spike camps, helispots, and use of retardant. As noted in the Fire and Fuels analysis, approximately 42 percent of the defense zone could generate flame lengths over 4 feet making it necessary to use mechanized equipment, including aircraft, for suppression activities. In addition, approximately 11 percent of the defense zone could experience active crown fire, making control efforts less effective and more hazardous to firefighters and the public. In conclusion, the natural quality would not be noticeably degraded in the short term due to lack of any new disturbance in proposed areas of mechanical fuel treatment. However in the long term, the natural quality would increasingly be adversely affected due to the lack of fire and localized suppression activities.

In terms of the “undeveloped” quality and the “solitude and primitive, unconfined recreation” quality, implementing the no-action alternative would have no effect on presently existing conditions.

Inventoried Roadless Area Effects

The no-action alternative would have no effect on wilderness attributes in the inventoried roadless areas in the short term but would affect the natural integrity attribute over time. Similar to the Palisades Wilderness Study Area, the lack of fuel treatments would not affect natural integrity in the short term. However, the effect would become more pronounced in the long term as fire suppression continues and suppression activities become more frequent or heavy-handed. There would be no effect on other wilderness attributes.

Cumulative Effects

Because no actions are proposed under this alternative, there would be no cumulative effects associated with past, present, and reasonably foreseeable actions in or near the Teton to Snake fuel treatment project area. Trends associated with long-term fire suppression effects as discussed above would continue.

Alternative 2 – Modified Proposed Action

Under alternative 2, there would be 825 acres of mechanical fuel treatment in the Palisades Wilderness Study Area (0.6 percent of the area) Specific treatment units include portions of Powerline Unit 1, Recreation Trail Units 1, 35, 6, and 7, Singing Tree Units 1, 2 and 4, Highland Hills Unit 1, Red Top Units 1, 3 and 5, and the Trails End Unit. All of the proposed mechanical treatments within the wilderness study area would be noncommercial thinning and would consist of cutting smaller trees (up to 9 inches dbh) and limbing branches on larger trees to reduce the potential of fire spreading into tree crowns. Chainsaws would be used for cutting but no ground-based machinery would be used. No permanent or temporary roads would be constructed or reconstructed. The cut trees would be left on-site with no removal for commercial use. The expected outcome is displayed in figure 7. Where the thinning creates low amounts of woody debris, branches would be cut off and the debris scattered. Where the thinning creates greater amounts of downed woody debris, the debris would be hand-piled and burned. Within the wilderness study area, 105 of the 825 acres were mechanically treated in 2003, thus the treatment on these areas would involve less cutting and limbing compared to acres that have not been previously treated. In addition to the mechanically treated acres, alternative 2 would also involve 12,042 acres of prescribed burning in 20 units with an associated 3 miles of fire line in the wilderness study area (9 percent of the wilderness study area).

Figure 7. Example of forested stand after noncommercial thinning operation

Within the Phillips Ridge Inventoried Roadless Area, alternative 2 would include 291 acres of mechanical fuel treatment (2.9 percent of the area). Specific treatment units include portions of Phillips Bench Units 1, 2, 5, and 7. Proposed treatment in units 1, 2, and 7 would be noncommercial thinning, hand-pile and burning without any use of ground-based machinery (i.e. same treatment as described for the wilderness study area). Unit 5 could include commercial thinning with machine-cutting or machinery use for piling material. Only 3.6 percent (7 acres) of treatment unit 5 is located within the Phillips Ridge Inventoried Roadless Area; the estimated amount of timber that would be removed and sold is 0.2 MBF. Portions of the power line road accessing Phillips Bench Unit 5 are located within the inventoried roadless area according to GIS map overlays. To access this unit, 1.5 miles of the road within the inventoried roadless area would need maintenance work. This work would involve blading, drainage, and some widening necessary to make the road suitable for log trucks per the approved maintenance level 2 standards. The maintenance level of the road would not be changed. Alternative 2 would also include 3,013 acres of prescribed burning in two units within the Phillips Ridge Inventoried Roadless Area with an associated 1.07 miles of fire line (30 percent of the area)

Within the Munger Mountain Inventoried Roadless Area, no mechanical fuel treatment would occur. Treatment in this inventoried roadless area would only involve prescribed burning totaling 3,844 acres in two units with an associated 4.24 miles of constructed fire line (30 percent of the area). There would be no road work.

Direct and Indirect Effects

Palisades Wilderness Study Area Effects

Effect on potential for future designation as Wilderness: Implementing alternative 2 would have little effect on the area's potential for future designation as wilderness. Mechanical fuel thinning and prescribed burning do not constitute an "improvement" that violates the inventory criteria for evaluating an area's capability as wilderness. Criteria 9 which speaks to past timber harvest is the closest criteria. However, noncommercial thinning is not timber harvest as it is described in criteria 9. Implementing alternative 2

would not create any roads, skid trails, or clearcuts, and the post-treatment canopy closure would be similar to the surrounding uncut area.

In terms of the area's manageability as wilderness, the proposed treatments would permit more fires to be managed with less intrusive suppression actions since less of the area would be capable of active crown fire or producing flame lengths greater than 4 feet. This would improve the ability to manage the area in accordance with the Wilderness Act. The area would remain within the wildland-urban interface fire protection zone and fire management would likely be part of discussions regarding future designation as wilderness. However, this would not prevent the area from being eligible for wilderness designation.

Effect on "presently existing wilderness character": In comparison with other alternatives, alternative 2 would have the greatest effect on "presently existing wilderness character." In the short term, there would be a decline in the untrammeled quality, a decline in the natural quality on the acres where mechanical treatment occur, a slight temporary decline in the undeveloped quality, and a slight temporary decline in the opportunity for solitude or primitive and unconfined recreation. However, in the long term, there would be improvement in both the untrammeled and natural quality and no effect on the undeveloped and solitude qualities. This alternative would do the most to reduce the risk of fire escaping from the wilderness study area in the long term and give fire managers a higher probability of success in controlling fire with less use of heavy-handed suppression actions. Against a baseline condition of 100 percent suppression in 1984, this would have positive long-term benefits to the untrammeled and natural aspects of wilderness character, however 342 more acres would receive mechanical thining treatment compared with the timber harvest cutting within the wilderness study area in 1984. Information to support the findings on effect to wilderness character is provided below.

Untrammeled Quality: There would be a short-term decline in the untrammeled quality due to the decision to manipulate fuels. However, in the long term, as treatments are implemented, managers would have more options to manage fires using lighter-hand suppression tactics and less interference which would help the area transition to a more natural fire regime. In contrast to the small scale mechanical treatments implemented in 2003, the proposed treatments are considered large enough to effectively change how fires are managed post-treatment. If mixed severity natural fires could once again occur in the project area, there would be limited to no need to re-treat the mechanical treatment areas. Alternative 2 would allow many more fires to be managed with less human interference. The improvement is due to the expected reduction in flame length and potential for crown fire. Within the defense zone, there would be a 35 percent reduction in the area capable of producing 4 foot flame lengths and a 65 percent reduction in the area capable of producing active crown fire (refer to Fire and Fuels analysis in this chapter). Fire managers anticipate that instead of 100 percent suppression that existed in 1984, more than 50 percent of fire starts could be managed with far less human interference than what occurs today, particularly those fires that ignite later in the season.

Natural Quality: Alternative 2 would result in a short-term decline in the natural quality in localized areas where treatments would occur. In the short term, plant community species composition and age structure would be altered on 825 acres by removing smaller diameter trees, especially subalpine fire. Mechanical thinning does not alter natural conditions to the extent that timber harvest does. However, to provide some context, implementing alternative 2 would result in approximately 342 more acres manipulated through some form of cutting compared with 1984 baseline conditions. Fire line construction associated with prescribed burning is anticipated to have far less impact on natural conditions compared with fire line construction associated with suppression action because there is greater control in determining where and when to ignite prescribed burns. This, combined with the standard use of minimum impact suppression techniques, means fire lines are unlikely to be noticeable after one year. Monitoring conducted on the

Jackson Ranger District one year after large fires in the Gros Ventre Wilderness support the conclusion that fire line impacts are minimal (USDA 2011).

In the long term, the natural quality would be enhanced since fire would be allowed to play a greater role in shaping plant communities and associated wildlife diversity. As described above, implementing alternative 2 would allow at least 50 percent of fire starts to be managed with less human interference..

Undeveloped quality: There would be a slight temporary short-term decline in the undeveloped quality due to a temporary increase in the use of chainsaws. Based on past fuel crew efforts, an estimated 13 acres can be treated per day. Thus, for 825 acres, an estimated 63 total days of chainsaw use would occur while the project was being implemented. This effect would be spread over a 2 to 3 year period. Once the thinning operation ceased, there would be no effect on the undeveloped quality.

Solitude quality: There would be a slight temporary short-term decline in the opportunity for solitude or primitive and unconfined recreation due to the presence of fire crews and need for temporary closures. Since much of the mechanical thinning work is not expected to occur around trails, it is unlikely that this use would negatively affect visitor's opportunity to experience solitude. However, during prescribed fire operations, some trail or area closures may be necessary which would temporarily affect visitor opportunities. This effect would be minimized through mitigation measures that provide for adequate public notification prior to burning. Once fuel treatment operations ceased, there would be no effect on this quality.

Inventoried Roadless Area Effects

Alternative 2 would have no adverse effect and some beneficial effect on apparent naturalness and natural integrity in the Munger Mountain Inventoried Roadless Area since there would be no disturbance from mechanical treatments and the prescribed burns would enhance natural integrity and manageability in the long-term. Within the Phillips Ridge Inventoried Roadless Area, alternative 2 would have some adverse effect on apparent naturalness in the short-term due to disturbance from mechanical fuel treatments (affecting approximately 2.9 percent of the inventoried roadless area). However, natural integrity and manageability would be enhanced in the long-term due to the prescribed burns and greater flexibility in managing future fire starts.

Within both inventoried roadless areas, there would be no effect on remoteness and solitude. With both areas, there would be a temporary short-term effect on primitive and unconfined recreation where trail or area closures would be necessary during burning operations. This effect would be minimized due to project design features that require adequate public notification prior to burning. Within the Phillips Inventoried Roadless Area, there is some potential for adverse effect on primitive and unconfined recreation if mechanical fuel treatments open up the forest enough to allow motor vehicle to travel off-road. This unauthorized use would be minimized due to a design feature: "roadside openings created by treatments in the vicinity of known non-system routes would be physically blocked", however this would require careful oversight to be effectively implemented.

Cumulative Effects

Based on an examination of past, present and reasonably foreseeable projects listed in appendix E, the combination of acres proposed for mechanical treatment under this project plus the acres that were mechanically treated as part of the 2003 Red Top Meadows fuel treatment project that are not part of the present project would result in a total of 861 acres of the wilderness study area manipulated by mechanical thinning if alternative 2 were implemented. There are no cumulative effects associated with the proposed prescribed burns since prescribed burning has not occurred in the past and are there no

reasonable foreseeable projects planned for the future within the wilderness study area or inventoried roadless areas beyond the current Teton to Snake project.

Alternative 3 – Reduce Potential Impacts to Special Areas and Wildlife Habitat

Under alternative 3, there would be 391 acres of mechanical fuel treatment in the Palisades Wilderness Study Area (0.3 percent of the area). In comparison with alternative 2, Recreation Trail Units 6 and 7, Trails End Unit, and Red Top Unit 3 would be eliminated and acres for the other treatment units would be reduced. Like alternative 2, all of the proposed treatments within the wilderness study area would be noncommercial thinning and would consist of cutting smaller trees (under 9 inches dbh) and limbing branches on larger trees to reduce the potential of fire spreading into tree crowns. Chainsaws would be used for cutting but no ground-based machinery would be used. No permanent or temporary roads would be constructed or reconstructed. Material would be scattered or hand-piled and burned. Within the wilderness study area, 96.5 of the acres were previously treated in 2003, thus the treatment on these acres would involve less cutting and limbing compared to acres that have not been treated. In addition to the mechanically treated acres, alternative 3 would involve 7,910 acres of prescribed burning in 11 units with an associated 1.6 miles of fire line (6 percent of the area).

Within the Phillips Ridge Inventoried Roadless Area, alternative 3 would include 273 acres of mechanical fuel treatment (2.8 percent of the area). Specific treatment units include portions of Phillips Bench Units 1, 2, 5 and 7. Unlike alternative 2, all treatments within the inventoried roadless area under alternative 3 would be noncommercial thinning, hand-pile and burning without any use of ground-based machinery. No timber would be removed from the inventoried roadless area and sold. Portions of the power line road would still require maintenance, however the portion of road within the inventoried roadless area would be reduced to 0.4 miles of maintenance under this alternative. Alternative 3 would also include 2,448 acres of prescribed burning in two units within the Phillips Ridge Inventoried Roadless Area with an associated 1.07 miles of fire line (25 percent of the area).

Within the Munger Mountain Inventoried Roadless Area, no mechanical fuel treatment would occur. Treatment in this inventoried roadless area would just involve prescribed burning totaling 1,658 acres in one unit (Munger Mountain burn unit 2 is eliminated under alternative 3) with an associated 2.92 miles of fire line (13 percent of the area).

Direct and Indirect Effects

Palisades Wilderness Study Area Effects

Effect on potential for future designation as Wilderness: For the reasons discussed under alternative 2, mechanical fuel treatment would not prevent the area from being eligible for wilderness designation according to capability criteria. Fire management would likely be part of discussions regarding manageability of the area for future designation as wilderness. However, this would not prevent the area from being eligible for wilderness designation as the criteria for eligibility are not as restrictive as the criteria for stewardship after designation.

Effect on "presently existing wilderness character": Alternative 3 would have less effect on "presently existing wilderness character" compared with alternative 2 but would provide some long-term benefit to wilderness character that would not occur under alternative 1 the no-action alternative. There would still be a short-term decline in the untrammeled quality, a decline in the natural quality on the acres where mechanical treatment occurs, a very slight temporary decline in the undeveloped quality, and a slight temporary decline in the opportunity for solitude or primitive and unconfined recreation. However the magnitude of the decline would be much less under alternative 3 compared with alternative 2. In the long

term, there would be improvement in both the untrammeled and natural quality and no effect on the undeveloped and solitude qualities Against a baseline condition of 100 percent suppression in 1984, there would be improvement in both the untrammeled and natural quality in the long term. In terms of the natural quality, alternative 3 would mechanically treat fewer acres compared to treated acres that existed in 1984. Information to support the findings on effect to wilderness character is provided below.

Untrammeled Quality: There would be a short-term decline in the untrammeled quality due to the decision to manipulate fuels. However, in the long term, as treatments are implemented, managers would have more options to manage fires using lighter-hand suppression tactics and less human interference which would help the area transition to a more natural fire regime. Within the defense zone, there would be a 20 percent reduction in the area capable of producing 4 foot flame lengths and a 41 percent reduction in the area capable of producing active crown fire (refer to Fire and Fuels analysis in this chapter). With this reduction in risk, fire managers anticipate that instead of 100 percent suppression, more than 40 percent of fire starts could be managed with far less human interference than what occurs today, particularly those fires that ignite later in the season.

Natural Quality: Alternative 3 would result in a short-term decline in the natural quality in areas where treatments would occur. In the short term, plant community species composition and age structure would be altered on 391 acres by removing smaller diameter trees especially subalpine fire. Mechanical thinning does not alter natural conditions to the extent that timber harvest does. However, to provide some context, implementing alternative 3 would result in approximately 92 fewer acres manipulated through some form of cutting compared with 1984 baseline conditions. Like alternative 2, the standard use of minimum impact suppression tactics for fire line construction combined with the ability to control where and when prescribed burns occur means that fire line effects are unlikely to be noticeable after one year.

In the long term, the natural quality would be enhanced since fire would be allowed to play a greater role in shaping plant communities and associated wildlife diversity. As described above, implementing alternative 3 would allow at least 40 percent of fire starts to be managed allowing natural processes to operate freely.

Undeveloped quality: There would be a slight short-term decline in the undeveloped quality due to a temporary increase in the use of chainsaws. Based on past fuel crew efforts, an estimated 13 acres can be treated per day. Thus, for 391 acres, an estimated 30 total days of chainsaw use would occur while the project was being implemented. This effect would be spread over a 2-3 year period. Once thinning operations cease, there would be no effect on the undeveloped quality.

Solitude quality: There would be a slight temporary short-term decline in the opportunity for solitude or primitive and unconfined recreation due to the presence of fire crews and need for temporary closures. Since much of the mechanical thinning work is not expected to occur around trails, it is unlikely that this use would negatively affect visitor's opportunity to experience solitude. However, during prescribed fire operations, some trail or area closures may be necessary which would temporarily affect visitor opportunities. This effect would be minimized through project design features that provide for adequate public notification prior to burning. Once fuel treatment operations ceased, there would be no effect on this quality.

Inventoried Roadless Area Effects

Alternative 3 would have no adverse effect and some beneficial effect on apparent naturalness and natural integrity attributes in the Munger Mountain Inventoried Roadless Area since there would be no disturbance from mechanical treatments and the proposed prescribed burning would serve to enhance natural integrity and manageability in the long-term. Within the Phillips Ridge Inventoried Roadless Area,

alternative 3 would have some adverse effect on apparent naturalness in the short term but this effect would be less than under alternative 2 due to the reduced amount of disturbance. Natural integrity and manageability would still be enhanced in the long-term under alternative 3.

Within both inventoried roadless areas, there would be no effect on remoteness and solitude and no effect on special features. Within both areas, there would be a temporary short-term effect on primitive and unconfined recreation where trail or area closures were necessary during burning operations but this effect would be minimal due to project design features that require adequate public notification prior to burning. Within the Phillips Inventoried Roadless Area, there is some potential for adverse effects on primitive and unconfined recreation if mechanical fuel treatments open up the forest enough to allow motor vehicle to travel off-road, however the lack of ground-based machinery would help minimize this effect. This unauthorized use would be further minimized due to design criteria that states that “roadside openings created by treatments in the vicinity of known non-system routes would be physically blocked”; this design criteria would still require careful oversight to be effectively implemented.

Cumulative Effects

Based on an examination of past, present and reasonably foreseeable projects listed in appendix E, the combination of acres proposed for mechanical treatment under this project plus the acres that were mechanically treated as part of the 2003 Red Top Meadows fuel treatment project that are not part of the present project would result in a total of 443 acres of the wilderness study area manipulated by mechanical thinning if alternative 3 were to be implemented. There are no cumulative effects associated with the proposed prescribed burns since prescribed burning has not occurred in the past and there are no reasonably foreseeable projects planned for the future within the wilderness study area or inventoried roadless areas beyond the current Teton to Snake project.

Effects Common to All Action Alternatives

The Jedediah Smith Wilderness is located adjacent to the Phillips Ridge Inventoried Roadless Area and is a class II airshed. There would be no direct effects from the proposed treatments on the wilderness, however indirect effects due to smoke may affect visibility during burning operations. Due to prevailing southwest winds, smoke would primarily be directed away from the Jedediah Smith Wilderness, minimizing the effect on wilderness visitors. The designated wild and scenic Snake River is also located adjacent to the project area, but none of the proposed treatments are within the one-quarter mile interim boundary for the wild and scenic river corridor. The closest treatments are the proposed burn units within the Munger Mountain Inventoried Roadless Area. These treatments would not directly affect the river’s free-flow, water quality, or outstandingly remarkable values, however they would be visible from the river.

Effects Summary

Table 22. Comparison of alternative effects on Palisades Wilderness Study Area

	Alternative 1 No Action	Alternative 2	Alternative 3
Acres of mechanical fuel treatment including new acres compared to 2003 treatment	0 acres	825 acres (approx. 721 new treatment acres and 104 re-treatment acres)	391 acres (approx. 294 new treatment acres and 97 re-treatment acres)
Acres of prescribed burning including miles of fire-line	0 acres	12,042 acres (3.0 miles of fire line)	7,910 acres (1.6 miles of fire line)
Effect on potential for inclusion in the National Wilderness Preservation System	Little effect	Little effect	Little effect
Effect on "presently existing wilderness character"	No effect in short term; increasing decline in untrammeled and natural quality over long term; 100 percent suppression but no active vegetation alternation	Short-term decline but long-term improvement in aspects of wilderness character; 50 percent suppression but more acres altered by mechanical treatment than baseline condition in 1984	Short-term decline but long-term improvement in aspects of wilderness character; 60 percent suppression but fewer acres altered by mechanical treatment than baseline condition in 1984

Table 23. Comparison of alternative effects on inventoried roadless areas

	Alternative 1 No Action	Alternative 2	Alternative 3
Acres of mechanical fuel treatment	0 acres	291 acres (all in Phillips Inventoried Roadless Area)	273 acres (all in Phillips Inventoried Roadless Area)
Acres of prescribing burning including miles of fireline	0 acres	6,857 acres (in both inventoried roadless areas) (5.3 miles of fire line)	4,106 acres (in both inventoried roadless areas) (4.0 miles of fire line)
Miles of road work	0 miles	1.5 miles (Phillips Inventoried Roadless Area) (All maintenance)	0.4 miles (Phillips Inventoried Roadless Area) (All maintenance)
Amount of commercial timber cut	0 board feet	0.2 MBF	0 MBF
Effect on wilderness attributes	No effect in short-term, increasing effect on natural integrity in long term	Beneficial effect on natural integrity in Munger Mountain Inventoried Roadless Area: some adverse effect on apparent naturalness in Phillips Ridge Inventoried Roadless Area in the short term (2.9 percent of area)	Beneficial effect on natural integrity in Munger Mountain Inventoried Roadless Area; some adverse effect on apparent naturalness in Phillips Ridge Inventoried Roadless Area in the short term (2.8 percent of the area but no use of ground-based machinery).

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Implementing the magnitude of mechanical treatments under alternative 2 may not meet the Wyoming Wilderness Act's direction to maintain "presently existing wilderness character" within the wilderness study areain the short term. Implementing the no-action alternative and alternative 3 would comply with the Wyoming Wilderness Act. Design features would need to be effectively implemented and monitored.

Unavoidable Adverse Effects

There would be an unavoidable short-term adverse effect on some aspects of wilderness character during the fuel treatment operations but wilderness character would improve in the long term because there would be less fire suppression and an increased ability to use light-hand tactics when fires must be suppressed.

Wildlife

The following resource information and analysis summarizes the Wildlife Report and Biological Evaluation (Kozlowski et al. 2015), and the Biological Assessment prepared for federally listed species, both available on the Bridger-Teton National Forest website and in the project record. This analysis addresses the effects to wildlife species in four categories:

- Threatened, endangered, and proposed species listed under the Endangered Species Act;
- Forest Service Region 4 sensitive species, and candidate species for federal listing;
- Bridger-Teton National Forest management indicator species, and
- Migratory birds.

The species displayed in table 24 are analyzed in detail for this project because there is evidence of occurrence or the presence of individuals and/or suitable habitat in the wildlife analysis area, and could be affected by project actions. Species screened for relevance and eliminated from detailed analysis are not listed below; a detailed accounting of the screening process is in the Wildlife Report and Biological Evaluation in the project record.

Species Analyzed in Detail

Table 24. Species analyzed in detail

Species	Species Listing	Species or Habitat Present or Occasional in Project Area	
		Species	Habitat
Canada lynx[1] (*Lynx canadensis*)	ESA threatened	Yes	Yes
Gray wolf (*Canis lupus irremotus*)	ESA nonessential experimental population; Forest Service sensitive	Yes	Yes
Grizzly bear (*Ursus arctos horribilis*)	ESA threatened; Bridger-Teton National Forest management indicator	Yes	Yes
Yellow-billed cuckoo[2] (*Coccyzus americanus*)	ESA threatened	Unlikely	Unlikely

Species	Species Listing	Species or Habitat Present or Occasional in Project Area	
		Species	Habitat
Bald eagle *(Haliaeetus leucocephalus)*	Forest Service sensitive Bridger-Teton National Forest management indicator	Yes	Yes
Three –toed woodpecker *(Picoides tridactylus)*	Forest Service sensitive	Yes	Yes
Northern goshawk *(Accipiter gentilis)*	Forest Service sensitive	Yes	Yes
Boreal owl (*Aegolius funereus*)	Forest Service sensitive	Yes	Yes
Great gray owl (*Strix nebulosa*)	Forest Service sensitive	Yes	Yes
Flammulated owl (*Otus flammeolus*)	Forest Service sensitive	Unknown	Yes
Columbia spotted frog (*Rana luteiuentris*)	Forest Service sensitive	Yes	Yes
Wolverine *(Gulo gulo)*	Forest Service sensitive	Yes	Yes
Western boreal toad (*Pseudacris triseriata*)	Forest Service sensitive; Bridger-Teton National Forest management indicator	Yes	Yes
Brewer's sparrow (*Spizella breweri*)	Bridger-Teton National Forest management indicator	Yes	Yes
Elk (*Cervus canadensis*)	Bridger-Teton National Forest management indicator	Yes	Yes
Mule deer (*Odocoileus hemionus*)	Bridger-Teton National Forest management indicator	Yes	Yes
Bighorn sheep (*Ovis canadensis*)	Bridger-Teton National Forest management indicator	Yes	Yes
Moose (*Alces alces*)	Bridger-Teton National Forest management indicator	Yes	Yes
American pine marten (*Martes americana*)	Bridger-Teton National Forest management indicator	Yes	Yes
Boreal chorus frog *(Pseudacris maculate)*	Bridger-Teton National Forest management indicator	Yes	Yes

1 - Canada lynx critical habitat is designated but does not occur in the project area.
2 - Proposed yellow-billed critical habitat does not occur in the project area.

Overview of Issues Addressed

Public and wildlife biologist' considerations were used to identify the issues surrounding potential impacts to wildlife and wildlife habitat as a result of the proposed activities. The concern is that project

implementation could disturb wildlife individuals or alter habitat to the extent that adverse wildlife effects could occur.

Issue Indicators

Analysis indicators were used to assess the predicted magnitude and degree of change that could occur to habitat of species analyzed in detail. Additional indicators estimated the potential direct disturbance to the wildlife and the potential benefits of conservation measures and project design features designed to minimize disturbance or conserve habitat.

Effects indicators for comparison of alternatives used in this project analysis are as follows:

1. Acres of mapped lynx habitat converted to stand initiation stages.
2. Acres of treated forest and non-forest cover that provide habitat for migratory birds.
3. Acres of goshawk nesting habitat converted to an unsuitable condition.
4. Number of units treated to reduce snags that occur at high density within a 200-foot corridor in defense zone units.
5. Units and acres of ungulate habitat valuable as cover, but converted to forage-producing habitat.
6. Brewer's sparrow habitat (sagebrush) converted to sparse sagebrush, grassland, or forbland.
7. Acres of old growth converted to early-successional stages (forest plan standard).
8. Acres of mature boreal forest treated, a measure of potential effects on boreal owls and other wildlife associated with mature boreal forest habitat.
9. Acres of potential forest habitat of flammulated owl, great gray and boreal owl treated by thinning and fire.
10. Miles of temporary roads potentially used by predators that compete with Canada lynx for snowshoes hares during winter.
11. Acres of treated habitat for all species studied in detail.

Existing Condition

Endangered Species Act Threatened, Endangered, and Experimental Non-essential Species

Canada Lynx - Threatened

In 2000, Canada lynx received protection as a threatened species under the Endangered Species Act, as amended (U.S. Fish and Wildlife Service 2000). Within the continental United States, Canada lynx occur in north central Washington, northwestern Montana, northeastern Minnesota, northern Maine, and the Greater Yellowstone Area (Wyoming, Montana, and Idaho). There is also a reintroduced lynx population in the Colorado Rocky Mountains.

Population and Habitat Status

Lynx in the Greater Yellowstone Ecosystem comprise the southern-most natural lynx population in the continental United States (Squires et al. 2003). Historical records indicate little occurrence or evidence of long-term lynx residency on the Bridger-Teton National Forest, including the project area. Based on a review of sightings and location records for Wyoming from 1856 to 1986, Reeve et al. (1986) concluded that lynx observations were concentrated in the Wyoming, Salt River, Absaroka, and Wind River Ranges,

with most sightings associated with subalpine fir or lodgepole pine forests at elevations exceeding 6,500 feet. From 2000 to 2009, resident lynx and offspring (telemetry-based study) were documented on the Big Piney, Greys River, and Kemmerer Ranger Districts in the Wyoming and Salt River Ranges (Squires et al. 2003).

There are no known lynx within the project area, although no recent surveys have been conducted.

Lynx analysis units and lynx habitat on the Bridger-Teton National Forest were identified in 2001in accordance with the Lynx Conservation Assessment and Strategy (Ruediger et al. 2000). The project area occurs in the Fall Creek North and Fall Creek South lynx analysis units. The project area supports 75,143 acres of mapped lynx habitat within the Fall Creek North and the Fall Creek South lynx analysis units.

During winter, lynx prefer habitat mosaics that include mature, multi-story spruce-fir forests (Squires et al. 2010). In most of their range, lynx densities and population dynamics are strongly tied to the distribution and abundance of snowshoe hare (*Lepus americanus*), their primary winter prey. Hares use both young even-aged and older multi-storied conifer stands that are densely stocked with seedlings or saplings and tall enough to provide cover and browse above winter snowpack (Koehler and Brittel 1990, Zimmer et al. 2008, Berg et al. 2012). Buskirk et al. (1999) suggested that snowshoe hare abundance should be high in sapling and old “gap phase” forests, where fires, tree mortality, and snag loss create openings in the forest canopy and promote understory cover production. Dense horizontal cover is an important determinant of snowshoe hare presence and abundance within lynx habitat.

Studies conducted from 2006 to 2008 on the Bridger-Teton National Forest indicate that the greatest snowshoe hare numbers occur in young lodgepole of high density, late seral multi-storied stands of mixed spruce–fir, mixed aspen and spruce–fir stands, and mixed lodgepole spruce–fir (Berg et al. 2012). Hare densities in these types are sufficient for production and recruitment of lynx kittens. Even though hare densities can be high on the portions of the Forest, lynx home ranges in the southern part of their continental range are large, suggesting that habitats containing abundant hares are rare and isolated (Squires and Laurion 2000, Squires et al. 2003). To persist, lynx require numerous patches of favorable, albeit dispersed, hare habitat in their home range. Snowshoe hares in Wyoming are not believed to exhibit the dramatic population cycles common to Canada and Alaska. Where snowshoe hares are limited, Canada lynx at the southern end of their range may opportunistically hunt alternate prey such as red squirrels and forest grouse. However, lynx appear unable to recruit their young into the population on a diet composed primarily of alternate prey (Ruediger et al. 2000).

Surveys of snowshoe hare habitat (horizontal cover) and pellet counts in the project area conducted in 2010 suggest low levels of winter habitat for snowshoe hares and that snowshoe hare numbers were very low in much of the project area. Plots with zero pellets were more frequent in the southern half of the project area. The proposed Powerline and Phillips Bench mechanical treatments (northern portion) supported the greatest number of snowshoe hare pellets.

No designated critical lynx habitat occurs within the project area.

Gray Wolf

Gray wolves in Wyoming were relisted under the Endangered Species Act as a nonessential experimental population in September of 2014. They are also listed as a Forest Service sensitive species.

Population and Habitat Status

Thirty-one wolves were reintroduced in Yellowstone National Park from1995–1996, with populations established within 2 years. In 2004, at least 121 wolves comprising 16 packs were present in Yellowstone

National Park. Outside the park, an estimated 225 wolves made up 15 pup-producing packs. Nine of 13 packs produced pups in Yellowstone National Park in 2010. Fifteen packs produced pups outside the park in Wyoming and another two are suspected to have produced pups (U.S. Fish and Wildlife Service 2010). The end of 2013 marked the 12th consecutive year that Wyoming has exceeded the numerical, distributional, and temporal recovery goals established by the U.S. Fish and Wildlife Service (Wyoming Game and Fish Department et al. 2014).

Wolves are wide-ranging and use nearly all habitat types throughout the project area. Key components of wolf habitat include (U.S. Fish and Wildlife Service 1987):

1. a sufficient year-round prey base of ungulates (big game animals) and alternate prey;
2. suitable and somewhat secluded denning and rendezvous sites, especially during the early denning period (late March through June); and
3. sufficient space with minimal exposure to humans.

The Dog Creek wolf pack that occupied the southern portion of the project area where wolves are designated as dual-status predatory and trophy animals was removed in 2013. No other packs are currently established in the area, although lone wolves commonly travel through the area.

Grizzly Bear – Threatened

This species was listed as threatened in the lower 48 states in 1975. The Yellowstone grizzly bear population is discrete from other grizzly populations, has markedly different genetic characteristics, and exists in a unique ecological setting where bears use terrestrial mammals as their primary source of nutrition (Mattson 1997; Miller and Waits 2003).

Population and Habitat Status

More than 500 bears now occur in the Greater Yellowstone Area (Schwartz et al. 2006), and the range distribution have expanded and counts of unduplicated females with cubs-of-the-year have increased to more than double the Recovery Plan target of 15 since 2000 (Haroldson 2006). During 2000–2005, all 18 bear management units in the Greater Yellowstone Area were occupied by female grizzly bears with cubs-of-the-year (Podruzny 2006).

The project area is several miles south of the southern boundary of the Yellowstone grizzly bear recovery zone (U.S. Fish and Wildlife Service 1993). The project area is located within the area that the U.S. Fish and Wildlife Service considers as biologically suitable for bear occupancy. No resident bears are known to occupy the area, but transitory bears move through. It is possible that grizzlies could establish residency in the near future. There has been an increase in grizzly bear sightings in the Teton Pass and Teton Village areas and the Snake River Canyon in the last 2 years.

Grizzly bears use forest environments in addition to grasslands and shrublands, particularly riparian zones. They prefer habitats that provide relative solitude and that support prey and vegetative bear foods.

Yellow-billed Cuckoo –Threatened with Critical Habitat Proposed

The yellow-billed cuckoo was listed as a threatened distinct population segment in western United States, Canada, and Mexico. Threats to yellow-billed cuckoo include habitat destruction from dams, water diversions, river-flow management, stream channelization and conversion of habitat to agricultural uses such as crops and livestock grazing. In addition, populations tend to be small and isolated and thus are susceptible to local extirpations.

Population and Habitat Status

Critical habitat was proposed in areas of Arizona, California, Colorado, Idaho, Nevada, New Mexico, Texas, Utah, and Wyoming (U.S. Fish and Wildlife Service 2014). None of the proposed critical habitat is located within or adjacent to the project boundary.

A summary of habitat use and needs is described in detail in the proposal to list the species (U.S. Fish and Wildlife Service 2013). The yellow-billed cuckoo nests almost exclusively in low- to moderate- elevation riparian woodlands that cover 50 acres or more within arid to semiarid landscapes. At the landscape level, the amount of cover dominated by cottonwood–willow communities and the width of riparian zones influence western yellow-billed cuckoo distribution and abundance (Gaines and Laymon 1984, p.76 as cited in U.S. Fish and Wildlife Service 2013). Such habitats limited to 77 acres in coverage, principally in the southeast portion of the project area.

The yellow-billed cuckoo is considered an uncommon summer resident in Wyoming (Wyoming Game and Fish Department 2003, Dorn and Dorn 1990), and nesting is not expected on the Bridger-Teton National Forest (Wyoming Natural Diversity Database 2010) due to inadequate nesting habitat. The nearest known nesting pair of cuckoos is more than 300 miles from the project area.

U.S. Forest Service Sensitive Species

Sensitive species are designated by the USDA Forest Service Regional Forester (FSM 2670) and are managed under the authority of the National Forest Management Act.

Information from draft conservation assessments that were completed in 2012-2013 for several sensitive Bridger-Teton National Forest species considered here (boreal and great gray owls, bald eagle, goshawk, peregrine falcon, three-toed woodpecker, wolverine, boreal toad and Columbia spotted frog) is incorporated and referenced in this report. Notably, risk factors to these species identified in the draft conservation assessments associated with management of forest and rangeland conditions by mechanical and prescribed fire treatments are integrated into the environmental consequences discussions on chapter 3.

Three-toed Woodpecker

Population and Habitat Status. This species requires snags in coniferous forests for nesting, feeding, perching, and roosting. In Wyoming forests, the three-toed woodpecker is found in large, continuous conifer stands. This species forages on insects, mainly in recently dead and dying trees, but would also feed in live trees. The three-toed woodpecker is primarily associated with recent coniferous forest burns and bark beetle infestations. Three-toed woodpeckers inhabit recently burned and beetle-killed conifer stands 1–6 years after a fire. They excavate a new cavity annually for nesting. One of the top three threats to three-toed woodpeckers is fire suppression. Less aggressive fire suppression and more prescribed burning in suitable habitat have been identified as key conservation elements for this species (Wyoming Partners in Flight 2003).

Three-toed woodpeckers were observed in 2010 within most of the units proposed for treatment in this project. The high mountain pine beetle populations provide a food source (beetles) for woodpeckers.

Northern Goshawk

Population and Habitat Status. Goshawk nest stands include large trees, high canopy closures, and relatively open understories (Reynolds et al. 1992; Squires and Reynolds 1997; Squires and Kennedy 2006). Nests are sometimes reused in subsequent years and alternate nests may be utilized within the same nesting area (Squires and Reynolds 1997). Goshawks rely on tree structure and nest platform suitability for nest sites rather than specific tree species (Reynolds et al. 1992).

Goshawks may occupy nesting territories as early as late March with egg-laying spanning from late April to early May. If eggs are lost, a second nesting attempt may occur although this is rare. The fledging stage occurs from mid to late July. Fledglings are typically dependent on adult birds for another 2 months (see summary in Squires and Reynolds 1997). The post-fledging family area usually consists largely of forested areas to provide cover for fledgling goshawks (Squires and Kennedy 2006).

Goshawk foraging areas tend to be much more diverse than nesting or post-fledging family areas and usually include open fields, sagebrush meadows, and riparian corridors (Reynolds et al. 1992; Hargis et al. 1994; Patla 1997; McGrath et al. 2003). Goshawks use foraging areas for opportunistic hunting of a diverse prey base. In western Wyoming, they primarily feed on snowshoe hares, squirrels, and large birds such as grouse, corvids, and woodpeckers (see summary in Squires and Reynolds 1997). These areas are usually representative of the landscape at large (McGrath et al. 2003).

Status of the Species in the Project Area. Goshawk nesting and foraging habitat is abundant in the project area, including the mechanical and prescribed burn units.

Surveys of the proposed treatment units and surrounding areas in 2010 and 2011 identified juvenile goshawks in a nesting territory in Coburn Creek and an adult at the mouth of Coburn Creek. The breeding pair on this territory successfully produced two fledgling goshawks. The nest stand was located on a north-facing slope dominated by mid-to late-successional lodgepole pine infested with mountain pine beetles.

Bedrosian (2014) provided locations of five potential goshawk post-fledging areas that overlap proposed treatment units within the project area. These post-fledging areas are centered around active goshawk or great gray owl nests that are abandoned (or alternate) goshawk nests. Additional goshawk call-back surveys would be completed before project treatments in the post-fledging areas centered on owls nests to assess the presence or absence of goshawks within or near these post-fledging areas. There were reported goshawk sightings in the Black Canyon area west of Wilson in the summer of 2009, however no nest sites were located. A goshawk was observed just west of Red Top Meadows in 2002, with no nest site located. Few other reliable observations of goshawks are known from the area, but goshawks are generally secretive and difficult to detect.

Boreal Owl

Population and Habitat Status. Boreal owls are generally associated with mature and old-growth subalpine forests dominated by subalpine fir and Engelmann spruce, often with inclusions of aspen, lodgepole pine, and Douglas-fir (Garber et al. 1991; Scott 2004). Subalpine forests naturally have a patchy distribution due to topographic variation and disturbances such as fire, insects, and diseases; and typically have high canopy cover, cool ambient temperatures, and high relative humidity (Knight 1994). In western Wyoming, subalpine forests typically occur above 8,000 feet in elevation, with stringers extending to low elevations along stream courses.

Boreal owls hunt for small mammals in mature and old subalpine forests where conditions promote the growth of lichens and other food for prey. Hunting is aided by the patchy nature of the forests. Foraging also occurs in edge habitats that are part of their large home ranges (up to 2,900 acres). Clearcuts and other uniform-age stands of regenerating conifers are generally avoided by foraging owls (Hayward et al. 1993; Knight 1994).

Boreal owls are secondary cavity nesters, using existing holes in snags in forests with high structural complexity, abundant trees with large basal areas, and understories that permit unobstructed flight during foraging (Hayward et al. 1993). Breeding peaks in March and April, egg-laying occurs from early April to mid-May, followed by incubation and nestling periods of about 30 days each.

Spatial modeling indicates that the Bridger-Teton National Forest and the Jackson Ranger District currently support about 300,000 acres and 64,000 acres, respectively, of mature or old subalpine forests that potentially provide nesting, roosting, or foraging or habitat for boreal owls.

Status of the Species in the Proposed Project Area. Surveys conducted in 2010 detected 27 owls, including 4 boreal owls. A one-night, localized survey in 2011 detected no owls.

The pre-1900 fire regime maintained a large portion of the project area as unforested, with the landscape dominated by herbaceous and shrub cover (Brandegee 1899). Where they occurred, forests were structurally diverse. Most fires were lightning-caused, mixed in severity, and small in size. In contrast, fire suppression during the 20th century resulted in increased conifer cover (likely including subalpine forests), and reduced cover of grasses, shrubs, and aspen (Loope and Gruell 1973).

Spatial modeling identified about 3,500 acres of mature or old subalpine forest in the project area, occurring in patches from 51 to 286 acres in size, primarily in Phillips Ridge and Mosquito, Trail, and Coburn Creeks. Modeled subalpine forests extensively overlap forest old growth and goshawk nesting habitat (Langston 2011).

Habitat has been affected by fire suppression, insect epidemics, and large wildfires. Large fires in conifer stands tended to set stands back to early-successional stages. Like insect epidemics, high-intensity fires reduced canopy cover, stand openness, and ambient air temperature. At sites where the fires burned at low or moderate intensities, only understory vegetation and woody debris on the forest floor was consumed, and tree mortality was limited.

Forest management activities since 1960 have created nearly 1,900 acres of young forest in the project area. These areas have small trees and generally lack the vertical and horizontal structure needed by boreal owls, and may be too dense for flying boreal owls.

A multi-year study on great gray owls began in 2013, and includes most of the project area from mid- to low elevation in or adjacent to proposed treatment units. The design allows for a potential long-term study to assess the influence of forest treatments on great gray owl, including changes in distribution, density and movements. Data collection focused within the proposed treatments in the Fall Creek and Fish Creek areas near Wilson, WY.

Boreal owls were detected in all forest cover types in the project area during the courtship period. Owls were detected two times more frequently in lodgepole pine mix forest cover which is also the forest type most common in the project area, together with the spruce-subalpine fir type. Owls were detected in aspen, Douglas-fir mix, and spruce/subalpine fir in about equal frequency. Approximately 75percent of the detections occurred in forest cover of trees under 10 inches dbh; the most represented tree size class in the project area. Approximately, 25percent of observations were in the 10 to 20 inch dbh tree size class; the second most represented class in the project area. Owls occurred most frequently (75percent of detections) in forest stands with 40 to 60percent canopy cover.

Treatment units with a high probability of owl presence include: PF 13, 22, 24, 26, 29, 30, 48 and T04, 05, 07, 08, 14, 15, 16, 17, 18, 19, 21, 23, 25, 31, and 33, totaling 5851 acres in alternative 2 units and 3669 acres in alternative 3. Boreal owls frequented many of the same units where great gray owls were found during surveys.

Great Gray Owl

Population and Habitat Status. The great gray owl inhabits the boreal climatic zones of North America and Eurasia. It is a year-round resident in Wyoming, primarily in the mountainous areas in the western

third of the state, including the Bridger-Teton National Forest (Hayward and Verner 1994). Great gray owl abundance is unknown in Wyoming. Surveys in 2009 detected great gray owls in the Wyoming Range; they are considered common in the Jackson area (S. Patla, field trip discussion). The Wyoming Game and Fish Department classifies it as a species of special concern due to unknown population status and trends, but they are expected to be stable. Timber harvesting can reduce and eliminate nest sites; however, there is no documented ongoing significant loss of habitat (Wyoming Game and Fish Department 2005a). The effects of the widespread beetle mortality on older forest stands are unknown, but could likely reduce habitat in the future.

The great gray owl is generally associated with lodgepole pine, Douglas-fir, and aspen forests; usually bordering small openings or meadows. For nesting, the species favors mature or old-growth Douglas-fir or lodgepole pine forests on moderate slopes. This owl selects for security cover with greater than 60 percent crown cover (Whitfield and Gaffney, *no date*). It forages primarily in wet montane meadows and older open forest stands with a high density of pocket gophers and *Microtus* species. Optimum habitat includes semi-open areas with abundant prey near dense coniferous forests—smaller diameter trees for roosting and broken top snags, stumps, dwarf-mistletoe platforms, or old hawk and common raven nests for nesting. In a 6-year northern goshawk monitoring study on the adjacent Caribou-Targhee National Forest, great gray owls were more likely to be found reusing alternate goshawk nests and would often reuse a stick nest from 2 to 4 years (Patla 1997).

Status of the Species in the Project Area. Great grey owls and nests are common in the project area as indicated by surveys conducted in the spring and summer of 2009 and 2010.

A multi-year study on great gray owls began in 2013, and includes most of the project area from mid- to low elevation in or adjacent to proposed treatment units. The design allows for a potential long-term study to assess the influence of forest treatments on great gray owl, including changes in distribution, density and movements. Data collection focused within the proposed treatments in the Fall Creek and Fish Creek areas near Wilson, WY.

In 2013, researchers (Beringia South) recorded 66 calling great gray owl in potential nesting habitat. They found four occupied nests and an additional family group in August, and estimated that 10 territories occurred within the study area. Great gray owl detections in 2014 were much lower than in 2013.

Treatment units with a high probability of great gray owl presence include: PF 22, 24, 26, 28, 29, 32, and T03, 17, 18, 19, 21, 23, 25, 33, 35, and 36. Great gray and boreal owls were found in many of the same units.

Flammulated Owl

Population and Habitat Status. The flammulated owl is a small, neo-tropical migrant that breeds in montane forests of western North America from British Columbia to Oaxaca, Mexico. It is a habitat specialist of dry, interior, open-canopied conifer forests containing ponderosa pine or forests with similar features (McCallum 1994). Due to its narrow habitat requirements, low reproductive rate, and association with commercially valuable forests on breeding and winter ranges, the flammulated owl has been given elevated conservation status at state, federal, and provincial levels across its range (Waterbury et al. 2009). The flammulated owl is a “Bird of Conservation Concern (BCC) 2008” as identified by the U.S. Fish and Wildlife Service (2008). Bird of Conservation Concern represent the highest conservation priority to prevent the need for additional ESA bird listings by implementing proactive management and conservation actions. Focused attention on protection of the habitats upon which Bird of Conservation Concern depend would promote healthy avian populations.

Generally, breeding habitat consists of a cold temperate and semiarid climate, a high abundance or diversity of nocturnal arthropod (mostly insect) prey, open forest structure, dense foliage for roosting, and large trees and snags providing nest cavities (McCallum 1994).

Flammulated owls in the northern Rockies occupy mid-elevation montane forests with structural attributes characteristics of late or old-successional forests, including low to moderate canopy closure, at least some large trees, and snags (Reynolds and Linkhart 1987, McCallum 1994*b*, Bull et al. 1990). They require a heterogeneous stand structure characteristic of uneven-aged forest. Snags and mature trees are required for nesting, and ponderosa pine seems to be preferred where it occurs. Scattered, dense thickets of understory regeneration (sapling or pole) are a critical component of roosting habitat. The structural heterogeneity created by these thickets adjacent to open spaces provides both security and diversity of prey opportunities for the owl. Other landscape characteristics associated with occupied habitats include clearings in and adjacent to forest stands for foraging, and ridgetops and xeric mid- upper slopes, which may be related to foraging energetics and prey availability (Goggans 1986 and Reynolds and Linkhart 1987, Bull et al. 1990).

Flammulated owls are secondary cavity nesters and nest sites may occur in both live conifer and deciduous trees with suitable nesting cavities (Arsenault et al. 2003 as cited in Waterbury et al. 2009). The nest cavity is used year after year by the flammulated owl pair.

Flammulated owls feed on arthropods, using hawking and hover gleaning tactics for hunting in open crowns, in forest openings and along edges. Preferred roosting habitat appears to be large live trees with significant overhead protection or dense vegetation. Old-growth trees are strongly correlated with nesting, singing, and foraging sites (Reynolds et al. 1989, Bull et al. 1990, Linkhart et al. 1998). Linkhart (2001) concluded that the association of flammulated owl productivity with higher densities of larger diameter trees suggests that flammulated owls are adapted to forests that were historically maintained by fire. Fire suppression in many western forests, which were historically characterized by open stands of large-diameter trees prior to European settlement, has resulted in higher tree densities especially in the smaller diameter classes, and the conversion of many pine forests to shade-tolerant fir forests and high tree densities in smaller diameter classes, which are less than optimal for flammulated owls.

Status of the Species in the Project Area. The flammulated owl is a rare summer resident of Wyoming's montane forests, especially ponderosa pine (Orabona et al. 2012). The Bridger-Teton National Forest and surrounding region lack breeding season occurrence records for this species despite presence of predicted habitat. There are no recorded observations of flammulated owls on the Bridger-Teton National Forest. There is only one observation (uncertain validity) of a flammulated owl in the Jackson Hole valley on the Wyoming Game and Fish South Park Wildlife Habitat Management Area south of Jackson. The population of flammulated owls in Wyoming is unknown and no population objective has been established by the State (Rosenburg 2004).

Conifer encroachment into moist meadows, upland grass and shrub communities, aspen clones and forest understory has gradually reduced foraging and prey habitat for owls. More conifer habitat has produced snags that potentially could be used for nesting. Where the encroachment of understory and mid-story conifers has altered what was once open habitat, fire suppression may have allowed understory growth to inhibit open flight lanes used for foraging. Ongoing changes in forest understory tree density, composition and structure have likely depressed the abundance and composition of prey species available to flammulated owls in the forest stands. With ongoing fire suppression activities, some of these dense stands may become totally unsuitable habitat in time. However, the recent forest mortality from Douglas-fir beetle infestation and an ongoing mountain pine beetle epidemic on the Forest and within the project area may be improving owl nesting and foraging habitat on the Jackson Ranger District (Amell 2012).

More snags and gaps of open canopy provide potential nest structures, more productive understory vegetation for owl prey and better flight lanes for hunting prey.

Based on the research information presented here on preferred habitats, the Douglas-fir mix, aspen and aspen-conifer mix cover types would provide the most suitable potential habitat for breeding and non-breeding owls. Lodgepole pine mix with Douglas-fir, aspen, and subalpine fir is generally considered less suitable for nesting habitat, but can provide suitable foraging and secure roosting habitat conditions for non-breeders, paired males and fledglings. Pure lodgepole stands and subalpine fir forest cover usually have fewer owl detections and are not considered suitable breeding and nesting habitat in the project area.

Columbia Spotted Frog

Population and Habitat Status. Columbia spotted frogs breed in ponds, marshes, slow streams, and along lake edges, and breeding site typically contain emergent vegetation such as sedges. After breeding, adults disperse to inhabit marshes, riparian areas, and moist or seasonally wet forests and meadows. The breeding season typically begins in late April or early May (low elevations) to late June (high elevations), and 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 2005:441). Summer habitat consists of seasonally moist meadows, ephemeral and permanent pools in meadows and forests, beaver ponds, lake margins, riparian zones, streams, and marshes (Pilliod et al. 2002, Patla and Keinath 2005). Wintering habitat includes ponds, streams, under stream banks, springs, beaver dams, and underground areas (associated with water bodies), but all such sites must have above freezing temperatures, be moist or wet, and be well oxygenated (Patla and Keinath 2005). Columbia spotted frogs winter in or immediately adjacent to aquatic sites, where they can avoid the threat of freezing or oxygen depletion (Bull and Hayes 2002 in Patla and Keinath 2005).

They are believed to be widespread in central and north Idaho, western Montana, and northwestern Wyoming. Columbia spotted frogs have declined in Utah's Wasatch Mountains, and in other portions of its range in the western United States, including northwestern Wyoming where the species occurs at the southeastern edge of its geographic range. Spotted frogs are a species of special concern in Wyoming and southwestern Idaho.

Status of the Species in the Proposed Project Area. Columbia spotted frogs commonly occur on the Bridger-Teton National Forest (S. Patla 2000, personal communication) in wetland areas. Breeding activity was identified on Munger Mountain during the 2010 surveys. Surveys and incidental observations have recorded the species in all six ranger districts of the Bridger-Teton National Forest (Wyoming Natural Diversity Database 2011, unpublished district records as cited in DeLong 2013, draft assessment). Although a relatively large number of breeding sites are known on the Bridger-Teton National Forest, the locations and distributions of summer-long habitat and wintering habitat remain largely unknown. Columbia spotted frogs (adults and tadpoles) have been observed at five sites in the project area (Wyoming Natural Diversity Database 2011) during formal surveys and incidental observations from 1990s through 2013. Breeding activity was identified along Mosquito Creek, in Pritchard pond and on Munger Mountain during the 2010 to 2013 surveys. Adult frogs also have been observed in wetlands south of Ski Lake and along Falls Creek just south of Red Top Meadows.

Western Boreal Toad

Population and Habitat Status. The boreal toad occurs from Alaska to northern New Mexico extending from within the Rocky Mountains west to the Pacific Coast. In Wyoming, it is restricted to mountains and foothills and relatively moist conditions. The boreal toad is a species of concern in Wyoming. The range of the boreal toad includes the entire Bridger-Teton National Forest. Breeding occurs in ponds, slow

streams, river backwater channels and along lake edges. Eggs are deposited in the water. Adults are primarily terrestrial and are observed in a great variety of habitats, frequently at night during the summer. This formerly widespread and common species has declined dramatically in the last three decades in many portions of its extensive range in western North America.

Boreal toads are considered “extremely rare” in Wyoming and on the Bridger-Teton National Forest (Patla 2001, Wyoming Game and Fish Department 2010), but surveys and incidental observations have recorded the species within all six ranger districts on the Bridger-Teton National Forest (Patla 2000, Wyoming Natural Diversity Database 2011, unpublished district records). In 2005, five boreal toad breeding sites were monitored (Patla pers. comm.). Currently, concentrations of persistent breeding activity (several sites in proximity) occur in the Upper Green River watershed and the northeast portion of the Wyoming Range. A single breeding site also occurs near the Blackrock Ranger District on the Buffalo Fork River.

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 appears to be an important component of breeding habitat, and there appears to be a propensity for toads to lay their eggs in the in or near the marshy parts of wetlands (Keinath and McGee 2005, unpublished amphibian monitoring data of the Bridger-Teton National Forest).

Most breeding takes place between mid-May and mid 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).

After the breeding season, male boreal toads tend to remain close to breeding sites (e.g., within about 330 yards in studied populations), while females may range as far as 1.5-2.4 miles (Muths 2003, Bartelt et al. 2004, Pierce 2006, Goates et al. 2007).

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, and they spend part of their time basking in the sunlight to thermoregulate (Keinath and McGee 2005). Adults are primarily terrestrial and inhabit a great variety of habitats, from non-forested to forested and from relatively dry to wet habitats, so long as moist microsites are available. Boreal toads can travel long distances, traversing through different types of habitats as they move.

Boreal toads occupy forested and non-forested wet, moist, and even relatively dry areas.in summer, although they use moist habitats more often than drier habitats (Bartelt et al. 2004, Brazier and Whelan 2004). In winter, they overwinter in underground burrows within about 3 feet of a small flowing stream and under slash piles (Bartelt and Peterson 1997 as cited in Patla 2001).

The extensive late-seral forests, as well as beetle-killed trees, may be increasing the amount of thermal and security cover for toads on the Forest.

Status of the Species in the Project Area. There are two suspected observations of boreal toads in the project area. A suspected breeding area was documented on Munger Mountain (Wyoming Natural Diversity Database 2011). Numerous toad lets, apparently in migration, were identified upslope from a suspected breeding area (currently unidentified) in Mosquito Creek in 2014.

Bald Eagle

Population and Habitat Status. Behrens (2012, draft conservation assessment) summarized the status, habitat requirements, risk factors and management objectives of the bald eagle on the Bridger Teton National Forest using information from research documents, annual monitoring reports, literature reviews, and conservation assessments.

The bald eagle is considered an uncommon resident in Wyoming, but the number of nesting pairs in the state has increased from 20 in 1978 to over 150 pairs by 2009 (Wyoming Game and Fish Department 2010). Although the recovering population has expanded, it is not expected to exceed 200 nesting pairs.

Bald eagles generally nest near coastlines, rivers, large lakes or streams that support an adequate food supply. They often nest in mature or old-growth trees; snags (dead trees); cliffs; rock promontories; rarely on the ground; and with increasing frequency on human-made structures such as power poles and communication towers. In forested areas, bald eagles often select the tallest trees with limbs strong enough to support a nest that can weigh more than 1,000 pounds. Nest sites typically include at least one perch with a clear view of the water where the eagles frequently forage. Shoreline trees or snags located in reservoirs provide the visibility and accessibility needed to locate aquatic prey. Besides the distance to nearest water, other features that influence nest location can include diversity, abundance, and vulnerability of prey base; presence and proximity of shallow water; and absence of human development and disturbance (Buehler 2000 as cited in Behrens 2012, draft conservation assessment).

Status of the Species in the Project Area. The bald eagle nests along all major river systems in Wyoming, but the largest number of nesting pairs is found in northwestern Wyoming in the greater Yellowstone area along the Snake River drainage and its tributaries. Bald eagles in northwestern Wyoming have long been recognized as part of a distinct population that nests in the Rocky Mountain west. This genetically distinct population extends into Idaho and Montana (Swenson et al. 1986 as cited in Wyoming Game and Fish Department 2013). Recovery of the species in Wyoming centered on the Jackson area beginning in the 1980s. The numerous territories located along the Snake River continue to serve as a source of bald eagles for other areas of the greater Yellowstone area and other parts of Wyoming (Harmata and Oakleaf 1992 as cited in Wyoming Game and Fish Department 2013). It appears that most fledglings produced in western Wyoming spend their first winter on the Pacific west coast but return to natal areas the subsequent spring. Sub-adults roam widely throughout the Greater Yellowstone Area, with population exchange between Idaho and Montana and Wyoming (Behrens 2012, draft conservation assessment).

Abundant, readily available food supplies near one or more suitable night roost sites are the primary characteristics of occupied winter habitat. The majority of wintering bald eagles are found near open water where they feed on fish and waterfowl, often taking those that are dead or vulnerable (Behrens 2012). Major rivers and large lakes constitute the majority of winter habitats used, although temporary presence of high quality foods may entice eagles to areas for remove from aquatic zones. When suitable conditions exist, particularly an absence of human disturbance, wintering bald eagles would forage in terrestrial habitats capturing small and medium sized mammals (such as prairie dogs and rabbits). They also may scavenge carrion of roadkill, winter mortalities of big game or livestock, or livestock associated with ranching (Behrens 2012).

General foraging habitats include nearly all upland and aquatic habitats that support sufficient prey species. In Wyoming, suitable general foraging habitats can include grasslands, shrublands, streams, rivers, lakes, and reservoirs which provide open flight paths, perches, and security from intrusion or disturbance, as well as adequate prey. Concentrated foraging habitats typically support high densities of prey species and can often be a reliable source of food during wintering.

Bald eagles are known to forage in the project area year around. There are no known bald eagle nests or communal roost sites in the project area. The nearest nest site to the project area (within 0.5 mile) is on private land adjacent to Munger Mountain Unit PF-48. Five other breeding pairs nesting on private, state and federal lands in the riparian forest corridor along the Snake River have home ranges that potentially overlap portions of the project area.

Wolverine

Population and Habitat Status. Previous reports, surveys, and sightings records suggest that wolverines historically occurred throughout the Yellowstone Ecosystem. Wolverines occur in the Teton Mountain Range and residents occasionally use the Snake River Range south of Teton Pass. Owing to their capability for long-distance dispersal, juveniles and temporary residents may occur nearly anywhere in the Yellowstone ecosystem, including the project area.

Wolverine habitat generally supports a year-round food supply of carrion and other mammals in remote areas. In western Wyoming, this includes portions of wilderness and backcountry areas that exceed 8,000 feet. Year-round habitat is defined by deep, persistent spring (April 15 to May 14) snow (Copeland et al. 2010, pp. 242– 243 as cited in U.S. Fish and Wildlife Service 2013). Wolverines do not 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, as cited in U.S. Fish and Wildlife Service 2013). The availability of large mammal (ungulate) carrion as food is important for the distribution, survival, and reproductive success of wolverines. Wolverines have been documented at higher elevations on the Jackson Ranger District.

Status of the Species in the Project Area. No resident wolverines have been documented in the project area. A telemetry-based study of wolverines in and near the project area (Grand Teton National Park, Jedidiah Smith Wilderness, and adjacent portions of the Caribou-Targhee National Forest) began in 2014. One male wolverine was captured and radio-marked. In 2015, the study team maintained one baited live-trap in the upper Mosquitor Creek watershed, but no wolverines were detected. The Bridger-Teton National Forest has mapped potential wolverine denning habitat along the high elevation western edge of the proposed project boundary in the vicinity of Indian Peak, Observation Peak, North Indian Creek Pass, Mud Pass, Teton Pass, Mt. Glory and Middle Fork of Phillips Canyon areas. Potential denning habitat occurs in the Phillips Canyon Rx 1, North Fork Phillips Canyon Rx 1, Powerline 1, and Black Canyon Rx 2 units.

Wolverines are naturally wide-ranging creatures and dispersal is an important mechanism for maintaining genetic interaction among and between sub-populations. The project area provides habitat for wolverines in the high alpine basins of the Palisades Wilderness Study Area and provides habitat connectivity with the Jedidiah Wilderness Area to the west and the Wyoming Range to the south. The project area is within a larger region important for maintaining habitat connectivity for north-south movement along the Snake River Range and Teton Range, continuing north into Grand Teton and Yellowstone National Parks.

Management Indicator Species

National Forest Management Act implementing regulations and the Forest Service Manual require that forest plans identify select vertebrates and/or invertebrates as management indicator species, and that

these species be monitored “in order to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent” (FSM 2620.5).

Much of the following management indicator species status and habitat information is adapted and excerpted from the “Updated Assessment of the Condition of Management Indicator Species Habitat with Respect to Livestock Grazing Use on the Bridger-Teton National Forest” (USDA Forest Service 2009).

Grizzly Bear, Western Boreal Toad, and Bald Eagle

These species are discussed above as either ESA or Forest Service sensitive species.

Brewer's Sparrow

Current Status

Brewer’s sparrows are sagebrush obligates that summer in North America and winter in Central or South America. Populations have declined nationwide. An analysis cited by Holmes and Johnson (2005) showed a significant decline in Brewer’s sparrow numbers from 1966 to 2002 for the entire state of Wyoming. Numbers declined in southern and eastern Wyoming but increased on routes in northwestern Wyoming. Regional survey data in Wyoming indicates the populations have rebounded and are stable.

Occurrence data collected from 1968 to 2003 on the Bridger-Teton National Forest showed a positive trend on four survey routes and an annual decline on the fifth route. Wildlife survey crews commonly observed Brewer’s sparrows in sagebrush habitats on the Jackson Ranger District, including in the project area, during point count surveys in 2010 and 2011. Additional survey data is in the project record.

The largest threat to breeding grounds is permanent loss of big sagebrush due to land use changes such as cultivated agriculture and residential development. Fire and other disturbances temporarily reduce nesting habitat, but this turnover of the big sagebrush type is needed for sustained health (Miller et al. 1994), and is a natural process characteristic of their habitat. Where big sagebrush habitat remains on Brewer’s sparrow breeding grounds, Holmes and Johnson (2005) suggested that variation in local reproductive success appears to result from nest predation. Nest parasitism by brown-headed cowbirds also affects reproductive success.

Partial burns in sagebrush are less detrimental to Brewer's sparrows than complete burns. Arthropods make up the majority of the adult diet and all of the nestling diet during the breeding season. In southeastern Idaho, prescribed burning did not affect the composition of nestling diets, largely because adults avoided burned areas and continued to forage for arthropods in unburned areas (Winter 1984; Petersen and Best 1986). Although nesting Brewer's sparrows spend 40 to 50 percent of their time foraging, prescribed burning had no effect on their activity budgets, feeding-trip frequency, or prey load size (Winter 1984). After burning, males flew 1.5 times farther from the nest to forage, but this did not change the duration of their foraging bouts. In southern British Columbia, birds continued to nest in burns that were 4 years old, but they used a much greater diversity of plant species for nesting, including large perennial forbs. Six years after burning, birds switched back to nesting in sagebrush that had germinated after fire (Mahony 2003).

Habitat

Brewer’s sparrows use sagebrush communities where canopy height is less than about 5 feet. In Idaho, average sagebrush height surrounding nest sites was about 1.5 feet and average nest shrub height was just over 2 feet. Optimum shrub canopy is under debate, and for the purposes of this analysis, shrub canopy cover of 10 to 25 percent and greater than 25 percent in big sagebrush communities (the two categories mapped in the Bridger-Teton National Forest’s vegetation mapping effort) are considered satisfactory.

Based on Wilson (2005), 100 acres of contiguous big sagebrush habitat was used in this analysis as a cut-off between one element of satisfactory and less than satisfactory conditions. 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. While some patches less than 100 acres may also provide habitat for Brewer's sparrows, considerably smaller, more isolated patches do not.

Although herbaceous cover requirements have not been identified, Brewer's sparrow habitat should provide concealment and support insects, an important food source (Holmes and Johnson 2005).

Nest building and egg laying typically begin in early May to early June and nesting ends in late July or early August. Nests are located in the branches or on the ground at the base of live sagebrush plants. Double-brooding and re-nesting are common.

Forestwide, the existing proportion of the big sagebrush type in late succession exceeds what would exist if the communities were in healthy, functioning conditions. Since Brewer's sparrows thrive in late-succession sagebrush, there is a larger amount of their habitat in satisfactory condition than occurred historically. Long-term risk factors that degrade habitat on the Bridger-Teton National Forest include:

- The increasing number, distribution, and canopy cover of conifers in big sagebrush habitat which may be reducing suitable habitat in the project area.
- Depleted herbaceous understories in big sagebrush communities due to excessive shrub canopy cover, overuse by livestock, and current and historic overuse by wild ungulates such as elk.

Elk

Current Status.

Elk were selected as a management indicator species due to harvest species (socioeconomic) status (USDA Forest Service 1990). There are 11 elk herd units on the forest, all with stable or slightly downward population trends. The Fall Creek and Jackson herd units overlap the project area. From 2011, elk numbers in the Fall Creek unit were stable, with numbers exceeding the Wyoming Game and Fish Commission objective of 4,400 elk by 9 percent in 2013. Elk in the Jackson unit numbered 11,800 in 2013 (stable since 2009), and were 5 percent above the 11,000 objective.

Habitat

Virtually all of the Bridger-Teton National Forest provides elk habitat and is classified as some type of elk seasonal range. Elk are habitat generalists and are mobile, adaptive, and wide-ranging; using a wide variety of vegetation types including aspen, several conifer types, big sagebrush, several mountain shrubland types, meadows, grasslands, herblands, and tall forbs. Within woody vegetation types, elk use all seral stages, but benefit most from a mix of seral communities.

Elk are mostly at higher elevations during summer and fall, feeding in mountain meadows, forest openings, big sagebrush, herblands, and on open ridge-tops (Boyce 1989). While contiguous forestland used as security cover (needed year-round) can be relatively large (particularly during the hunting season), nearby edges or small forest openings are necessary for foraging.

Transition ranges are generally at lower elevation than summer habitat, except when crossing mountain ranges to reach winter range. The nutritional quality of forage on late summer and fall habitats is critical to elk, particularly for elk that winter on native winter range (Boyce 1989; Wisdom and Thomas 1996; Cook et al. 2004). Spring, summer, and fall range (including transition range), as mapped by Wyoming Game and Fish Department, encompasses nearly all of the project area.

During winter, elk movements are dictated by forage and browse availability, and snow conditions. Prior to Euro-American settlement, most elk in western Wyoming migrated to lower-elevation shrub steppe zones, often located within major river basins. However, many elk in western Wyoming now spend their winters on feed grounds. Most of the elk that use summer ranges in the project area use the Dog Creek feedground (adjacent Snake River Canyon to the south) during the winter. Few elk in the area use native winter range. Such areas are typically south-facing slopes interspersed with aspen stands, conifer forestland, and riparian areas. The quality of winter range is less important for elk herds that rely on feed grounds.

Calving habitat for elk consists of high quality foraging areas, and hiding and thermal cover. Big sagebrush interspersed with aspen stands and/or conifer forestland is favored for calving, although cow elk would use a variety of habitats (Gruell 1975; Boyce 1989; Skovlin et al. 2002). The project area includes important parturition range for elk, as identified and designated by Wyoming Game and Fish Department.

Elk generally are opportunistic in their diet selection, can easily digest forage of low quality, and form larger herds, all of which may give them a competitive edge over other ungulate species when resources are limited (Wisdom and Thomas 1996; Cook 2002).

The significant under-representation of nutritious forage types (early- and mid-seral communities in shrubland and forestland) caused by reduced fire-return intervals is compensated by the high natural diversity of vegetation types across the forest. Conifer mortality from beetle epidemics mitigate the lack of fire to some extent and benefit aspen, an important community type for elk.

Mule Deer

Current Status

Mule deer were selected as a management indicator species due to harvest species (socioeconomic) status (USDA Forest Service 1990). The forest includes five mule deer herd units, all with fluctuating populations that remain below Wyoming Game and Fish Department population objectives. Low doe-fawn ratios contribute to low numbers. Mule deer in the project area are part of the Sublette mule deer herd unit which includes Jackson Hole and the Upper Green River Basin. During 2013, the herd numbered 22,900 mule deer and was 28 percent below the 32,000 objective.

Habitat

Virtually all of the Bridger-Teton National Forest provides mule deer habitat and is classified as some type of seasonal range. Mule deer are habitat generalists and are mobile, adaptive, and wide-ranging. Mule deer use a wide variety of vegetation types including aspen, several conifer types, big sagebrush, several mountain shrubland types, meadows, grasslands, herblands, and tall forbs. Within woody vegetation types, mule deer use all seral stages and do best in areas where there is a mix of seral communities.

Wallmo (1978, as cited by Peek 2000, page 643) stated “three general axioms applicable to habitat management for mule deer: (1) early stages of plant succession are more beneficial than climax vegetation, (2) a mixture of plant communities provides better habitat than any single community, and (3) more browse is preferable to less browse.” The third axiom is not as applicable in early spring and summer when mule deer favor succulent and highly digestible forbs.

Mule deer inhabit nearly all of the Bridger-Teton National Forest during summer and fall, although they are most abundant between 7,500 and 10,000 feet in elevation where abundant nutritious forage is available. Mature bucks tend to summer at higher elevations than does. Thermal and security cover is less

important to mule deer, compared to elk (Kie and Czech 2000). Transition range is found at the lower elevations of the summer range and contains abundant grass and forbs, intermixed with the shrub and aspen communities. Late summer and fall habitats are important to overwinter survival and fawn production (Peek and Krausman 1996). Winter range on the Bridger-Teton National Forest is limited due to high average elevation, including the project area. Where it occurs, winter range is composed mostly of south and westerly facing slopes that support big sagebrush, mountain shrubland, mountain mahogany, and aspen; as well as nearby Douglas-fir forestland on adjoining north slopes.

Fawning habitat for mule deer consists of foraging areas and hiding and thermal cover, and is typically on spring transition range with mild slopes and abundant succulent vegetation within 600 feet of water. An important component of hiding cover includes herbaceous vegetation in some areas (Robinette et al. 1977). Although a variety of habitats are used for fawning and fawn-rearing, those providing relatively large quantities of nutritious forbs are most important.

Bighorn Sheep

Current Status

A small bighorn sheep population inhabits the Teton Mountain Range and a small portion of the project area. This herd consists of a group in the northern portion of Grand Teton National Park and a southern group that inhabits the northern portion of the project area and vicinity (Rendezvous Peak; and the headwaters of Jensen Canyon, Phillips Canyon, and the north fork of Phillips Canyon) and adjacent high-elevation areas in the park. Although currently stable at about 125 individuals, which is the Wyoming management objective, this population is vulnerable to extirpation from risk factors such as severe weather, disease (emerging mountain goat population in the area), and human disturbance from winter and summer recreation. Occupied habitat occurs at high elevations year-round. Winter habitat is most likely the limiting factor for this population. Transitional and summer ranges also include portions of the Caribou-Targhee National Forest to the west of the park and the Bridger Teton. Historically, this population was migratory and wintered at low elevations around Jackson Hole and Teton Valley, Idaho.

Habitat

Bighorn sheep prefer high-elevation alpine habitats with steep escape terrain adjacent to open foraging areas. High-elevation portions of several fuels treatment areas and their vicinity (north fork of Phillips, Phillips, and Jensen Canyons) in the northern extent of the project area provide winter, summer, and transitional habitat for bighorn sheep.

Moose

Current Status

The project area occurs within the Sublette moose herd unit. This unit includes several hunt areas east of the Snake River Canyon. The herd has recently increased to 1,400 moose in 2014 from an average of 1,193 from 2008–2012. As of 2014, the herd was 6.7 percent below its objective of 1,500 individuals.

Research studies on the nearby Jackson herd (north of the project area) identified declines in habitat condition, predation, human disturbance during winter, and disease as factors contributing to population losses in that area. Becker (2008) concluded that moose decline in the Buffalo Valley is related to “habitat quality and its effects on the physical condition, survival, and reproductive success of adult female moose appeared to be the primary factor limiting population growth.” Franzmann (2000) stressed that habitat typically is the primary limiting factor of moose populations. High quality habitat conditions for all seasons and resultant healthy animals can help to mitigate adverse factors.

Habitat

Nearly all of the Bridger-Teton National Forest is classified as some type of moose seasonal range. Peek (1997) characterized moose as “selective generalists—capable of using forage and other habitat components in higher proportions than they occur in the environment, and adept at selecting seasonally advantageous habitats.” They do best in areas with relatively “stable” habitats (e.g. willow bottoms) and transitory habitats, particularly post-fire conifer forestland and aspen. Vegetation types used by moose on the Bridger-Teton National Forest include aspen, many conifer types, several mountain shrubland types, big sagebrush, meadows, herblands, and tall forbs. Within woody vegetation types, moose use all seral stages and do best in areas where there is a mix of seral communities. An important characteristic of moose habitat across their range is periodic disturbance, such as fire (Peek 1997; Franzmann 2000).

Plant communities of importance to moose in the project area include willow, sagebrush, aspen, conifer, and alpine communities from lower to higher elevations (6,500 to 12,500 feet). During the winter months most moose migrate to lower elevation willow bottom or aspen dominated habitats, typically associated with private lands (Wyoming Game and Fish Department, 2014). Thermal cover is especially important during the hottest months of summer. In montane regions, moose seek cool mountain valleys and shade provided by aspen and conifers to escape high temperatures and gain “comfort” while foraging. Aquatic habitat such as beaver ponds can also be important for cooling. Fat reserves gained during the summer play an important role in winter survival; body condition can serve as an indicator of range quality. Transition range is similar to summer habitat, except occupied habitats during fall migrations are typically lower in elevation. In conifer types, biomass of browse in the winter diet varies greatly with seral age of forests, making early and mid-seral forests important. Although moose cannot maintain their weight on high quality browse during winter, the nutritive quality of browse influences how fast they burn up their fat reserves (Schwartz and Renecker 1997).

Female moose use a variety of habitats when calving and raising calves, but they tend to seek out dense cover (Peek 1997), such as closed-canopy shrub communities and understories. The effects of nutritional quality and availability of forage during winter and spring on calf production and survival is not fully understood, but may be a factor Schwartz and Renecker (1997, page 166–167).

There are very few year-long diet studies on moose in the Rocky Mountains, but it appears browse (shrubs and trees) is the most important component of year-round moose diets, except that forbs may comprise the bulk of the diet when they are available and succulent (Renecker and Schwartz 1997). Moose feed little on graminoids. Winter diets consist almost exclusively of browse, with willows being preferred and subalpine fir being the next most heavily used item in the Greater Yellowstone Area (Wigglesworth 2004). Palatability of subalpine fir is higher than other conifers, but lower than willow and other deciduous browse. Direct competition with livestock for forage is lowest of all native ungulates addressed in this report (Renecker and Schwartz 1997).

Moose require a mix of successional stages in forestland and rangeland types. The abundance of late-seral and old-age conifer classes likely limits browse production. However, young subalpine fir, an important winter browse species for moose, is most common in late-seral conifer and aspen forests. Conifer mortality due beetle outbreaks is increasing aspen and shrub species in many locations on the Forest and within the project area.

American Pine Marten

Current Status

This species is common on the Bridger-Teton National Forest and is expected to occur throughout the forested portions of the project area. The extensive late-seral forests found at the high elevations in the

project area provide abundant habitat. Bait and hair collection stations deployed in conifer forests on the Jackson and Buffalo Ranger Districts for detecting meso-carnivores (e.g., marten, Canada lynx) during 2015 commonly identified martens. Similarly, snow tracking surveys conducted in the Buffalo Ranger District during winter, 2009-2010, indicated that martens were common in spruce-fir habitat (70 tracks in 39 transect sections), although this species also used other forested and open habitats as well.

Habitat

This species primarily inhabits late-successional, old-growth, and mixed-age stands of conifers, especially those with complex physical structure near the ground. On the Bridger-Teton National Forest, martens serve as an ecological indicator of the condition of old-growth habitats. Although fires carry many positive, long term (over 30 years) effects on marten habitat by altering vegetation diversity and age structure, high intensity fires may reduce horizontal cover and forest structure needed by marten and their prey. They eat a variety of foods such as small mammals, rodents, berries, eggs, and fish (Ruggiero et al 1994).

Old-growth forest, particularly in spruce-fir stands such as those in the Black Canyon area are the most desirable marten habitat because of their ability to provide abundant prey, suitability for winter occupancy, and predator avoidance due to overhead and ground cover.

Boreal Chorus Frog

Current Status

Boreal chorus frogs are common on the Bridger-Teton National Forest. Chorus frog sites are routinely identified during annual amphibian surveys. They were identified on Munger Mountain in 2010. They were detected during surveys of Mosquito Creek in 2014 and 2015.

Habitat

Formerly known as the western chorus frog, the boreal chorus frog is the smallest (maximum size 1.5 inches) and most conspicuously vocal amphibian in the area. This species occupies suitable habitats across a broad range of elevation and vegetation conditions. In the spring and early summer, male frogs call from ponds, marshes, and ephemeral pools, attracting females to the breeding sites. Eggs are deposited in water on submerged vegetation. After breeding, adults disperse away from the breeding sites to moist habitats including riparian areas, grasslands, and forests. They occupy any wetland habitat from low-elevation deserts to alpine areas above timberline.

Migratory and Neotropical Birds

Neotropical migrants are birds that breed in the northern latitudes of North America but winter from Mexico to South America. The three most referenced groups of migratory birds are waterfowl, raptors, and neo-tropical migrants. Migratory birds are protected by the Migratory Bird Treaty Act, including common songbirds, waterfowl, shorebirds, hawks, owls, eagles, ravens, crows, native doves and pigeons, swifts, martins, swallows and others. The Act also protects nests and eggs.

Executive Order 13186 directs departments and agencies to take action to further implement the Migratory Bird Treaty Act. Specifically, the order directs Federal agencies, whose direct activities will likely result in the” take” of migratory birds, to develop and implement a memorandum of understanding with the U.S. Fish and Wildlife Service that will promote the conservation of bird populations. Under Executive Order 13186, the U.S. Fish and Wildlife Service must ensure that environmental analyses of Federal actions evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern. In December of 2008, a Memorandum of Understanding between the USDA Forest Service and the U.S. Fish and Wildlife Service to Promote the Conservation of Migratory Birds was

signed (USDA 2008). Pursuant to the Executive Order and the Memorandum of Understanding, the Forest Service shall ensure that environmental analyses of Federal actions required by NEPA evaluate the effects of actions and agency plans on migratory birds, with emphasis on: 1) species of management concern along with their priority habitats; and 2) species of conservation concern.

Birds of Conservation Concern are identified in the Memorandum of Understanding between the USDA Forest Service and the U.S. Fish and Wildlife Service, and are defined in the Memorandum of Understanding as those U.S. Fish and Wildlife Service -listed migratory and non-migratory birds of the United States and its territories that are of conservation concern. The list is published and maintained by the U.S. Fish and Wildlife Service, Division of Migratory Bird Management (U.S. Fish and Wildlife Service 2008). The current version of the list is available at http://www.fws.gov/migratorybirds. The Bridger-Teton National Forest is located within the Northern Rockies Bird Conservation Region (BCR 10).

Neotropical migrants observed in forest stands in fall in the Jackson area include yellow-rumped warbler, Wilson's warbler, Townsend's warbler, yellow warbler, warbling vireo, ruddy-crowned kinglet, and many species of flycatchers (S. Patla, personal communication). Most songbirds migrate at night and at high altitudes, coming close to the ground to land during dawn. Migrating birds also fly closer to the ground when facing stiff headwinds.

There are no known migration routes for neotropical migrants through the project area, but migrating birds are likely to move through the project area during spring and fall. All of the project area provides stopover habitat where migrating songbirds may stop to rest and feed. During the fall, migrating birds often linger longer than in the spring, and may be present for several weeks.

The Atlas of Birds, Mammals, Amphibians, And Reptiles In Wyoming (Wyoming Game and Fish Department 2009) was used a guide to evaluate bird presence in the project area. Nongame biologist S. Patla, Wyoming Game and Fish Department, reviewed the list of species were March 8, 2013. Of the twenty two bird species of conservation concern listed for bird conservation region 10, thirteen were known or suspected to regularly occur there. Two of these were addressed as Management Indicator, Sensitive or federally listed species. The remaining bird conservation region species were addressed in detail as neotropical migratory birds. These included Swainson's hawk, long-billed curlew, calliope hummingbird, Lewis's woodpecker, Williamson's sapsucker, olive-sided flycatcher, willow flycatcher, sage thrasher, Cassin's finch, loggerhead shrike, and black rosy-finch.

Environmental Consequences

Methodology and Scientific Accuracy

We first evaluated the presence of a species or its habitat within and immediately adjacent to the project area. This step was completed in the species screening tables located in the Affected Environment section (above) of this report. If the species or its habitat was present, the next step was to identify in the Environmental Consequences section (below) the project's potential direct effects, such as project-related human disturbance or physical harm (e.g., nest loss), and any effects on the species' habitat.

The cumulative effects of the project on individual species were also evaluated. Cumulative effects are the incremental effects predicted when the direct and indirect effects of the proposed action are added to the effects of the past, present, and future actions (here, identified as "cumulative" actions); and their interactions that occur or are planned in the cumulative effects analysis area. Cumulative actions are listed in appendix E. A determination of effects for each species, appropriate to species type (e.g., federally-listed, sensitive, etc.) was made based on the cumulative effects.

Information Sources

Information to support the analyses of the effects of the alternatives on the wildlife species discussed in the affected environment section was obtained from diverse sources, including peer-reviewed professional technical papers; reports by the Wyoming Game and Fish Department, the U.S. Fish and Wildlife Service, other federal or state agencies, and private research organizations; and personal communications with State and Federal wildlife biologists or other specialists familiar with the project area and wildlife conditions.

Field surveys were conducted within the project area for goshawk, great gray owl, boreal toad, Columbia spotted frog, boreal chorus frog, three-toed woodpecker, standing tree snags, and snowshoe hares (horizontal cover and pellet groups) by Forest, University, or Wyoming Game and Fish personnel. Big game herd populations of elk, mule deer, moose, and bighorn sheep are periodically monitored by Wyoming Game and Fish and reported in their job completion reports available on-line at https://wgfd.wyo.gov/web2011/wildlife-1000496.aspx. Field research studies concerning boreal and great gray owl, wolverine, gray wolf, and bighorn sheep were completed by private research (non-profit organizations Beringia South or Round River) or are ongoing. Gray wolf and grizzly bear were monitored annually by Wyoming Game and Fish, the U.S. fish and Wildife Service, and the Interagency Grizzly Bear Study Team. Incidental field observations of migratory birds by District personnel are noted in unpublished District records.

Two types of assessments regarding sensitive wildlife species were consulted in the preparation of this document. At the Forest Service Regional scale, Species Conservation Assessments are previously prepared documents for sensitive species and management indicator species by third party biologists having species specific expertise. These Species Conservation Assessments are peer reviewed documents and are published as reference information to assist Forest Service biologists during project level analysis. They summarize key reference literature, as well as discussing the status, primary threats, primary conservation elements, and management implications for each species. The second type of document consulted is referred to as the draft Bridger-Teton National Forest Species Assessments. Although original peer-reviewed papers and unpublished reports are referenced in the effects analysis, both types of species assessments (as above) are used more generally as well.

Walk-through field surveys of several proposed treatment units by Forest or Wyoming Game and Fish personnel were completed to assess forest and range conditions, options for vegetation management, and to record wildlife observations and wildlife habitat conditions.

Incomplete and Unavailable Information

Field surveys were not available for all species, and many wildlife surveys were not detected in the project area every year. Species' presence, absence, and habitat conditions were often estimated from the experience and knowledge of State and Federal biologists, and others who had knowledge of wildlife in the project or adjacent areas.

Spatial and Temporal Context for Cumulative Effects Analysis

The spatial and temporal boundaries for cumulative effects analysis area were described for each species. For many species, the temporal context for the analysis began with the large wildfires in the 1930s and the institution of the "10 am Policy" in 1935, which made aggressive fire suppression the standard response to wildfire and reduced the acreage of wildfires on National Forest System lands. Fire suppression marked the beginning of departure of vegetation conditions (composition and structure) and pattern (shape, size, juxtaposition, continuity) from the historic range of diversity and variability in vegetation at a landscape scale. The other temporal boundary (future) was based on the species in question and the nature of the cumulative actions that could affect it.

Endangered Species Act Threatened, Endangered, Experimental, and Candidate Species

Canada Lynx - Threatened

Alternative 1 – No Action

Direct and Indirect Effects

The project area would continue to support an abundance of habitat mapped under the Northern Rockies Lynx Management Direction, except where large, stand-replacing fires, promoted by ongoing fire suppression, set mature conifer stands back to early successional stages. This situation would continue to worsen as suppression efforts push stands towards heavy fuel loading.

Because there are no direct or measurable indirect effects, there would be no cumulative effects.

Alternative 2 – Proposed Action

Direct Effects

Potential direct effects of the project include mortality or disturbance of lynx due to prescribed burns or mechanical treatments and related human activity in and out of treatment units, including motor vehicle travel necessary for project operations. Vehicle-strike losses from this project are highly unlikely because of the limited timeframe and area of this project compared to the overall range and distribution of lynx on the Forest. Because no lynx or their natal dens are documented in the project area, deaths of lynx adults or kittens due directly to prescribed fire or mechanical treatments are also highly unlikely.

Canada lynx might be temporarily displaced from treatment units by human activity. Any displacement would likely be incidental, rare, and short term due to the short and seasonal nature of treatments. Also, lynx travel through the treatment units is unlikely because lynx are rare in the general region. No temporary or permanent man-made barriers to lynx travel would be created by this project.

Snow on temporary roads could be packed by snowmobiles and provide access to snowshoe hares by competing predators such as coyotes, at least until the roads are obliterated. Most of the project area is open to off-route use by snowmobiles including under the no-action alternative, so there could be a loss of snowshoe hare prey for lynx during the winter months. This effect would be minor for lynx because the incidental loss of prey would be localized along short temporary roads.

Indirect (Qualitative) Effects

Mechanical treatments would likely be detrimental to snowshoe hares, and thus to lynx, at the sites where vegetation is removed. By removing woody debris and ladder fuels, mechanical treatments would reduce horizontal cover available to hares, a negative effect that would persist for approximately 10 to 30 years. Some regrowth of understory shrubs, forbs, and grasses would occur within 3 years following treatment. This would improve horizontal cover and forage available to snowshoe hares, particularly during the non-winter months.

The project goal of reducing fire behavior in the wildland-urban interface area to allow future wildfires to play their natural role in the ecosystem would lead to a more natural fire regime that promotes, over the long term, forest diversity and structure. The post-fire environment should include some early-successional habitats with abundant cover for snowshoe hares and other lynx prey in both winter and non-winter seasons. For example, the project area should include some young stands of lodgepole pine that are sufficiently dense to support abundant snowshoe hares (Berg 2009). Thus, the mosaic of vegetation

communities of varying species composition and seral stages developed by prescribed and subsequent natural fires would benefit snowshoe hares and lynx (Ruediger et al. 2000).

Several factors would reduce the effect of the prescribed fires on snowshoe hare and lynx habitat. Monitoring results for other areas from the Grand Teton National Park and Bridger-Teton Interagency fire effects crew indicate that the prescribed burns would likely burn little (average about 35 percent) of any individual forested burn unit, leaving the cooler and more humid north slopes, east slopes, and drainage bottoms unburned. Prescriptions for the proposed action were chosen such that north and east slopes where higher levels of horizontal cover, higher shading, and larger trees were specifically avoided, mostly to avoid effects on boreal owls, goshawk nesting, and lynx. Such stands are likely to provide the best patches of habitat for hares because they are typically characterized by high levels of horizontal cover. In addition, the prescribed fires would tend to burn at lower intensity and remove less vegetation on protected, cool slopes. Occasional stand-replacing prescribed fires could improve conditions for hares on a local scale because they often lead to abundant burned material at ground level (after wind events) mixed with dense lodgepole regeneration. Such stands provide high levels of horizontal cover and some lynx denning opportunities.

Quantitative Effects on Mapped Canada Lynx Habitat and Consistency with the Northern Rockies Lynx Management Direction

Standards in the Northern Rockies Lynx Management Direction Record of Decision(Northern Rockies Lynx Direction) (USDA Forest Service 2007) restrict vegetation management activities in lynx habitat. However, exceptions allow for fuel treatments within the wildland-urban interface. Relevant standards and compliance of the treatment alternatives with Northern Rockies Lynx Direction standards and guidelines are discussed below. Also see appendix B of the Wildlife Report and Biological Evaluation for a summary of all Northern Rockies Lynx Direction standards and guidelines.

Lynx analysis units and lynx habitat were identified in 2001 on the Bridger-Teton National Forest in accordance with the Lynx Conservation Assessment and Strategy (Ruediger et al. 2000). The project area occurs in the Fall Creek North and Fall Creek South lynx analysis units.

VEG S1 (stand initiation structural stage limits). Stands in initiation stage are defined as forests with single-story layers of shrubs, tree seedlings, and saplings that develop in response to stand-replacing disturbances such as fire or regeneration timber harvest, and are composed of species that thrive in full sunlight (USDA Forest Service 2007). None of mapped lynx habitat within mechanical treatments units would be converted to stand initiation stage because the treatments would leave a continuous overstory with tree canopies spaced at 20 feet apart. Overall, two layers of vegetation (an herbaceous understory and an overstory of aspen or conifer) would be retained throughout the forested portions of mechanical units.

Fire modeling and monitoring results related to prescribed fire indicate that this alternative would convert about 7 percent of suitable lynx habitat in the Fall Creek North, and 1 percent of the Fall Creek South lynx analysis unit to stand initiation stage, bringing the post-treatment coverage of stand initiation to 19 and 11 percent, respectively.

This project would be consistent with VEG S1 which limits the coverage of the stand initiation stage within lynx habitat to 30 percent (excepting over-runs due to wildfires). Because VEG S1 is met for both lynx analysis units in the project area, the requirement that fuels projects must not result in several adjacent lynx analysis units not meeting VEG S1 is satisfied.

VEG S2 (limits on regeneration from timber management). Because there has been essentially no timber management or harvesting in the project area within the past 10 years, the project would be

consistent with VEG S2, which limits the conversion of lynx habitat in stand initiation stage to 15 percent among projects conducted over any consecutive 10-year period.

VEG S5 (precommercial thinning limits). This standard does not apply to this project because vegetation management associated with this project does not meet the definition of precommercial thinning.

VEG S6 (multi-storied stands and snowshoe hare horizontal cover). VEG-S6 allows vegetation management that adversely affects cover available to snowshoe hare in multi-story mature or late-succession forests when treatments occur inside a wildland-urban interface up to 6 percent of mapped lynx habitat on the planning unit. The Forest's total acreage of lynx habitat treated in wildland-urban interfaces since the lynx management direction became effective, including this project, totals 10,333 acres, well within the Forest's allocation of 120,000 acres covered in the incidental take statement provided as part of the U.S. Fish and Wildlife Service's biological opinion (U.S. Fish and Wildlife Service 2008).

In summary, this project is consistent with all standards and guidelines of the Northern Rockies Lynx Management Direction when considering the exception that allows for fuel treatments in wildland-urban interface areas of national forests. The proposed reduction in horizontal cover is well within the acreage permitted in the exception for VEG S6.

Other than the reduction in habitat quality for snowshoe hares, the post-project landscape should continue to provide for several other habitat requirements of lynx, including (1) winter snow conditions that are generally deep and fluffy for extended periods of time; (2) sites for denning that have abundant coarse woody debris, such as downed trees and root wads; and (3) 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 in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range.

Indirect (Qualitative) Effects

Small scale (less than 100 acres), stand-replacing fires within the planned mixed-severity prescribed burn units would benefit snowshoe hares where the fires create a mosaic of vegetation communities of varying species compositions and seral stages (Ruediger et al. 2000, Interagency Lynx Biology Team 2013). Collectively, the prescribed burns and mechanical treatments would allow a natural fire regime to return in the larger area (because natural ignitions would not be consistently suppressed) and promote, over the long term, forest diversity, structure across a mosaic of lynx habitat that would vary locally from high quality to low quality foraging patches—the natural condition for this area.

Alternative 3 – Reduce Potential Impacts to Special Areas and Wildlife Habitat

This alternative differs from alternative 2 by excluding from treatment some of the north and east slopes where higher levels of horizontal cover, higher shading, and larger trees occur that could provide prime habitat for boreal owls, goshawk nesting, and Canada lynx.

Direct Effects

The potential for lynx mortality and disturbance resulting from the proposed activities are similar to those discussed under alternative 2. However, there would be less project-related disturbance (truck and helicopter traffic) and mortality risk (vehicle-strike) under alternative 2 because fewer acres are proposed for treatment.

Indirect (Qualitative) Effects

Alternative 3 would have similar effects to lynx habitat as alternative 2, but would be lessened due to fewer acres treated. This alternative also reduces lynx habitat loss or unfavorable modification (loss of cover) due to fewer miles, acres, and numbers associated with proposed road maintenance and reconstruction, temporary landings, fire control lines, and commercial harvest.

Quantitative Effects on Mapped Canada Lynx Habitat and Consistency with the Northern Rockies Lynx Management Direction

The discussion of Northern Rockies Lynx Management Direction standards in alternative 2 applies to alternative 3 as well. Different acres and percentages for alternative 3 are noted below where applicable.

VEG S1 (stand initiation structural stage limits). Fire modeling and monitoring results indicate that this alternative would convert about 4 percent of suitable lynx habitat in the Fall Creek North, and 1 percent of the Fall Creek South lynx analysis unit to stand initiation stage, bringing the post-treatment coverage of stand initiation to 16 and 11 percent, respectively.

Because there has been essentially no timber harvesting in the project area within the past 10 years, the project would also be consistent with VEG S2, which limits the conversion of lynx habitat in stand initiation stage to 15 percent among projects conducted over any consecutive 10-year period.

VEG S2 (limits on regeneration from timber management). This standard would be met as discussed under alternative 2.

VEG S5 (precommercial thinning limits). This standard would be met as discussed under alternative 2.

VEG S6 (multi-storied stands and snowshoe hare horizontal cover). Including this project (1,555 acres of prescribed fire and 1,757 acres of mechanical treatments in lynx habitat), the Bridger-Teton National Forest’s cumulative total of treated lynx habitat in wildland-urban interface areas following the Northern Rockies Lynx Management Direction decision is 9,267 acres, well within the Forest's allocation (about 120,000 acres) for this exception.

Cumulative Effects – Alternatives 2 and 3

The cumulative effects analysis area for Canada lynx is the 79,000 acre project area. This area is appropriate because it’s large enough to encompass the home range of at least one adult male or female lynx. In addition the direct and indirect effects remain undiluted, as would be the case if a larger analysis area was chosen. The temporal extent for the cumulative effects analysis is 35 years before and after the present, chosen because it’s the approximate period that forest stands exist in stand initiation stage following management activities such as fuel reduction projects and logging. Treated forest stands that exceed this age typically are not in stand initiation stage.

The actions considered for cumulative effects are listed in appendix E. Of those, the ten fuel reduction projects on national forest, state, or private lands within the project area, would locally reduce a portion of the mature forest stands to stand initiation stage through mechanical or prescribed fire treatments and/or at least adversely reduce horizontal cover and structural diversity of forest stands for snowshoe hares and other lynx prey. A wildlife enhancement project overlapping the project area would target sagebrush steppe, which by reducing sagebrush cover and structure, could negatively affect snowshoe hares where sagebrush stands occur in close proximity to forested stands. Livestock grazing (2 allotments within or overlapping the project area) could affect the age and structural composition of aspen, willow, and sagebrush communities, important aspects of lynx habitat. Activities such as trail improvements (eleven projects), installation of utilities (three projects), and special use permits in the project area could adversely modify or eliminate lynx habitat over small areas, and potentially introduce disturbance effects

for lynx that may occasionally use the area. A major highway reconstruction project (Jackson South; outside the project area) would increase disturbance effects during the construction period, but would provide wildlife underpasses to facilitate movement. The reconstructed highway would transect about 15 acres of mapped lynx habitat, but little habitat loss would result from lane widening and clear zones. The completed Wild and Scenic Rivers planning project (Forest Plan amendment) provided objectives, standards, and guidelines for forested, riverine, and grazing lands habitat that maintain or improve the ecological integrity of lynx habitat, maintain travel corridors, and sustain ecological processes. The ongoing Sage Grouse Forest Amendment planning project (expect completion fall 2015) would provide habitat protection for sage grouse that benefit shrubland communities (sagebrush and riparian) areas sometimes used by lynx for foraging.

Based on the nature and scope of the proposed projects in appendix E, the cumulative effects to snowshoe hare and lynx habitat can be expected to extend for 30 to 40 years. All future projects would adhere to the Northern Rockies Lynx Management Direction and have had (or would have) determinations similar to this project. However, due to the large number and large acreage of fuels reduction and thinning projects (see appendix E) in and adjacent to the project area, the cumulative effects of the alternatives are predominantly negative due to the reduction of understory cover and habitat available to snowshoe hares and lynx.

Determination – Alternatives 2 and 3

Implementing alternative 2 or 3 would have adverse effects to lynx and lynx habitat, but would not impede the recovery and delisting of this threatened species. The alternative is consistent with the Northern Rockies Lynx Management Direction and the Forest Plan objective of supporting recovery of listed species. This determination is analogous to “Likely to Adversely Affect” in Section 7 consultation (Endangered Species Act) with the U.S. Fish and Wildlife Service, and is appropriate in situations where multi-storied stands and snowshoe hare horizontal cover are affected (standard VEG-S6). The affected area is in a wildland-urban interface and below the allowable exception of 6 percent of mapped lynx habitat on the planning unit.

Rationale for Determination

This determination is based on the temporary reduction in horizontal cover available to snowshoe hares (i.e., conversion to stand initiation stages) caused by the prescribed fire treatments, a loss of cover in mechanical treatments, and a short-term increase in the mileage of temporary roads that could favorably affect lynx competitors and unfavorably affect lynx. Although the mechanical treatments would not technically convert forests to stand initiation stage, they would at least temporarily reduce levels of horizontal cover at ground level, an adverse effect on snowshoe hares.

In formulating the cumulative effects, other forest management actions would also contribute to long-term effects in addition to those of this project. However, the project would still be consistent with the Northern Rockies Lynx Management Direction and the Forest Plan because these effects are allowable within wildland-urban interfaces up to 6 percent of the lynx habitat mapped Forestwide.

Overall, the adverse effects on lynx habitat described above would have little or no effect on Canada lynx recovery because the acres affected would be very small in comparison to the planning unit (Bridger-Teton National Forest, about 2.7 million acres of mapped lynx habitat), the Yellowstone Ecosystem, and to the contiguous United States.

Gray Wolf

Alternative 1 – No Action

Direct and Indirect Effects

Potential disturbance from human activity would remain the same. Forest succession toward older forests, and conifer encroachment on grass, shrub, and aspen communities due to continued wildfire suppression could have a slight unfavorable effect on mule deer and elk foraging, which could negatively impact wolves.

Because there are no direct or measurable indirect effects, there would be no cumulative effects.

Alternatives 2 and 3

The effects determination is the same for alternatives 2 and 3, although forage available for wolf prey would be increase more in alternative 2 over that of alternative 3. Potential human disturbance would be less for alternative 3 due to fewer treatments and related actions.

Direct Effects

The project area includes at least part of the home range previously occupied by the Dog Creek wolf pack. The effects on new wolves establishing a territory in this area are minor because refugia from disturbance, as well as abundant prey, are readily available inside and outside the project area. Project activities may affect dispersing or transient wolves by temporarily displacing them from the immediate area, although wolves would likely continue to travel freely through the project area, including prescribed fire areas. A project design feature (WL-12) would minimize disturbance around den and rendezvous sites, minimizing stress to adult wolves and reducing the chances wolf pups would have to be prematurely relocated. Wolves would not be trapped or injured by prescribed fires because such treatments would occur during low or moderate burning conditions that do not support rapidly advancing fires. No mortality is expected from project activities.

Indirect Effects

The proposed treatments would promote aspen regeneration from root suckering and would create a mosaic of sagebrush/grasslands that would provide beneficial cover and forage for big game species. These benefits would indirectly enhance prey species for wolves.

Cumulative Effects

The cumulative effects analysis area includes the Snake River Range on national forest lands south of Highway 22, west and north of the Snake River and east of Highways 26 and 31, and state and private lands along the Snake River corridor immediately adjacent to the national forest boundary. The cumulative actions include several fuels reduction projects on the nearby Caribou-Targhee National Forest. This area is appropriate because it’s large enough to encompass the seasonal travels of a resident wolf pack and the seasonal ranges of its prey base.

The projects considered for cumulative effects (appendix E) within this area that could impact the gray wolf include 18 fuels management projects. These would increase forage for elk and mule deer, important wolf prey. Negative effects include project-related disturbance disrupts daily and seasonal movements and displace wolves from preferred hunting areas.

Ongoing management of the Dog Creek domestic sheep and Munger Mountain cattle allotments is an intermittent, but important source of wolf mortality through control actions triggered by livestock depredation. These control actions have, and would continue to reduce wolf numbers in the Dog Creek

wolf pack, or eliminate it entirely. The pack has a history of reestablishing itself 1–3 years following elimination. Such wolf losses are a clear adverse effects on the pack and other lone wolves in the area, and are a strong negative counter-weight to the positive effects of the fuels treatments on habitat for wolf prey.

The trail maintenance, re-construction and construction projects and the use of these trails could add to wolf disturbance, depending in part on the location wolf dens. Most of the projects listed in appendix E could at least cause disturbance to wolves. In general however, the cumulative effects of the treatment alternatives area positive because of the large number and acreage of fuels reduction and thinning projects that increase forage availability for wolf prey. Excepting disturbance to wolf dens early in the denning season (April through June), wolves are tolerant of human and activity and disturbance in their habitat (M. Jimenez, U.S. Fish and Wildlife Service, personnel communication, April 2015).

Determination – Alternatives 2 and 3

This project is consistent with the recovery and delisting of gray wolves in Wyoming and the Forest Plan objective of supporting recovery of listed and sensitive species. The analogous determination in Section 7 consultation with the U.S. Fish and Wildlife Service is **may affect, not likely to adversely affect gray wolves**. The alternatives would not contribute to a loss of population viability of wolves on the planning (Forest) unit. With regard to wolves as a sensitive species, the treatment alternatives may impact individuals or habitat, but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species on the forest.

Rationale for Determination

No mortality of wolves is expected due to project operations. Spring prescribed fire treatments and mechanical treatments would not occur within 0.5 miles (ground-based activity) or 0.25 miles (aircraft; design feature WL-12) of active dens or rendezvous sites identified in the project area. Temporary displacement of wolves during the project implementation would not adversely affect wolves because adjacent habitat is available, and the treatment areas already have moderate and regular human activity such as recreation and livestock management. Remote areas not targeted for treatment or disturbed by other cumulative activities are readily available adjacent to the project area.

The mechanical and prescribed fire treatments would produce habitat conditions within the historic range experienced by the species. The project should benefit wolf prey because of the improved forage production that typically results from development of vegetation communities in early stages of succession.

The intermittent wolf mortality associated with control actions in response to domestic sheep depredation is a an adverse effect on wolves that negatively weights the cumulative effects. However, despite the control actions, wolf packs would persist in the project area through reproduction, ingress from surrounding packs, and recruitment of new breeding individuals, as indicated by their responses to past 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 the Northern Rocky Mountains. Gray wolf recovery in the Northern Rocky Mountains 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 (U.S. Fish and Wildlife Service, and others 2015). The area outside Yellowstone and Wind River Reservation has remained well above the minimum delisting criteria. Thus, the cumulative effects associated with the alternatives are consistent with gray wolf recovery and delisting in Wyoming.

Grizzly Bear

Alternative 1 – No Action

Direct and Indirect Effects

No grizzly bear mortality or displacement would occur from operations and human activities associated with mechanical forest treatments or prescribed fire. Fire suppression activities associated with future wildfires could temporarily displace bears and disrupt movements.

Fire suppression associated with this alternative would prevent wildfires that introduce natural disturbance in plant communities that locally increase vegetation diversity in grizzly bear habitat. Such small-scale diversity includes habitats in early successional stages that provide an abundance of herbaceous forage for bears and their ungulate prey. However, to the extent that ongoing fire suppression contributes to large-scale, high intensity fires, this alternative also promotes early seral vegetation at large spatial scales. The loss of forest cover that results from high intensity fires not been identified as a negative influence in grizzly bear habitat.

Alternatives 2 and 3

The effects analysis and determination are the same for alternatives 2 and 3 because the degree of habitat change and disturbance from both alternatives would be virtually the same for this species. If they occur in the project area, grizzly bears would be expected to range widely across the project area and traverse treatment sites of both alternatives. The differences in the intensity and duration of effects between the two alternatives, principally those associated with vegetation changes (coverage of early seral communities) and project-related disturbance on grizzly bears, would not be measureable.

Direct Effects

No mortality from vehicle traffic or project operations is expected because grizzly bears are uncommon in the area and traffic would move at low to moderate speed during daylight hours. Project design features require proper food storage by personnel on the job.

The prescribed burns are unlikely to reach sufficient intensities and speed to harm bears in the vicinity. Bears may be temporarily displaced by project activities from foraging and resting habitat but alternative sites for these bear behaviors are readily available elsewhere.

Indirect Effects

No impacts are expected from road work because of the low miles of planned temporary roads and skid trails, and no new permanent roads would be established as a result of the project. Thus the treatment alternatives would not reduce secure grizzly bear habitat, except where and when temporary roads would be in use. Skid trails and temporary roads would be closed and decommissioned immediately following project completion. Thus there would be no change in the acreage of secure grizzly bear secure habitat in the project area.

The treatments would temporarily reduce some forbs, grasses, and mast that might otherwise serve as bear foods; however, this effect should be limited due to the season of operations and post-treatment conditions that promote rapid revegetation. Over the long term, the treatments should improve the coverage of early seral communities that support herbaceous forage used by grizzly bears. The design features providing down woody materials and snags would help maintain foraging opportunities for bears seeking insects and their larvae. The design feature for a prescribed burning window during plant dormancy would reduce shrub and cool season grass mortality and help stimulate more vigorous and productive re-sprouting and regrowth of shrubs and grasses for bear forage. In addition, the treatments

should improve long-term foraging conditions for ungulates that serve as food for predaceous or scavenging bears.

Cumulative Effects

The cumulative effects analysis area for grizzly bear is comprised of pre-defined bear analysis units outside the recovery zone reported in the Final Conservation Strategy for the Grizzly Bear in Greater Yellowstone Area. This area includes the portions of the Snake, Teton, and Palisades bear analysis units, and private and state lands adjacent to the Caribou-Targhee and Bridger-Teton National Forests. This collective area is large enough to encompass a home range for this wide-ranging omnivore and its seasonal prey base and other food resources.

The projects considered for cumulative effects (appendix E) that could impact bears include 18 fuels treatment projects, a utility and ski resort project, livestock grazing, outfitter and guide activity, and trail projects. The fuels projects have or would have minor or no effect on bears because they are mostly located in close proximity to high human use areas and the urban interface, and therefore it is unlikely that bears would be present or affected. However, such treatments would improve herbaceous forage for bears and bear prey. Ungulates are an important source of prey and carrion in the Yellowstorn Ecosystem. By reducing conifer competitors, the fuel treatments in seral or climax whitebark pine forest cover would help maintain or increase this species (seed crops) as a key food source for bears. However, the fuel treatments and other projects (e.g, bridge and highway improvements) are a source of disturbance that could disrupt seasonal movements of dispersing and wandering bears. The trail projects and trail use by the public add to disturbance of bears. Most of the projects listed in appendix E cause at least some disturbance to bears, with the caveat that few grizzly bear currently occur in the project area and near vicinity, especially south of Highway 22.

Outfitter activities increase risks of grizzly bear removals related to food storage violations (none to date). A project design feature (WL-14) would minimize the potential to develop food attractants that might increase the presence and use of the project area by bears. Food storage orders also apply to other areas within the bear analysis and management units on the Caribou-Targhee National Forest, Bridger-Teton National Forest and Grand Teton National Park.

Ongoing management of the Dog Creek domestic sheep and Munger Mountain cattle allotments are a potential source of grizzly bear losses through removal actions by the U.S. Fish and Wildlife Service and the Wyoming Game and Fish Department. Such actions are adverse to individual grizzly bears, and are an important source of grizzly bear mortality in western Wyoming. However, no livestock losses to grizzly bears have occurred to date in these allotments, likely due to the current absence of resident bears in the area. Resident bears may expand their range to include the allotments during the treatments.

In sum, the cumulative effects of the alternatives are neutral because the beneficial effets of the many and large number of fuels reduction projects that promote ungulates as a grizzly bear food source are counterbalanced by widespread disturbance effects (past, present, and future) and mortiality risks that accompany human activity in bear habitat.

Determination and Management Indicator Analysis – Alternatives 2 and 3

This project is consistent with the recovery and delisting of grizzly bears in the Yellowstone Ecosystem and the Forest Plan objective of supporting the recovery of listed species. The analogous determination in Section 7 consultation with the U.S. Fish and Wildlife Service is **may affect, not likely to adversely affect grizzly bears**.

Rationale for Determination

- The project area is outside the designated recovery area and primary conservation area for grizzly bears.
- At present, there are no grizzly bears with GPS/VHF transmitter collars bears with home ranges in the project area, but bears are known to travel through the area. Should a bear be discovered in the project area, disturbance activities would be postponed until the situation is reviewed and appropriate action taken to avoid and protect the bear and field crews.
- The mechanical and prescribed fire treatments would produce favorable early seral habitat conditions within the historic range experienced by the species.
- Personnel are trained to properly store food and use bear spray, therefore, the likelihood of human-caused food conditioning of bears or negative direct human-bear interactions is unlikely.
- No mortality or relocation of bears is expected due to project operations. Prescribed fire treatments that occur during the spring would not occur within 1.0 mile of known active dens of grizzly bears (design feature WL-15).

The expected level of the effects for the project would not contribute to cumulative effects that are detrimental to grizzly bear recovery. No direct or indirect grizzly bear mortality, important disturbance effects, or a reduction in secure grizzly bear habitat is expected from project activities. The Yellowstone Distinct Population Segment of grizzly bears continues to expand in both population size and distribution.

Yellow-billed Cuckoo

Alternative 1 – No Action

Direct and Indirect Effects

There would be no project-related disturbance effects of this alternative because no treatments would occur. However, the birds do not reside in the project area during breeding season, and have not been observed as spring or fall migrants. Continued fire suppression in this alternative would reduce the occurrence of small-scale fires that reduce conifer expansion in riparian zones and benefit cuckoos. Similarly, ongoing fire suppression contributes to large-scale, high intensity fires that also reduce conifer coverage in riparian zones, but also reduce the coverage of mature cottonwood and willow, important components of cuckoo habitat (U.S. Fish and Wildlife Service 2013).

Alternatives 2 and 3

Direct and Indirect Effects

Mortality or disturbance effects to yellow-billed cuckoos are highly unlikely because the birds are not known to reside in the project area during breeding season, and no migrants been observed using the area. The coverage of cottonwood-dominated habitat is minimal in the project area, about 77 mapped acres, and no treatments would occur there. A project design feature precludes treatment in cottonwood galleries in or adjacent to treatment units.

Approximately 321 and 206 acres of willow habitat exists in alternatives 2 and 3 that could contain occasional cottonwoods that are suitable to the cuckoo. The edges of these willow stands could be affected in prescribed fire treatments when fire, intended for upland shrubs and other woody materials, creeps along willow borders. Small amounts of willow, grasses, and woody materials along the edges of riparian habitat may be scorched or burned, but this low-intensity fire on the willow edges would not

result in loss of cottonwoods. One hundred-foot no treatment buffers have been designed along all riparian areas to ensure that potential yellow-billed cuckoo habitat is not modified.

Cumulative Effects

The cumulative effects analysis area for the yellow-billed cuckoo is the project area and adjacent private land down to the cottonwood galleries along the banks of the Snake River corridor. This area is large enough to encompass the home range area of nesting pairs of yellow-billed cuckoo and includes potential riparian cottonwood and willow habitat along the Snake River corridor potentially used for nesting or movement by seasonal migrants.

Because there would be no direct or measurable indirect effects, there would be no cumulative effects.

Determination (Alternatives 2 and 3)

Based on the direct, indirect, and cumulative effects, it is determined that the project would have no effect on yellow-billed cuckoo or its proposed critical habitat.

No effects to the yellow-billed cuckoo or potential habitat are expected because it is highly unlikely that any individuals occur in the project area, and because the proposed treatments and those considered for cumulative effects would have little or no effect on riparian/upland cottonwood-willow forest habitats with implementation of project design features. Since the project would not result in direct or indirect effects, there would be no cumulative effects. Critical habitat was proposed on 8/15/2014 in areas of Arizona, California, Colorado, Idaho, Nevada, New Mexico, Texas, Utah, and Wyoming (U.S. Fish And Wildlife Service 2014). None of the proposed critical habitat is located within or adjacent to the project area.

Rationale for Determination

No effects to the yellow-billed cuckoo or its habitat are expected because the birds are unlikely to occur in the project area, and because the proposed treatments would have little or no effect on cottonwood-willow habitats with implementation. Nesting and migratory habitats are protected by design features. Because the project is unlikely to carry disturbance effects or cause a loss of habitat for cuckoos, it contributes little if any to the cumulative effects. No proposed critical habitat for yellow-billed cuckoos occurs in the project area.

USDA Forest Service Sensitive Species

Bald Eagle

Alternative 1 – No Action

Direct and Indirect Effects

There would no direct effects such as bald eagle mortality or loss of active nests because no treatments would be implemented to reduce fuel conditions on the project area.

Fire suppression would continue as presently practiced and the risk of stand replacing wildfire could increase as more contiguous, homogenous forest stand and range conditions develop across the project area. Wildfire, if it occurs would create more open early seral habitat conditions that favor eagle foraging opportunities and prey species availability and abundance. However, intense wildfire could kill large diameter trees and topple snags within and beyond the project area preferred by eagles for nesting, perching and roosting habitat.

Without wildfire, plant communities would continue to age toward a late seral condition with greater decadency and less herbaceous cover. Forest encroachment in meadows and shrublands would reduce upland foraging opportunities (carrion and prey) for eagles as tree density increases. Early seral plant communities would progressively become under-represented across the project area relative to the historic pattern. Ground squirrels, a prey item associated with more early seral vegetation, would be less available for eagles. Big game animals that serve as a source of carrion for eagles would be less available.

Alternatives 2 and 3

The potential direct and indirect effects to eagles and their habitat would be similar for alternatives 2 and 3. The differing pattern and acres of treatment units would not change the overall extent of available nests, roosts, and bald eagle occupancy; and use of the project area.

Direct and Indirect Effects

No mortality to bald eagles or loss and disturbance to known nests or winter roosts from implementation of the proposed mechanical and prescribed fire treatments would occur. One proposed treatment unit (Munger Mountain PF-48) intersects an primary eagle use area during the breeding and nesting season. This nest site area, when occupied, and any newly occupied nests or winter roosts, would be protected by design features (WL-8 and WL-9) to reduce disturbance to breeding, nesting, roosting eagles; and to maintain suitable and secure habitat conditions around the nest or winter roost site.

Eagles foraging within or outside of delineated home ranges during ground or aerial operations may avoid intense human activities and focus foraging efforts in adjacent uplands with less human disturbance. Because bald eagles are highly mobile, and the duration of the proposed disturbances are short , eagles would be able to forage in other areas, likely with no measurable effect.

Effects on eagle habitat above the Snake River could result from prescribed fires in the Munger Mountain PF-48 unit in alternative 2, including mortality of large mid- and over-story trees and snags that are currently used as perches or roosts. However, the fires would also create standing snags that provide perching and roosting opportunities. These structures would be available shortly after the burns and would persist a decade or more. In general, snags and large trees would not limit eagle use of riverine habitats after treatments because these structures would be protected within a ½ mile of the Snake River.

The prescribed fires would reduce conifer expansion and increase the coverage of early seral plant communities that provide the forage base for eagle prey. Big game animals and livestock (carrion) are an important alternative to fish during late fall, winter, and early spring. Prescribed burn areas would also provide more open habitat conditions with easier prey detection (i.e. ground squirrels in spring) and fewer flight impediments that obstruct the capture of prey. The burns would not substantially reduce large tree and snag availability in uplands because only isolated torching (live trees) is expected to occur. Snags created in this way could be useful to eagles as hunting perches. Some snags would be removed along fire control lines, new temporary or reconstructed roads, within 200 feet of the private lands, landings and other mechanical thin units to reduce hazards to field crews and timber harvest operations. Such effects are minor because of the limited spatial extent of treatments, as compared to ranges of foraging bald eagles.

Mechanical thinning of smaller under- and mid-story trees would reduce tree density, resulting in more water and nutrients available to the remaining mature and old trees, and healthier stand conditions. These large trees benefit eagle nesting, roosting, and perching during foraging.

There would be no effects to the fisheries prey base in the Snake River watershed. Design features for hydrology and soil combined with state best management practices and Forest Plan standards and guides

for thinning and prescribed fire would be sufficient to minimize sediment input to fisheries habitats (Fogle 2014).

Cumulative Effects

The cumulative effects analysis area for bald eagles is the Snake Wyoming Bald Eagle Management Unit within the Greater Yellowstone Area (Greater Yellowstone Bald Eagle Working Group 1996). The area primarily includes bald eagle breeding areas associated with the riparian forest of along the Snake River extending from the southern boundary of Grand Teton National Park, south to the Idaho and Wyoming border.

The projects listed in appendix E that contribute to cumulative effects include 14 similar fuel reduction treatments on private, state and national forest lands within and adjacent to the project area, and a prescribed fire wildlife habitat enhancement project in the Snake River Canyon to the south of the project area. These projects have the collective effect of improving upland foraging conditions for eagles (benefits to prey and eagle flight) and should provide resident or migratory eagles in the project area and Snake River corridor with an improved prey base, a positive influence on eagle productivity and survival. The habitat treatments should also improve foraging conditions for big game and cattle that serve as a source of carrion.

The removal of some larger overstory and mid-story live trees and snags during the projects listed in appendix E could reduce existing and future potential upland perching and roost sites. Project units closer to the Snake River riparian forest corridor (ie. Crescent, Pine Glenn South, Hoback Junction, Bryan Flats, Snake River Canyon) and nest sites could remove potential perch and roost habitat from nesting eagle primary use areas. However, sufficient upland sites are available in untreated forest stands within and adjacent to the project area and within the Snake Wyoming Bald Eagle Management Unit to meet the needs of nesting, foraging and wintering eagles. However, the project may cause eagles to change their patterns.

Determination and Management Indicator Analysis (Alternatives 2 and 3)

Considering the alternatives' direct, indirect, and cumulative effects to bald eagles, this project may impact individuals or habitat, but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species on the forest.

Rationale for Determination

Implementation of alternatives 2 or 3 would have similar effects on bald eagles and their habitat. These effects are minimal and are not expected to result in eagle mortality, would not limit available nesting, perching, or roosting habitat; and would not reduce the eagle's prey base.

Project design features fully protect nest sites and communal roosts by minimizing disturbance to eagle nests and habitat in the vicinity, primary use areas, and communal roosts.

Upland foraging habitat conditions for eagles and their prey would improve with the reduction of conifer encroachment and presence in forest understories, and the restoration of early seral plant communities. The improved conditions would be cumulative with 14 other similar project actions (appendix E). Fisheries habitats would remain functioning based on protection of hydrologic and soil resources.

Commercial thinning of some live overstory and mid-story trees, and potential torching of individual trees could reduce existing and future perch and roost sites in eagle primary use areas. Likewise, felling snags in thinning units, landings, along new and reconstructed roads and fire control lines, hazard tree removal, firewood cutting and loss of snags from prescribed burning may also reduce some upland perch and roost habitat. However, perch and roost sites are not a limiting factor: large snags would be retained in many

treatment units, and sufficient upland perching or roost sites are common and would remain available in untreated forest stands within and adjacent to the project area. Perch and roost availability would continue to meet the needs of nesting, foraging and wintering eagles. Considering the design features to protect nest sites and communal roosts, and the abundance of bald eagle roosts that would remain post project treatment, the cumulative effects of this project would not reduce bald eagle nesting, occupancy, or local populations.

Three-toed Woodpecker

Alternative 1 – No Action

Direct and Indirect Effects

This alternative would maintain current populations and habitat in the near term. However, ongoing fire suppression would contribute to wildlfires that may burn over large areas at high intensity. In this scenario, woodpecker habitat would temporarily improve because new snags created by wildfire would attract insects and would provide new nest cavities. After six to ten years, however, nesting and foraging habitat would decline in the presence of early seral conditions and snag-fall over large areas.

Alternatives 2 and 3

The effects determination is the same for both of these alternatives. The degree of the impacts would differ with regard to the acreage of snag removal.

Direct and Indirect Effects

The design features to eliminate mechanical and prescribed burn activity during the primary nesting season (WL-1 and WL-2) would reduce negative effects on woodpeckers. Some loss of woodpecker nest cavities (snags) and foraging sites could occur due to early spring burning that would be permitted up to May 15.

Removing dead and dying trees from the mechanical treatment units and fire control lines, and snag removal in the defense zone would reduce nesting and foraging opportunities for three-toed woodpeckers. However, many large trees and snags would be retained in untreated areas. In addition, Forest Plan standards for snag retention would ensure adequate habitat would be retained. Any loss in acreage of snags would be offset by new foraging and nesting habitat that has been, and is being created, by the current mountain pine beetle epidemic within the project area and elsewhere on the Bridger-Teton National Forest. Through isolated torching of live trees and limited tree morality caused by moderate-intensity fire, the prescribed fires would temporarily provide new foraging and nesting opportunities for woodpeckers. Alternative 3 would treat 27 percent fewer safety corridors in defense zone units for snag removal (36 percent fewer acres) compared to alternative 2.

Cumulative Effects

The cumulative effects area for three-toed woodpecker is the project area. This area is appropriate because it is large enough to encompass the breeding ranges of numerous individuals that could define a local woodpecker population. Moreover, the choice of a larger effects area could dilute the importanceof the direct and indirect effects in the analysis. The cumulative actions that contribute to the cumulative effects of the alternatives are listed in appendix E. The fuels reduction projects would reduce the potential for uncontrolled severe wildfires that temporarily improve nesting and foraging habitat (insects) for woodpeckers, but degrade habitat in the long term over large areas by converting forests to early successional stages. Moreover, the fuels projects would help return a natural fire regime that ultimately provides a mosaic of forest ages, some useful to woodpeckers, at the landscape scale.

Determination

In considering direct, indirect, and cumulative effects, the alternatives may impact individuals or habitat, but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species on the forest.

Rationale for Determination

Some disturbance to woodpeckers and loss of snag habitat would result from implementing either of the two alternatives. However, snag removal in this project would be limited and would follow the Forest Plan snag retention standard. Snag removal would be offset by the creation of new foraging and nesting habitat by localized torching of live trees during prescribed burns, and by new habitat created by the current mountain pine beetle epidemic. Considering the limited spatial scope of the project and its associated cumulative actions, the cumulative effects of this project would be negligible.

Northern Goshawk

Alternative 1 – No Action

Direct and Indirect Effects

The accumulation of fuels resulting from continued fire suppression could increase risk of larger, high-severity fires in the future. Subsequent increases in early-seral forests due to high-intensity fires that burn over large areas would reduce goshawk nesting suitability for several decades to over 100 years, depending on fire severity and acreage burned.

Alternative 2

Direct and Indirect Effects

This alternative could negatively affect 806 acres of goshawk nesting habitat (656 acres in prescribed burns, and 150 acres in mechanical treatments), assuming that about 35 percent of prescribed fire units receive fire, and about half of the acreage of fire-affected stands burn in a stand-replacing manner. All 150 acres of mechanical treatments were assumed to be negatively affected by mechanical treatments. Twelve of the 14 simulated goshawk home ranges (see Langston 2011) would retain more than 240 acres of nesting habitat when factoring in the effects from project activities. Two territories do not have more than 240 acres of nesting habitat in the existing condition.

Fire monitoring data suggest that prescribed fire treatments in conifer stands are expected to burn just 35 percent of any individual unit, with half of the burn acres considered stand-replacing. The loss of nesting habitat in the project area may not be highly detrimental: Reich et al. (2004) concluded that territoriality and not the amount of nesting habitat was the limiting factor in goshawk nesting populations. In other words, the loss of nesting habitat may not reduce the number of goshawk territories.

Project design features would be implemented to protect nesting goshawks from the disturbances associated with mechanical thinning and prescribed fire to minimize the possibility of nest abandonment, nest failure or fledgling mortality. Other design features would retain or develop nesting and post-fledging area characteristics to help assure continued goshawk presence in occupied territories. Project design feature WL-10 would restrict project-related human disturbance from April 1 to August 15 around active goshawk nests and post-fledging areas. Feature WL-11 would provide a no-treatment buffer of 40 acres around active and inactive goshawk nests and at least 50 percent canopy cover in post-fledging areas.

Under alternative 2, the attributes of goshawk foraging habitat within the project area would change to include more area in the early-successional size class and less area in mid- to late-successional classes. These changes would not be substantial given that goshawks are opportunistic hunters that use a variety of habitats while foraging. The amount of early-successional forest in the project area would increase from 2.4 to 8 percent, which would be closer to the recommended 10 percent given by Reynolds et al. (1992).

Alternative 2 would have little impact on the availability of prey to goshawks because:

- Prey species and their habitats are diverse and abundant in the project area.
- The proposed activities would have negative impacts on some prey species' habitats and beneficial impacts on others. For example, fires may reduce red squirrel habitat but increase that of ruffed grouse and woodpeckers.
- Prey abundance may not be as critical to goshawk nesting success as forest structure (Beier and Drennan 1997).

Alternative 3

Direct and Indirect Effects

In this alternative, several treatment units were reconfigured or dropped to exclude large tracts of goshawk nesting habitat, including burn units which overlap the post-fledging family area in the Coburn Creek territory. The same design features described above for goshawks in alternative 2 apply here as well.

This alternative would negatively affect 272 acres of goshawk nesting habitat (122 acres in prescribed burns and 150 acres in mechanical treatments), assuming that 35 percent of prescribed fire units receive fire as described above, and half of these acres burn with stand-replacing effects. All other effects of alternative 3 would be very similar to those of alternative 2, but would occur at a smaller spatial scale.

Cumulative Effects – Alternatives 2 and 3

Projects which may contribute to cumulative effects are listed in appendix E and include ground- and habitat-disturbing projects such as timber- related work.

The cumulative effects analysis area for the northern goshawk is the project area because of the recent (Langston 2011) modeled goshawk analysis completed for the project. This area is large enough to encompass numerous territories of the birds. The choice of large analysis area would have diluted the direct and indirect effects of the alternatives in the analysis. Because of the nature of the proposed, completed and on-going projects (appendix E), the time period for cumulative effects 30 to 40 years.

Past fire suppression may have increased goshawk nesting habitat in the last several decades, while also affecting available prey species by altering forest composition and structure.

Past timber harvest has affected the structure, function and quality of nesting and foraging habitat by reducing nesting habitat and prey habitat such as snags and downed wood. Reduction and fragmentation of habitat of mature forest may benefit competitors and predators such as red-tailed hawks and great horned owls that favor early successional conditions. Nestling and juvenile goshawks are incapable of or inexperienced at predator avoidance. Predation, therefore, is likely to be a more important mortality factor for these age classes than in adults.

Ten fuels-reduction projects along Fall Creek Road on private and state lands have recently been completed or are scheduled for implementation in in the near future. Approximately 214 acres of goshawk nesting habitat are included in these projects. The projects would not contribute to adverse cumulative effects due to the spatial scale of the projects (spread out over a 12-mile front), and because adequate acreage of nesting habitat remaining after project completion. The large prescribed fire treatment (10,000 acres) on the Caribou-Targhee National Forest in the Snake River canyon on the southern end of the project area to improve wildlife habitat should improve foraging habitat availability, but could potentially reduce some forest nesting habitat.

Livestock grazing on federal and state range allotments and on private lands continues to affect the species composition and structure of herbaceous ground cover and subsequently, the prey species composition and abundance available to foraging goshawks.

Determination - Alternatives 2 and 3

Considering direct, indirect, and cumulative effects, the project may impact individuals or habitat, but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species on the forest.

Rationale for Determination

In both alternatives, there would be a minor loss of nesting habitat. Overall, the area would still be suitable habitat for foraging. The minimal amount of disturbance, in light of the well distributed and abundant foraging and nesting habitat, would not affect species viability.

In both alternatives, no treatments would occur in the known 40-acre nest stands and its post-fledging areas from April 1 through August 15. Thus, treatment would occur outside of the nesting and post-fledging season and not affect reproductive success.

Proposed treatments in mature forest, which is preferred nesting and fledging habitat for goshawk, would retain a forest structure composed of the mature live trees, as well as snags and logs, that is within the historic range of variability for the site. Treatments retain sufficient nesting trees, mature forest for fledging, and suitable diversity as foraging habitat for goshawks.

Changes in forest understory and mature tree density from the proposed actions may have minor effects to the abundance and habitats of prey species and hunting patterns of goshawk in localized areas. Prey species such as red squirrel, snowshoe hare, grouse, woodpeckers, and other small game would continue to inhabit the area in overall abundance similar to that currently available as a food source.

Projects considered for cumulative effects would not modify available habitat to a level that would affect reproduction or reduce the population based on the following reasons:

In addition:

- Modeled goshawk nesting habitat indicates that adequate habitat would remain, similar to the no-action alternative.
- Changes in foraging structure in the project area would not substantially shift from the existing condition to conditions that would limit goshawk hunting opportunities.
- Goshawk prey species and their habitats are diverse and abundant in the project area, and would not decline, and some would benefit, due to project activities.
- Treatment units would be surveyed in the current or previous summer before implementation, and no-treatment buffers would be designated around known nest sites.

Boreal Owl

Murphy (2012, draft assessment) provides a thorough summary of the risk factors to boreal owls and their habitat from timber harvest, fuels reduction (mechanical and prescribe fire), wildfire, fire suppression and human disturbance.

Alternative 1 – No Action

Direct and Indirect Effects

Direct effects are project activities that may cause owl mortality, such as felling trees that contain active nests, or that disturb important activities such as feeding, breeding, or roosting. By reducing rates of survival and reproduction, direct effects negatively influence animal abundance and, at the extreme, population viability. No direct effects would occur from this alternative.

Indirect effects are related to habitat, such as food, nest sites, and security cover. Although indirect effects influence the survival and reproduction of individuals, they also affect the movements of resident adults within their territories and those of dispersers that travel between populations.

In the no-action alternative, secondary succession, and the current pattern of fire suppression in existing subalpine forests would continue to maintain boreal owl habitat. Existing and new snags used for nesting, and mature timber used for roosting and perching would remain intact. Decadent woody material on the forest floor would slowly accumulate, and indirectly contribute to favorable habitat conditions for small mammals such as red-backed voles that provide food for boreal owls (Hayward 1994).

Future large-scale, stand-replacing wildfires that could result from continued fire suppression could set much of the existing acreage of mature and old subalpine forest back to early successional stages. Such fires would be detrimental to boreal owls because they would greatly reduce canopy cover, locally increase ambient temperatures, kill large trees used for roosting, perching, and nesting, and consume soft woody material on the forest floor that supports owl prey. Continued fire suppression would also allow conifers to outcompete and limit aspen recruitment and coverage, reducing the coverage of this cavity and prey-rich community type (Hayward 1993).

Alternative 2

This alternative would affect 2,516 acres of spruce-fir forest through prescribed fire and mechanical treatments, including modeled mature and old subalpine forest habitat (331 acres of prescribed burns and 54 acres of mechanical treatments), and a total of 15,905 acres (inclusive of all subalpine-spruce cover) of forest habitat potentially used by owls, at least during the courtship period.

Direct Effects

The mechanical treatments would be applied throughout the units except where unsuitable for field crews, or exclusions for resource protection. After mid-July, crews might disturb and locally displace adults and juveniles near nests and in the vicinity of work sites. Project design features to reduce potential effects on boreal owls (and species with similar requirements) by avoiding or minimizing mechanical treatments in forest stands where owls are present or have a high probability of occurring would be applied.

Disruption of breeding and nesting, and mortality of nestling boreal owls might occur in forest habitat in prescribed burn units if owls are present, because burning operations would be allowed during the period February 1 and May 15. Forest habitat in prescribed fire units potentially used by owls totals 8,055 acres (15 percent of project area forest habitat) of which 331 acres is modeled subalpine habitat. Like mechanical treatments, effects on boreal owls would be reduced by minimizing treatments, no-treatment

buffers or restricting activities in forest stands where boreal owls occur. After mid-July, crews might disturb and locally displace adults and juveniles near nests and in the vicinity of work sites.

These effects would be very minor because the amount of modeled subalpine habitat (about 54 acres) and other forest habitat (about 1,443 acres) affected would be low relative to the large summer home ranges (2,900 acres) of breeding boreal owl pairs (Hayward et al. 1993). Also, disturbance effects would occur across well-spaced mechanical units and would be temporally separated across several work seasons. There is little scientific evidence that disturbance is an important factor in nest loss or owl movements. Boreal owls readily tolerate human and machine noise (Murphy 2012, draft assessment). In addition, prime mature and old subalpine forests identified during field surveys have been avoided to the extent consistent with the purpose and need for the fuels project.

Mature and old-growth forest structure removed by temporary road construction would be very limited.

Indirect Effects

In the short term, treatments would open up the canopies and promote shade intolerant species: whitebark pine, lodgepole pine, limber pine, Douglas-fir, and aspen (Amell 2012). In mechanical thinning units, stocking density of understory and mid-story climax subalpine fir and spruce would generally be reduced to favor retention of more desirable tree species. In the 2-storied and multi-storied areas, the noncommercial thinning would open up the understories and mid-stories, depending upon the age and size distribution. The post-treatment stands would have flatter diameter distributions but would still be considered 2-story to multi-story. Units proposed for commercial and noncommercial thinning are either multistory or generally even-aged and single-story, although there are areas within some units where an understory of subalpine fir and aspen is developing. The result of the treatments in these units would be to open up the stands, but their structure would not change.

Prescribed burning would reduce the number of trees in the short term, especially the small diameter trees and the less fire-intolerant tree species. The treatments would mostly kill subalpine fir, Engelmann spruce, small Douglas-fir and small lodgepole pine. The burned areas would be pushed toward early-seral species compositions. However the results would be variable; from unburned areas to high intensity burns killing individual or small groups of trees. Prescribed burn treatments, because of the variation in fire, would increase both horizontal and vertical structural diversity. Generally, the treatments would flatten the tree diameter distributions, but because of burn variability, the effect would not be as great or as uniformly distributed as expected in the thinning treatments. In the short term, some burned areas would be pushed toward a single-story structure because the understory trees had been killed, some areas would retain a multi-story structure because they are unburned or lightly burned, and some small areas would be pushed toward non-forested openings. In the long term, trees would become established in the openings, creating a patchy new age class to the stand structures.

By reducing vertical forest structure, canopy cover and decadence (snags and woody debris), mechanical treatments applied in subalpine forests would have negative effects on boreal owl habitat (Hayward et al. 1993, Knight 1994, and Murphy 2012, draft assessment). Canopy spacing and removing even small (less than 10 inches dbh) trees, especially where trees are clumped, would reduce thermal cover available to boreal owls during the summer and would promote crusted snow layers that render small mammal prey inaccessible during the winter. The removal of large diameter snags from mechanical units in portions of the defense zone and along fire lines constructed to contain prescribed fires would reduce potential nest sites for boreal owls, insect food for primary cavity excavators such as pileated woodpeckers and northern flickers, and habitat for primary prey (Hayward 1994 and Murphy 2012, draft assessment). Changes in forest structure or tree species composition potentially changes the abundance and accessibility of prey for boreal owls (Hayward 1997 as cited in Murphy 2012, draft assessment). The removal of ladder fuels

and downed logs at ground level would reduce existing and potential woody debris that supports lichens and fungi needed by owl prey (Knight 1994). The more open nature of thinned stands would increase ambient temperatures and humidity, also to the detriment of owl prey. However, where conifer removal improved aspen suckering and enhanced the vigor and size of mature aspen, owls might benefit from the nesting opportunities where work crews did not remove snags.

As an obligate cavity nester, boreal owl populations may be influenced by changes in cavity availability resulting from changes in snag abundance or woodpecker populations (Murphy 2012, draft assessment). The strength of the relationship is dependent on the relative abundance of nest sites. Changes in forest structure from mechanical thinning or prescribed fire that reduce the number and dispersion of trees and snags larger than 45 cm dbh could limit owl nesting and render nests more vulnerable to predation (Murhpy 2012, draft assessment). Similarly, changes in forest structure that alter woodpecker prey availability or the foraging ability of cavity excavators such as northern flickers (*Colaptes auratus)* and pileated woodpeckers (*Dryocopus pileatus*) would affect boreal owl nest site availability. Finally, changes in tree species composition, regardless of tree size class, could influence nest site availability as tree species differ in their longevity as a snag and in suitability for cavities (McClelland 1977 as cited in Murphy 2012, draft assessment).

Prescribed fires would result in a mosaic of burned and unburned areas that would benefit boreal owls by creating canopy gaps and promoting species and age-class diversity that boreal owls favor. At small spatial scales (less than 50 acres), most conifer forests in the prescribed fire units would experience low- to moderate-intensity fires that consume only understory vegetation and woody debris on the forest floor. Effects on mature subalpine forests would be buffered by effects of prevailing high humidity and cool conditions that reduce fire intensity and spread on north slopes and along stream courses where this cover type tends to occur. New snags in moderately burned areas would provide habitat for foraging and nesting woodpeckers (cavities for boreal owls), and would eventually accumulate as woody debris on the ground. Where the treatments promoted the recruitment and growth of aspen, they would have a positive long-term effect on the availability of nest sites. However, the fires would eliminate parts of some dense forest stands consisting of large mature trees through isolated torching and crowning, and reduce vertical forest structure and understory tree density and forest canopy cover (Hayward et al. 1993 and Murphy 2012, draft assessment). These changes in forest structure influence the availability of cool microsites to reduce thermal stress for summer roosting, and can contribute to crusted snow conditions in burned forest stands that limit owl access to winter prey (Hayward 1997). Locally, higher intensity burn areas would also consume existing snags for nesting and decadent woody material in the forest understory needed to support owl prey (Murphy 2012, draft assessment). However, these effects would not typically extend over large (greater than 50 acres) areas.

Alternative 3

Direct and Indirect Effects

The direct and indirect effects of alternative 3 would be qualitatively the same as those for alternative 2, similar in location, but smaller in spatial scope based on fewer acres treated.

Alternative 3 was designed, in part, to have fewer effects on wildlife species that depend on mature and old spruce-fir forests. This forest type is an important habitat for boreal owls because of it’s diverse understory, abundance of voles as prey, and more abundant cavities available as nest sites.

Compared to alternative 2, alternative 3 treats 22 fewer acres of modeled mature and old subalpine forest habitat through mechanical treatments. Mechanical treatments would affect about 32 acres, which is 1 percent of all subalpine habitat (3,500 acres) in the project area.

Compared to alternative 2, alternative 3 treats 266 acres fewer acres of modeled mature and old subalpine forest habitat of subalpine forest through prescribed fires. Prescribed fire treatments would affect about 65 acres, which is 2 percent of subalpine forest on national forest system land (3,500 acres) in the project area.The total area treated of subalpine forest is 1,730 (including the modeled mature and old subalpine forest habitat) which is a 31 percent reduction from alternative 2.

In total, 9,553 acres of all forest habitats potentially used by boreal owls would be treated in alternative 3, a 40-percent reduction from alternative 2.

Cumulative Effects – Alternatives 2 and 3

The analysis area for cumulative effects includes the project area and some nearby future actions on the Bridger-Teton and Caribou-Targhee National Forests. This landscape-scale area is most appropriate for assessing effects on boreal owls (Hayward 1994). A larger area, such as the Jackson Ranger District or the entire forest, was not used because the cumulative effects would be lessened and speculative at that scale. Also, boreal owl home range size is relatively small and numerous pairs are known to be present within the project area. The temporal context begins with the large scale wildfires in 1934 and extends to 40 years post-treatment.

Of the projects considered for cumulative effects in appendix E, 34 projects have similar habitats to those in the Teton to Snake project area —they support montane (e.g., Douglas-fir or lodgepole pine) forests mixed with aspen, shrub steppe, and grassland steppe at low elevations, grading up to spruce-fir, lodgepole pine, and whitebark pine stands at higher (over 8,500 feet) elevations. These areas also include isolated patches of mature subalpine forests that likely support boreal owls. Most of the vegetation treatment projects use primarily prescribed fire to reach the project's goals, and mechanical treatments used in most projects would affect little acreage of forest cover (about 2500 acres). Overall, prescribed fire improves forest structure as discussed above. Neither treatment type would substantially affect travel of resident owls within their territories, or dispersing individuals moving between watersheds, as habitat perforations and areas of non-habitat are not detrimental to owl movement (Scott 2004). Prescribed fires would also carry positive effects on owl foraging and nesting, because they would likely improve the condition, size, and longevity of many aspen stands.

The projects listed in appendix E that do not involve vegetation management could cause disturbance if owls are present but the spatial scale is so small that effects would be minor. Recreational activities (hiking, biking, horse riding, dispersed camping, back country skiing) associated with the trail work could be an erratic source of disturbance to nesting pairs and their young.

Determination - Alternatives 2 and 3

Considering the direct, indirect, and cumulative effects of alternatives 2 and 3, this project may impact individuals or habitat, but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species on the forest.

Rationale for Determination

Mechanical treatments would have small negative effects to individual boreal owls and their habitat. Although removal of standing trees modifies the cover and understory habitat used by prey species as foraging perches, and as potential nest cavities, the nature of the treatment ensures that all three features would still remain within treated areas and would not eliminate the site as suitable habitat. Relatively few acres (about 2,500) of total available forest cover would be modified within the project area and large amounts remain untreated in the surrounding landscape.

Prescribed fire would have a similar effect in the short term by modifying the understory through low or moderate intensity burn, but fewer trees in the overstory would be removed. Over a longer period (10

years and beyond), forest structure favored by boreal owls would occur, including new standing dead trees for cavities, and more vigorous understory growth as habitat for voles and other prey. These effects are preferred in contrast to large scale stand-replacing wildfires that might otherwise reduce forest stand structure.

The treatments would not impede movements of resident adult or dispersing juvenile boreal owls since habitat would remain on-site and owls are easily mobile across the landscape and are not affected by small openings.

Because alternative 3 was designed to reduce effects to wildlife, including boreal owls, alternative 3 would have fewer potential negative effects than alternative 2.

Great Gray Owl

Murphy (2013, draft assessment) identified timber harvest and fire suppression as potential risk factors to owls and their habitat.

Alternative 1 – No Action

Direct and Indirect Effects

With no action, fire suppression would continue and conifers would continue to encroach on meadows and grasslands within the forested landscape, which degrades foraging habitat for great gray owls. Similarly, increased canopy cover and the resulting decrease in the forest understory reduces habitat quality for potential prey and results in forest structure less suitable for foraging great gray owls (Hayward and Verner 1994 as cited in Murphy 2013, draft assessment). Fires that create openings can provide foraging opportunities for 20 years or more depending on the rate of forest succession. However, higher intensity, stand replacing fires can eliminate prime mature and old-growth forests used for nesting, particularly among montane (low elevation Bridger-Teton) forests (Murphy 2013, draft assessment).

Extensive conifer mortality from insects and disease attributed to persistent dense and homogenous stand conditions, and trees stressed from competition for soil moisture and nutrients, may increase foraging and nesting habitat for owls in the short term. Long term, the loss of mature and old-growth forest cover from extensive mortality may reduce the availability of suitable nesting structures and preferred foraging habitat.

Alternatives 2 and 3

The effects determination is the same for both of these alternatives. The difference is the degree of impact based on acres of habitat treated.

Alternative 2 would treat a total of 15,905 acres of forest habitat potentially used by owls, while 9,553acres would be treated in alternative 3, a 40-percent reduction. Most of the treated acres would occur in the lodgepole pine mix forest type where owls were most frequently found (Bedrosian, personal communications 2014). Operations and forest structure changes resulting from the proposed activities have the most potential to influence owl presence, movements, nesting, and foraging behavior and post-treatment habitat use in the project area.

Direct Effects

Management activities may disturb individual owls that are in or near units during implementation, even if the unit is not within an active nest territory. Such disturbance would be minor and temporary, and great gray owls could easily avoid the disturbance by flying to other portions of their home ranges. However, repeated, daily disturbance could disrupt nesting and brood rearing behavior and result in nest

abandonment. A design feature (WL-6) to protect owl nest sites and minimize disturbance around these sites are provided in alternatives 2 and 3.

Direct mortality of individuals from prescribed fire is unlikely since burns would be of low to moderate intensity with only small areas of possible higher intensity torching and crowning.

Indirect Effects

A reduction in fuels and more open forest conditions post-treatment which lowers the threat of large scale, stand replacing wildfire and promotes opportunities for future fire use wildfire would benefit owls over the long term by restoring a more historic fire regime. Natural fire events over the project landscape would help restore the distinctive fire mosaic of forest and range age classes, structural diversity and species composition favorable for owl nesting and foraging.

Reducing stocking levels in a mosaic pattern expected from the proposed treatments may benefit great gray owls by increasing the herbaceous understory and providing larger populations of prey species, and by opening up flight paths for hunting (Hayward and Verner 1994). Great gray owls rarely forage in dense forested habitats. Improving foraging opportunities would prevail until the understories are reforested, approximately 20 to 50 years.

Over the long term, reducing stand density by either mechanical or prescribed fire treatments may increase nest site availability by promoting the growth of large trees capable of supporting abandoned nest platforms of other raptors or corvids, or that leave snags and snag replacements that may eventually produce broken top nest structures for great gray owls. Maintaining mature forest with large trees, cavities, and broken-off snags for nesting is crucial to maintaining breeding populations of great gray owls (Wyoming Game and Fish Department 2011 as cited in Murphy 2013, draft assessment).

Some older large trees in the thinned stands would likely be broken off by post-treatment wind events, creating favored nesting platforms by great gray owls. The mature trees occasionally killed in prescribe fire units would provide future snag habitat for owl nest sites. Conversely, mechanical treatments would remove some snags, diseased and deformed trees, and leaning trees, especially in the defense zone and along fire control lines for prescribed fires. Once lost through vegetation management activities, nesting platforms would not be replaced naturally for a century or more in many forest types (Hayward 1994 as cited in Murphy 2013, draft assessment).

The mechanical treatments would reduce stand density, open the overstory canopy, and remove understory ladder fuels. This would increase habitat for habitat-generalist raptors such as red-tailed hawk and great horned owl that can prey on great gray young and out-compete great gray owls for nest sites and prey (Wyoming Game and Fish Department 2010 as cited in Murphy 2013, draft assessment).

Cumulative Effects – Alternatives 2 and 3

The analysis area for cumulative effects includes the project area and some nearby future actions on the Bridger-Teton and Caribou-Targhee National forests. A landscape-scale area is most appropriate for assessing effects on owls (Hayward 1994). The analysis area is appropriate because it is large enough to encompass the territories of numerous great gray owls. Several pairs of owls nest within the project area. A larger area, such as the Jackson Ranger District was not used because the impact of the direct and indirect effects would be diluted by the cumulative actions. Similar to direct and indirect effects, the collective acreage of cumulative impacts is an indicator of their effects on great gray owls.

Disturbance and disruption of owl nesting and/or displacement of owl fledglings may occur from the implementation of forest management activities identified in Appendix E. Recreational activities (hiking,

biking, horse riding, back country skiing, dispersed camping) associated with the trail work listed in appendix E can disturb nesting owls and their young as well.

Of the projects considered for cumulative effects (appendix E), 12 projects, totaling 1500 acres would add to the cumulative acres of owl habitat changed from its present structure and composition for approximately 20 to 40 years.

Along roads, hazard tree removal, and personal and commercial firewood cutting along road corridors are removing snag and downed wood material created from the extensive beetle mortality.

Annual livestock grazing on federal and private lands within the project area reduces the herbaceous and grass cover in moist meadows and upland grasslands and shrub communities that provide habitat for owl prey. While less cover improves prey detection for owls and other raptors, the removal of herbaceous cover may also reduce the abundance and distribution of some prey species.

Determination

After considering direct, indirect, and cumulative effects on great gray owls, this project may impact individuals or habitat, but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species on the forest.

Rationale for Determination

Project design features would be implemented to maintain habitat and restrict project-related acitivity in critical nesting areas and time periods. From April 1st to July 15th, vegetation treatments and removal, and temporary road construction within 0.25 miles of active great gray owl nests would not occur. In addition, 50 acres of the highest quality forest nesting foraging habitat (interior conifer and aspen forest, meadow) would be identified around active nests stands and maintained or improved.

Activity centers would be managed to maintain 50 percent forest canopy cover; remove conifer encroachment in meadow, shrub, and aspen habitats; maintain a depth of 300 feet in forest conditions around the perimeter of open forage areas; and create an average of two dead or cull-leaning trees per acre (within 300 feet of nest trees, if they are absent) greater than 8 inches in diameter and 40 feet in length lodged in adjacent green trees.

These conservation measures, coupled with other beneficial aspects of the project treatments, would maintain great gray owl presence and suitable habitat conditions in the project areas and thus, overall populations or habitat suitability would not be reduced.

Flammulated Owl

Alternative 1 – No Action

Direct and Indirect Effects

In this alternative, large-scale fire suppression in the project area would continue to occur and carry several detrimental effects on flammulated owl foraging and nesting habitat. This species requires mature forests with moderately closed canopies and shrubby understories for foraging, and snags with cavities for nesting. Across their range in the western United States, these requirements are typically met in mature ponderosa pine, Jeffery pine, and aspen forests. In the project area, forests dominated by mature Douglas-fir with open or moderately open canopies provide foraging and nesting habitat potentially used by flammulated owls.

Long term, fire exclusion in the conifer forests generates older, more decadent forest stands with encroachment of shade tolerant species in the understory. Dense stands of stagnant conifer regeneration reduces the quality of foraging habitat because grass and small shrubs that harbor numerous prey species, are shaded out by the dense thickets of stunted conifers (McCallum 1994). Fire suppression also permits young shade tolerant trees (e.g., Engelmann spruce) to suppress the recruitment of shade intolerant trees (here, Douglas-fir) that are important to the flammulated owls for nesting and foraging. In the absence of low-intensity ground fires, subalpine fir and lodgepole pine have increased in density and extent at the expense of fire-adapted species such as aspen and stands of large Douglas-fir that provide suitable nesting habitat. Fire exclusion also risks accumulation of woody debris and ladder fuels that contribute to large-scale, high-intensity fires that dramatically reduce the coverage of mid-age and old age Douglas-fir forests.

A positive effect of this alternative is that no fuel reduction treatments would reduce the availability of snags used for nesting or roosting. This effect would be limited to the vicinity of private property where mechanical treatments would otherwise occur.

Alternatives 2 and 3

In general forest management activities such as mechanical thinning, commercial timber harvest and low-intensity prescribed burning that would occur in these alternatives would reduce the risk of stand replacing fires. Such changes facilitate restoration of pre-settlement forest conditions characterized by more open canopy structure and large-stature trees that provide nesting cavities and foraging habitat for flammulated owls (Waterbury et al. 2009).

Direct and Indirect Effects

These alternatives carry minor or no disturbance-related effects on flammulated owls because the species is rare or does not occur in the project area. Moderate human activity may not carry adverse impacts because the species nests close to occupied areas and tolerates intrusive observation and handling by researchers (McCallum 1994).

If flammulated owls are detected within the proposed treatment units prior to or during implementation of either alternative, conservation measures to reduce possible disturbance to breeding and migrating would be implemented as part of design features WL-1, WL-2, WL -4 and WL-5. Project managers would avoid habitat modifications and worker disturbance in areas known to have active flammulated owl nests.

D.B. McDonald (McCallum 1994) suggests that thinning or prescribed fire that flushes roosting birds may be a more serious threat to adult survival in October when migrating *Accipiters* may be more common than in June, even though the possibility of lost reproduction is obviously greater in the summer (McCallum 1994). Thus, project activities that displace flammulated owls from roosting sites may increase mortality.

Alternative 2 would treat a total of 13,389 acres of forest habitat potentially suitable for flammulated owls, while 7,823 acres would be treated in alternative 3, a 42-percent reduction. Most of the treated acres would occur in the lodgepole pine mix forest type (6,797 and 3,648 acres in alternatives 2 and 3, respectively), followed by aspen and Douglas-fir mix cover types.

Although flammulated owls have shown declines following timber harvest, nesting individuals occur in selectively logged areas with open structures and interior edges (McCallum 1994). Thus, vegetation changes associated with these two alternatives would improve habitat for flammulated owls because large old trees and snags, open forest structure, shrubby forest understories, and some dense vegetation (untreated sites) for roosting would be retained and/or created. The proposed mechanical and prescribed

burn treatments would open up the understory and provide habitat for prey and flight paths for hunting owls. Younger trees in close proximity of large (greater than 20 inches dbh) and old Douglas-fir and Engelmann spruce would be removed. By removing or killing competing conifers, the mechanical and prescribed treatments would promote aspen stands used for cavity nesting. However, because vegetation management would reduce conifer stand density, open the overstory canopy, and remove understory ladder fuels, predation on flammulated young by habitat-generalist raptors such as red-tailed hawk and great horned owl may increase.

The reduction in snags associated with the mechanical fuel reduction treatments, where it occurs (200 foot bands in defense zones and other treatment sites as necessary), would reduce cavities available for nesting, although many snags would be created through isolated large tree torching that would accompany the prescribed burn treatments. Loss of snags is considered one of the most immediate threats to the species in North America (McCallum 1994). Recruitment of snags (dead trees or branches with good potential for holes) and health of woodpecker populations is essential to the conservation of all cavity-nesting owls.

Cumulative Effects

The analysis area for cumulative effects includes the project area and several nearby cumulative actions on the Bridger-Teton and Caribou-Targhee National Forests, and state and private lands within and adjacent to the project area. This analysis area is appropriate because of the limited scope and scale of effects on the potential nesting and foraging habitats in the project area and adjacent lands. Because this species has a relatively small territory and breeding home range, territories of several nesting pairs could be encompassed within the project area. Secondly, a broader cumulative effects analysis area was not chosen because the contribution of the direct and indirect effects to the cumulative effects would be unnecessarily diluted.

The cumulative actions (appendix E) in the analysis area carry effects that are similar to those described above for direct and indirect effects. Hazard tree removal, firewood cutting, and mechanical fuels reduction reduces snags that provide nesting cavities and potentially cause disturbance to nesting pairs and fledglings, if and where flammulated owls are present. Likewise, recreational and outfitting activities (especially motorized travel and camping), and forest management activities (e.g., trail maintenance) potentially carry negative, but small-scale disturbance effects. The prescribed burn treatments would increase the availability of snags (through isolated torching of large trees) and promote open-canopy Douglas-fir forests by reducing dense young growth conifers in the understories.

Overall, the collective weight of the cumulative effects are positive for flammulated owls because the implementation of the alternatives would promote open forest conditions by reducing woody debris and young-growth, shade tolerant conifers in the understory, especially in mature Douglas-fir stands in the project area where the species is most likely to occur. This beneficial effect outweighs the negative consequences of snag reduction (limited acreage) in the mechanical treatments and the occasional disturbance effects on this species that is uncommon in the project area.

Determination

With regard to flammulated owls, the two alternatives may impact individuals or habitat, but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species on the forest.

Rationale for Determination

Alternatives 2 and 3 carry both positive and negative effects on the species and its habitat. Through restrictions on the timing of work activity and vegetation treatments within nesting stands, design features

WL-1, WL-2, WL-4, and WL-5 would act to reduce disturbance effects on owls and adverse effects on habitat. Human disturbance on the species stemming from project activities would be minor, if they occur at all, because the species is currently uncommon in the area. The negative effects of the mechanical fuels treatments on the availability of snags (nesting cavities) would be spatially limited to 200 foot bands in defense zones—37 acres and 27 acres under alternative 2 and 3, respectively, and to other mechanical treatment sites as necessary to protect workers. Otherwise, the mechanical treatments would promote open forest conditions with moderate-density canopies and forest understories. Likewise, the larger-scale prescribed fire treatments (19,991 acres in alternative 2; 12,524 acres in alternative 3) would promote the coverage of mature Douglas-fir forests with open understories that provide nesting and foraging habitat, and locally improve the numbers of snags.

Columbia Spotted Frog, Western Boreal Toad and Boreal Chorus Frog

The effects of the project are essentially the same for all three amphibian species. Information on the potential effects on frogs and toads from the no-action and two action alternatives is derived from a comprehensive assessment by DeLong (2015, draft assessment) of risk factors associated with timber harvest, roads, prescribed fire, fire use, and wildfire on spotted frog and boreal toad and their habitats. All references cited here are found in DeLong (2015, draft assessment).

Alternative 1 – No Action

Direct and Indirect Effects

The impact of not treating upland vegetation to reduce fuels on the project area would have no measurable direct effect to frogs or toads or their habitat.

Continued sustained fire suppression and the concurrent overrepresentation of late-seral forest conditions has the potential to reduce water flow into wetlands and may accelerate evapotranspiration of surface water. This could reduce tadpole survival; reduce acreage of meadow, willow and aspen communities which support frogs and toads; reduce distribution and abundance of beaver pond complexes and their wetland habitat for frogs and toads; and limit forage production for tadpoles from shading of breeding pools by increased conifer canopy cover (DeLong 2015, draft assessment). “Fire suppression may indirectly affect boreal toad habitat by altering the natural succession cycles in forest communities” (Keinath and McGee 2005:38). PARC (2008) notes that western toads (including boreal toad) may have been adversely affected by years of fire suppression and the contributions have led to canopy closure in conifer forests. Conversely, fire suppression that maintains late-seral forest conditions has positive effects on water quality and wetland persistence by limiting soil erosion and sedimentation rates.This also contributes to greater retention of moist terrestrial microsites and large woody debris for thermoregulation and body water conservation of summering and migrating frogs and toads.

The increased risk of stand-replacing wildfire and suppression response if no action is taken to manage fuels at this time may cause post-fire sediment delivery to downstream breeding sites, which can affect tadpole survival (Maxell 2000, Patla 2001, Pilliod et al. 2003, Keinath and McGee 2005). In some small streams, sedimentation may increase to 10-100 times natural levels for 10 years or more (Pilliod et al. 2003). Sedimentation can also reduce the longevity of wetlands (see the Water Quality section), particularly as a consequence of large flushes of sediments which can occur with heavy rains following a severe fire. Control actions taken to suppress wildfires can have temporary detrimental impacts on amphibians and their riparian and wetland habitats by drafting water from streams, ponds and lakes.

The impact of not treating upland vegetation at risk to Douglas-fir and mountain pine beetle infestation, could have both positive and negative effects to amphibians or amphibian habitat. An increase in tree mortality may improve the size and amounts of large woody debris available as amphibian habitat on the

forest floor. Dead trees near roads may attract firewood cutters in vehicles that may cause resource damage, including erosion from off-road travel and log-skidding that contributes sediments to stream courses.

Alternatives 2 and 3

Direct and Indirect Effects

The effects described below are similar for both alternatives with only minor differences based on the number of acres treated and the distribution across the project area. Streams, wetlands, and known and historic breeding sites of Columbia spotted frog, boreal toad, and boreal chorus frogs were reviewed and specifically avoided by project design. In addition, buffers were incorporated into the project design that avoid treatments in streams, wetlands, and known or suspected amphibian breeding sites. As a result, direct mortality of individuals is expected to be minimal or may not occur at all and similarly, indirect effects are expected to be minimal since aquatic best management practices would be incorporated to protect water quality and retain proper functioning condition of streams and wetlands.

Use of heavy equipment in project operations and vehicle traffic on roads could directly impact amphibians by crushing adult frogs and toads near undocumented breeding wetlands. For prescribed fire, the main potential for amphibian mortality would occur if burning occurs in the May or June in the vicinity of unknown breeding sites, when juveniles are dispersing from breeding pools in summer months, and in localized areas where large numbers hibernate. Some amphibians can avoid direct effects of fire by remaining in water bodies, finding moist refugia, burrowing, and moving away from small fires, but most fires move too quickly for amphibians to avoid them if they are in the path of the fire (Pilliod et al. 2003). Since streams, wetlands, and known breeding sites were specifically avoided by project design, such mortality is expected to be minimal or may not occur at all.

The potential negative indirect effects to amphibians and their habitat from alternatives 2 and 3 include possible elevated erosion, sediment deposition and poorer water quality in breeding areas; loss of moist microsites and changes in prey base from reduced coarse woody debris, soil compaction, and drier internal forest stand conditions under more open canopies. Compliance with Bridger-Teton National Forest standards and guidelines, soil and water standards, and best management practices for protection of water resources would mitigate potential adverse impacts to aquatic habitats.

Likewise, several positive effects are possible including:

- increased early seral forest and rangeland conditions through prescribe fire and forest thinning can increase water flow and retention in wetland habitats to support breeding and metamorphosis;
- increase the acreage of willow, aspen and meadow communities which tend to be more moist;
- provide more productive herbaceous and shrub understories for prey and moist microsites;
- facilitate the presence of beaver and their wetland habitat for frogs and toads;
- reduce tree canopy cover; and
- increase the amount and distribution of opening and edge especially favorable to boreal toad (neutral or beneficial to frogs) breeding and reproductive success.

The net effects of fire, timber harvest, and mechanical thinning for this fuels project would be neutral because sufficient forest canopy cover and coarse woody material would be retained; associated roads and treatments would not impede movements or elevate mortality rates; there would be no reduction in habitat due to roads; water quality would not be adversely affected; and crushing by heavy equipment would not measurably elevate mortality rates.

Over the long term (decades), the two action alternatives would reduce the probability of potential impacts from large scale stand replacing wildfires; increase water yield; increase herbaceous and shrub productivity; increase aspen regeneration and other early seral vegetation; and benefit beaver, frog and toad habitats. Overall, the proposed project would have no long-term (greater than 10 years) negative effects to amphibians or amphibian habitat after completion, with the possible exception of a minor loss of upland woody debris and minor aquatic sediment deposition in local areas.

Cumulative Effects

The cumulative effects analysis area for amphibians was chosen as the project area and adjacent state and private lands downstream of the project area to the Snake River. This analysis area is appropriate because water flow along riparian stream systems could extend effects downstream to frog and toad habitat outside the project area. Past experience shows that these kinds of effects in a riparian area can heal within 5 to 10 years.

Similar positive and negative effects are expected from mechanical thinning and prescribed burn projects listed in appendix E. Recreational activities, especially dispersed camping and off-road motorized travel in and around streams, ponds, wetland, and riparian areas can impact amphibians from direct mortality and impaired breeding habitat. Sediment delivery and contaminants from road systems, motorized and nonmotorized trails and housing developments in the project area contribute cumulative effects to water quality and sediment deposition at amphibian breeding sites. Effects from the Coburn Creek, Teton Pass/ Powerline and Candyland, and Phillips Canyon Trail reconstruction and maintenance; the Fall Creek bridge replacement, Pritchard boat ramp construction, annual road maintenance, and livestock grazing could contribute to cumulative effects to amphibians because they occur within or adjacent to riparian zones along streams and wetlands where frog and toad habitat exists. Firewood removal reduces future coarse woody debris and is an additional source of potential sediment delivery to aquatic systems. Effects from all these projects could last up to 10 years after projects are completed.

Determination and Management Indicator Analysis

Columbia spotted frog and western boreal toad (USDA Forest Service Sensitive)—The action alternatives may impact individuals or habitat, but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species on the forest.

Western boreal toad and boreal chorus frog (Bridger-Teton National Forest management indicator species) —Habitat would be retained in its current condition and no breeding areas would be lost or modified. The action alternatives would not measurably reduce populations or reproduction across the project area or the forest.

Rationale for Determination

The project design features include:

- No-treatment buffers within 100 to 300-feet of wetlands, streams, and riparian areas, which is the habitat most occupied by amphibians and most important to reproduction.
- Maintain a minimum 300–foot no treatment buffer around breeding sites.
- All wetlands, ponds, springs and streams would be identified and mapped prior to or during unit layout (Fryxell 2014).
- Direct and indirect impacts to frogs and toads and their habitat would be minimized by implementing Wyoming’s best management practices for streamside management, and Bridger-Teton National Forest standards and guidelines for timber harvest. These practices would help maintain coarse woody debris and retain snags for future woody debris around frog and toad breeding sites.

Over the long term (decades), the two action alternatives would reduce the probability of impacts from large scale stand replacing wildfires; increase water yield; increase herbaceous and shrub productivity; increase aspen regeneration and other early seral vegetation; and benefit beaver, frog and toad habitats.

Overall, the proposed project would have no long-term (greater than 10 years) negative effects to amphibians or amphibian habitat after completion, with the possible exception of minor losses of available upland woody debris and minor aquatic sediment deposition in local areas. Potential cumulative effects are listed in appendix E and were included in the effects determination.

Wolverine

Alternative 1 – No Action

Direct and Indirect Effects

The over-representation of late and old forest conditions as fire suppression continues would reduce the availability of early seral forage for elk and mule deer that serve as prey and provide carrion. If large-scale, severe wildfire occur, forage would likely increase and support these food sources of wolverine, although moose would be negatively affected by the reduction in forest overstories that provide shading and reduce over-heating . Overall, the indirect effects to wolverine of the no-action alternative are minimal.

Alternatives 2 and 3

Direct Effects

The proposed action is expected to improve the suitability of winter range for ungulates, and therefore would likely enhance the winter carrion base for wolverine. Some units are located within ungulate winter ranges potentially used by wolverines. No barriers to local movements or dispersal of wolverines would result from this project.

No mortality or other effects to wolverines are expected due to the small number of resident wolverines in the Teton Range; their general avoidance of mid-and lower elevation areas (under 8,000 feet) where most of the treatment operations would occur; and their ability to range widely and avoid disturbances. Adequate remote and undisturbed refugia to escape disturbance exists within the large home range of any individual whose daily or seasonal movements may include the proposed treatment units. Roads would not present barriers to movement or dispersal because their use would be seasonal and project-related traffic minimal.

Indirect Effects

The scope and scale of changes in forest and range structure from proposed treatments in both alternatives 2 and 3 would have similar effects.

The proposed treatments would improve the suitability of seasonal ranges for ungulates, and therefore, would likely maintain or enhance the seasonal availability of prey (elk calves and mule deer fawns) and carrion for wolverines. Some units are located within ungulate winter ranges potentially used by wolverines. Early seral vegetation (herbs and grasses) that develops on treated acres also would improve habitat conditions for rodents and small mammals that provide seasonally available prey for wolverines.

Cumulative Effects

The cumulative effects analysis area is the Teton and Snake River ranges south of Jackson Lake (Grand Teton National Park and north of Highway 26, including the Caribou-Targhee National Forest

immediately to the west and south to Alpine, Wyoming. This area is large enough to encomplass the entire home range of a single (or more) wolverines that might overlap the project area. The wolverine is a wide-ranging scavenger capable of large scale movements with a relatively large home range (Wilmot 2015, draft assessment).

This project and the 11 similar fuel reduction projects listed in appendix E as cumulative actions are typically at elevations lower than areas frequented by wolverines, and adjacent to private land. Potential wolverine presence in the cumulative treatment areas would most likely be sporadic, but an individual could travel through at any time.

The proposed Snake River canyon wildlife habitat improvement treatments (10,000+ acres) would improve forage availability and production for big game species and livestock, primary sources of carrion for wolverine. Secondary small mammal prey also would benefit from these treatments.

Proposed infrastructure development at in Teton Village (Teton Mountain Resort) may displace wolverines from suitable habitats, including denning or rendezvous habitat. The latter effect tends to be most detrimental to sensitive wildlife, because the area of displacement may be much larger than the area of direct habitat loss (U.S Fish and Wildlife Service 2010 as cited in Wilmot 2013, draft assessment). The trail maintenance, reconstruction and construction projects and trail use add to wolverine disturbance.

Determination

Based on the direct, indirect, and cumulative effects, this project may impact individuals or habitat, but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species on the forest.

Rationale for Determination

Wolverines are a highly mobile species with large home ranges and long daily movements. Their seasonal activities occur at a scale much larger than the collective treatments and project area. Thus alternative untreated habitats would be readily available. The projects would occur at elevations lower than typically used by wolverines. The proposed mechanical and prescribed fire treatments along with similar fuels reduction projects would improve habitat conditions for wolverine prey and sources of carrion such as big game, rodents and small mammals.

There are no known home ranges of wolverines within the project area, but they are known to make sporadic use of the area for foraging or travel. Should a wolverine den or rendezvous site be identified at a later time, buffers would be put in place to avoid disturbances by project aircraft (WL-20).

Management Indicator Species

National Forest Management Act implementing regulations (36 CFR 219.19) and Forest Service Manual (FSM) 2600 guidance require that Forest Plans identify certain vertebrate and/or invertebrate species as management indicator species, and that these species be monitored “in order to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent” (FSM 2620.5).

Western Boreal Toad and Boreal Chorus Frog

See the summary of effects in the USDA Forest Service Sensitive Species section above.

Brewer's Sparrow

Alternative 1 – No Action

Direct and Indirect Effects

The no-action alternative would have no short-term effects to Brewer's sparrow populations. Over the long term, populations may gradually decline due to conifer encroachment into sagebrush communities. The limited sagebrush habitat in the treatment areas would continue to be at risk of a high intensity fire which could dramatically reduce the amounts of sagebrush habitat. Fire suppression actions could have direct effects from aerial borate delivery to sage communities. Other fire suppression actions such as fire lines, crew activity and presence, vehicle travel, and noise would create disturbance to nesting birds.

Alternatives 2 and 3

Direct and Indirect Effects

Spring burning in alternatives 2 and 3 could unintentionally disrupt nesting behavior, destroy nests, and result in adult mortality in sagebrush habitat where such activities occur before May 15.

Mechanical thinning treatments in coniferous forest stands would have little if any effect on Brewer's sparrow or their habitat since sagebrush community types are sparse or absent in these stands. Both the mechanical and prescribed fire treatments would reduce conifer encroachment and invigorate herbaceous production in sagebrush community types.

A design feature (WL-3) to maintain at least 50 percent sagebrush cover in large (over 100 acres) sagebrush patches would minimize long-term, negative effects on the habitat of this sagebrush-dependent species. Fire treatments would occur in a mosaic pattern on a minimal amount of acreage in sagebrush habitat. The immediate effect of fire on Brewer's sparrow populations depends greatly upon the season and intensity of the burn. A relatively cool fire during the dormant season could greatly increase food sources (Wright and Bailey 1982). Best (1972) found that the major impact of burning on foraging behavior was to make plant foods accessible, particularly grass seed that was unavailable before the burn because of the accumulation of grass litter. McGee (1976) also found an influx of non-breeding birds to the burned areas in his study. He attributed this to the increased availability of plants and insects as food items. Winter (1984) found Brewer's sparrow foraging efficiency remained unchanged in the post-burn period, and also documented that burned patches contained more arthropods than unburned areas in late July. With the reduced vegetative cover after burning, arthropod accessibility increased.

Brewer's sparrows are adapted to eat particular kinds of food, and the birds' abundance may depend largely on the supply of the appropriate kind of food (Bendell 1974). Short- to long-term food supplies could increase and be more dispersed across the mosaic of sage and non-sage areas following the burn.

Cumulative Effects

The cumulative effects analysis area for Brewer's sparrows is the project area because of the limited home ranges of these small birds during the breeding season and their association with sagebrush communities. Cumulative actions that contribute to cumulative effects are listed in appendix E, and include all fuels and other ground-disturbing projects. Only livestock grazing could impact the herbaceous and grass understories of sage communities at a scale that could affect nesting cover and food resources of the bird. Over the long term, annual livestock grazing in sage communities can increase the stocking density and canopy cover of sagebrush plants to benefit Brewer's sparrow if enough understory vegetation remains to provide nesting cover and food resources.

Determination and Management Indicator Analysis

The direct, indirect, and cumulative effects of the project would not contribute to declining populations of Brewer's sparrow on the planning unit (Bridger-Teton National Forest). Indirectly, this determination supports that an adequate quality and quantity of healthy sagebrush communities would persist with implementation of either treatment alternative.

Rationale for Determination

Implementing the action alternatives would carry both beneficial and negative effects on Brewer's sparrows and their habitat, but populations would not change substantially in the project area or at the forestwide scale. Disturbance, mortality, and displacement effects of project operations should be minor because the limited treatment of sagebrush and because project activities there would be short term. Effects on sagebrush habitat would be minimal in spatial extent and in severity where habitat is treated mechanically and by prescribed fire. Mechanichical treatments, where they occur in sagebrush, would enhance sparrow habitat by removing conifers. Likewise, the proposed use of low- to moderate-severity prescribed fire would enhance age class diversity of sagebrush communities. Sagebrush cover may be reduced initially but there is potential for more sage plants following tree removal. Treatments would locally increase the diversity of plant composition and structure. Mature sagebrush cover would be conserved by design features WL-3. Potential Brewer's sparrow habitat is of sufficient quality and abundance across the forest to allow the species to continue to be well distributed across Federal lands. Historic habitats remain well occupied.

Elk

Alternative 1 – No Action

Direct and Indirect Effects

The no-action alternative would maintain stable populations within state objectives for elk in the project area. Elk populations might decline over the long term due to reduced forage productivity expected from the increased density of conifer stands. The project area would continue to be at risk of a large, high-intensity fire, which could dramatically reduce the amounts of hiding cover, but dramatically increase forage productivity.

Alternatives 2 and 3

The effects determination is the same for both of these alternatives, differing slightly in the extent of actions. There would be less overall road work and proposed treatments would affect 30 percent fewer acres of ungulate habitat in alternative 3 over that of alternative 2.

Direct and Indirect Effects

This alternative would increase elk vulnerability to hunters by decreasing elk hiding cover over the short term (10 to 20 years), and may slightly reduce elk numbers. However, increased forage resulting from the reduction of overstory canopies in portions of some units may increase the birth rates and survival of elk calves. Considering the benefits of increased forage, the drawbacks of loss of hiding cover, the importance harvest regulations play on managing this elk population, and considering that populations are already at or near state objectives, it is likely that there would be little discernible change in elk population within the project area as a result of implementing either of the action alternatives.

By invigorating herbaceous production on seasonal ranges and improving the coverage of aspen , forage availability for elk would increase. After the treatments, forage for elk in forested areas would be nearer the levels considered "optimal" (Thomas et al. 1979) with an accompanying. Recent research (Cook et al.

1998) indicates that higher levels of forested forage are typically more beneficial to elk than high amounts of thermal cover.

Forest Plan standards for elk habitat effectiveness and security would be met under both alternatives. Use and development of roads would have minor negative effects on elk habitat effectiveness and none on elk habitat security. Use of seven existing roads at Phillips Bench and Red Top by work crews would not reduce elk habitat effectiveness because these roads are already open and used by the public. However, elk habitat security would not change because no secure habitat occurs in this area. Prescribed fire would not reduce elk habitat security because forest overstories, important components of secure habitat, would not be substantially affected. Fire and mechanical treatments on understory cover would remove some cover, but would encourage re-growth of many species that could provide security cover.

Cumulative Effects

The cumulative effects analysis area for elk consists of the Wyoming hunt areas 85 (Fall Creek) and 78 (Wilson). Both occur within the Fall Creek and Jackson herd units. These hunt areas are large enough to encompass most of the yearlong range used by elk that inhabit the project area during the spring, summer, and fall. The Dog Creek feedground occurs within the Fall Creek hunt area.

Reasonably foreseeable future actions that contribute to cumulative effects are listed in appendix E and include all fuels projects and road improvements that increase access for hunters. Timber harvest results in local increases in forage and reductions of security cover or habitat effectiveness.

Determination and Management Indicator Analysis

By providing favorable habitat conditions, implementing alternatives 2 or 3 would support the state's elk population objectives for the Fall Creek and Jackson herd units.

Rationale for Determination.

Implementing the proposed treatments would increase elk forage availability, production and quality, temporarily reduce hiding cover and cause no change in overall elk habitat effectiveness or security. Research indicates that reduction of thermal cover through mechanical thinning or prescribed fire would not have a measureable effect on current elk survival or numbers in the project area.

The proposed use of low- and moderate-intensity prescribed fire and mechanical thinning to treat fuels would facilitate restoration of forage vegetation, but would reduce cover available to elk in the short term. The temporary reduction in cover should not impact elk in the area, because treatments would likely increase vegetative diversity and forage production in both plant species composition and structure, and because cover is not a limiting factor. Aspen enhancements, achieved by both the mechanical and prescribed fire treatments, would benefit elk by providing improved forage and cover during calving.

Project design features WL-17 and WL-18 would protect elk calving areas and elk wintering areas in treatment areas from human disturbance.

Mule Deer

Alternative 1 – No Action

Direct and Indirect Effects

The no-action alternative would maintain mule numbers and habitat similar to the current condition, and contribute negatively toward achieving the Wyoming population objective for the Sublette herd unit.

The project area supports spring-summer-fall-winter and crucial winter mule deer habitat. In the presence of ongoing fire suppression, habitat would decline over the long term due to reduced forage productivity and increased conifer cover. Open meadows and shrub steppe are likely to decrease due to encroaching conifers. Thermal and hiding cover would improve but their value would be diminished where sites are not adjacent to grassy openings suitable as winter range. The project area would continue to be at risk of a large, high-intensity fire, which could dramatically reduce the amounts of thermal and hiding cover, but dramatically increase the level of forage productivity.

Alternatives 2 and 3

Direct and Indirect Effects

The effects determination is similar for both of these alternatives, differing slightly in the extent of actions. There would be less overall road work and proposed treatments would affect 30 percent fewer acres of ungulate habitat in alternative 3 over that of alternative 2.

The proposed treatments would increase deer vulnerability to fall hunters by decreasing deer hiding cover over the short term (10 to 20 years), although adequate hiding cover would remain outside units to allow mule deer to escape hunting pressure.

Increased forage production resulting from reduction of overstory canopies in some units would enhance forage for mule deer, improving the condition and survival of adult deer and increasing birth rates and survival of deer fawns. The enhanced condition and coverage of aspen due to both mechanical and prescribed fire treatments would benefit mule deer by providing nutritious forage and cover, particularly during fawning.

Cumulative Effects

The cumulative effects area consists of the state hunt areas 50 (Wilson) and 51 (Fall Creek) within the mule deer Sublette herd unit. These two hunt areas encompass nearly all of the late spring, summer, and early-fall used by mule deer that inhabit the project area. The use of a larger area (e.g., the area used by the entire Sublette mule deer herd) would dilute the direct and indirect effects of the proposed alternatives in the analysis.

The post-treatment (3 to 30 years) forest and range vegetation conditions from the proposed treatments add to the cumulative acres (12,000+ acres) of improved forage availability, diversity and production from 13 fuels reduction and wildlife habitat improvement projects (see appendix E) within the Fall Creek and Wilson hunt areas. The cumulative effects contribute positively to forage resources of the Sublette mule deer herd, albeit only over a small portion of the herd unit. There would be 30 percent fewer acres of deer habitat treated in alternative 3 than alternative 2.

Determination and Management Indicator Analysis

The proposed mechanical treatments and the associated cumulative effects contribute positively toward achieving the Wyoming population objective for the Sublette mule deer, a herd currently well below desired levels.

Rationale for Determination

The proposed mechanical and prescribed fire treatments would increase the quality and quantity of forage available for mule deer, with little corresponding negative effect on cover. This habitat improvement should increase mule deer survival and birth rates.

The Sublette mule deer herd was approximately 23,000 in 2013, well below the state objective of 32,000. The 2014 Wyoming Game and Fish job completion report states that winter survival, winter range habitat

condition and quality, and habitat loss from gas and residential development are the primary issues the influencing this herd's population dynamics. Although mule deer numbers may increase in the project area as a result of the treatments, the numerical contribution to the Sublette herd would be small because the project area represents a small fraction of the herd unit.

Bighorn Sheep

Alternative 1 – No Action

Direct and Indirect Effects

Fire suppression would continue at the current levels and methods. As a result, a steady decline in preferred open habitat and the nutrition of available forage would occur.

Alternatives 2 and 3

Direct and Indirect Effects

The treatments in bighorn sheep habitats (North Fork Phillips Canyon Rx and Phillips Canyon Rx burn units) would be similar for the two treatment alternatives, resulting in similar coverage of new open forage areas. Some short-term disturbance to bighorn sheep would occur during implementation of the prescribed fire treatments. Treatments in Douglas-fir mix and spruce-fir forests would descrease conifer cover and increase shrub and herbaceous forage quantity and quality. The presence of new openings would benefit sheep security by increasing sight distances, that is, the distances sheep can see threats such as predators.

Cumulative Effects

The cumulative effects analysis area for bighorn sheep is the Targhee herd unit. This unit extends north through the Teton range to the Yellowstone National Park boundary and south through the end of the Snake River range. This analysis area is large enough to encompass the yearlong range and habitats required for the herd's persistence. Bighorn sheep do not currently occupy the Snake River Range, but potential habitat occurs there.

Projects considered as cumulative actions are listed in appendix E. Actions important to bighorn sheep include the Teton Pass fuels reduction project, Snake River canyon wildlife habitat improvement project, annual trail and road maintenance, and livestock grazing. Trail and road work, and implementation of the Teton Pass project could be sources of disturbance to sheep and displace them from habitats near the project operations. Recreational activities such as hiking, biking, horseback riding, dispersed camping; and both resort (Jackson Hole and Targhee resorts) and backcountry skiing on the Bridger-Teton and Caribou National Forests and Grand Teton National Park year round sources of disturbance. The ski areas also have reduced habitat available to resident and migratory sheep. Like the proposed project, the Teton Pass fuels treatments and Snake River canyon prescribed fire should improve forage conditions and sight distances for sheep. By improving habitat, these projects may help extend the local geographic range of the herd at the southern edge of the Teton Range or possibly to the Snake Range. The beneficial effects of these two projects could last for 30 to 40 years in this high-elevation and short vegetation-growing season environment.

Domestic sheep grazing in the Teton Ranges reduces forage available to bighorn sheep, and is a potential disease vector. The presence of domestic sheep and their herders may deter also deter bighorn use of foraging areas.

Determination and Management Indicator Analysis

Implementing either alternative 2 or 3 would contribute positively to maintaining the Targhee bighorn sheep herd at objective. With regard bighorn sheep as a sensitive species, the alternatives may impact individuals or habitat, but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species on the forest.

Rationale for Determination

Habitat improvements associated with alternatives 2 and 3 would increase survival and reproduction in the herd, reducing the risk of extirpation of this small and geographically isolated herd of 125 individuals. This bighorn sheep population is at the post season management objective (125 sheep) and the proposed mid-winter trend based on aerial surveys in 2008 and 2010, and according to estimates provided in the most recent Job Completion Report (Wyoming Game and Fish Department 2014).

The prescribed fire treatments would increase vegetation diversity and forage production; and increase sight distances. Disturbance effects from prescribed fire operations would be minimal because they would be limited to a small area and because they would be temporary. Other disturbances such as back country and resort skiing, and disease risks associated with domestic sheep would continue to occur, but would be partially compensated by the positive effects of the alternatives.

Moose

Alternative 1 – No Action

Direct and Indirect Effects

In this alternative, the absence of habitat enhancements associated with the treatment alternatives contributes negatively toward increasing the Jackson and Targhee moose herd units toward their population objectives. The quality of moose foraging habitat in the treatment areas would slowly decline due to absence of natural disturbances that create vegetation communities in early successional stages. However, ongoing mountain pine beetle infestations in lodgepole pine stands would work to increase forage availability for moose through decreases in shading of competing conifers. In addition, forests would continue to become denser and taller, improving thermal cover (summer heat). The area as a whole would continue to be at risk of a large, high-intensity fires, created partially through fire suppression, which could reduce thermal cover over large areas and over the long-term, but dramatically increase shrub and herbaceous forage availability.

Alternatives 2 and 3

The effects are similar for both of these alternatives. However, alternative 3 is would have fewer road-related effects and its treatments would affect 30 percent fewer acres of ungulate habitat.

Direct and Indirect Effects

Project operations could temporarily disturb and displace moose from treatment units, causing movement into adjacent, undisturbed areas.

Increased forage production of forbs and woody species resulting from reduction of overstory canopies in treatment areas would positively affect moose foraging. Locally, treatments that remove forested cover would increase the abundance and diversity of grasses and shrubs found in upland areas that are used as forage. However, the reduction of understory tree species such as subalpine fir, and important winter forage for moose, could counter this positive effect. Opening the forest canopy would reduce effective summer thermal cover. Forest canopies also reduce the interception of snow, thereby reducing snow depths where moose yard during the winter. Deep snow impedes movements and renders forage

unavailable to moose. Where treatments occur in moose wintering areas, removing subalpine fir understory and mid-story could locally reduce forage, contributing to reduced survival and birth rates where forage is limiting.

Roads and skid trails would be closed or obliterated following completion of unit treatments and, following regeneration of conifers and shrubs, would have no additional post-treatment effect on moose habitat.

Cumulative Effects

The cumulative effects analysis area for moose is the Fall Creek-Targhee hunt area within the Sublette herd unit. This hunt area is appropriate because it is large enough to encompass the yearlong ranges of moose that inhabit the project area. The direct and indirect effects would be diluted in the cumulative effects analysis with the choice of a larger area.

Reasonably foreseeable cumulative actions that contribute to the cumulative effects are listed in appendix E. They include numerous fuel reduction projects, road improvement work, recreational use, and livestock grazing. Timber harvest would locally increase forage availability (e.g., aspen, woody shrubs, and forbs), but reduce thermal cover and canopy intercept during the winter for approximately 20 to 40 years. Thereafter, conifer regrowth and canopy closure would bring conditions back to pretreatment levels. The ongoing and proposed fuels treatment projects on private, state and federal lands (more than 25,000 acres) would similarly affect moose habitat. The large prescribed fire treatment (10,000 acres) in the Snake River canyon to improve wildlife habitat should also improve forage availability, production and quality for moose on all seasonal ranges.

Livestock grazing on federal and state range allotments and on private lands has, and would continue to affect herbaceous forage availability and production on seasonal moose ranges. Until 2013, the coverage, structure, and regeneration of willows in the riparian zone of the lower reach of Fall Creek was negatively affected by cattle browsing and trailing; reducing forage availability and cover for moose. Willow condition in this area is now improving in response to grazing adjustments.

Likewise, recreational activities (hiking, biking, horseback riding, dispersed camping, hunting) associated with the trails are a source disturbance.

In sum, the cumulative effects associated with both the treatment units would have a positive effect on moose populations because of the large acreage of the mechanical and prescribed, and despite the local effects of grazing, recreational disturbance, and forest canopy.

Determination and Management Indicator Analysis

Implementing alternative 2 or 3 would positively contribute toward achieving and maintaining the Sublette herd at the Wyoming population objective. Currently, the herd is slightly below objective.

Rationale for Determination

By improving forage availability over a large area, implementation of the action alternatives would maintain moose populations in the project area. The proposed use of low- to moderate-intensity prescribed fire and mechanical treatments would promote willow and aquatic vegetation, important source of forage for moose. In the long term, moose would see a small benefit from an increase in forage following prescribed fire and thinning.

Silvicultural and burn prescriptions are designed to minimize disturbances on big game winter ranges, promote post-burn shrub and cool season grass resprouting and regrowth, encourage aspen regeneration

and stand retention, maintain unburned patches within in burn units, and create variably dense forest cover in thinning units; all benefits to moose.

Although there is a small reduction in thermal cover and winter forage from treatments in subalpine fir habitat (upland moose habitat), these treatments leave large portion of the project area untreated. Less than one-third of the potential upland moose habitat on the project area (which equates to far less in the overall hunt area) would be treated.

Completed, ongoing and reasonably foreseeable actions that contribute to cumulative effects to moose and their seasonal habitat are listed in appendix E and were considered in the effects determination.

American Pine Marten

Alternative 1 – No Action

Direct and Indirect Effects

The no-action alternative would perpetuate existing conifer habitats used by marten because habitat would be maintained or improve. Nearly all forested portions of the project area provide habitat for marten because of the presence of mature conifer forest that is perpetuated by fire suppression. Over the long term, there is a greater probability of high-intensity, large-scale wildfire that would reset large blocks of mature forests back to early-successional stages that are far less suitable habitat for pine marten.

Alternatives 2 and 3

Direct and Indirect Effects

Pine marten use a variety of forested and non-forested habitats on the Forest, but prefer mature spruce-fir stands conifer stands and old growth with multiple stories and abundant woody debris. Removing snags, downed logs and other understory structure in coniferous stands can have an adverse effect to pine marten and their food sources because it reduces prey and cover for avoiding predators. Marten have been observed tolerating 25-30 percent natural and human-made openings in their home range, crossing man-made openings of 30 to 300 feet within their home ranges, and crossing openings up to 900 feet when shifting home ranges (Buskirk 2002).

The proposed mechanical treatments would reduce forested cover and on-the-ground structure for pine marten, especially within the 200-foot corridor in the defense zone where snags (as well as woody debris, small trees, and ladder fuels) would be removed for firefighter safety. Loss of coarse woody debris have a negative effect on a martens ability to encounter, attack, and kill prey (Andruskiw et al. (2008). To accommodate the effects on prey from the reduction of coarse woody debris, individual marten may shift to other habitats, and expand or shift their territories. A total of 385 acres of mature subalpine forests (prime habitat) would be affected in alternative 2, as compared to 87 acres treated in alternative 3. Retaining numerous live trees (especially over 9 inches dbh) and snags within noncommercial treatment units outside the 200-foot corridor should sustain some use by pine marten.

The prescribed fire treatments would create a mosaic of burns characterized by light and moderate-intensity fires, and unburned sites that would retain, at a broad scale, multistory forest structure, woody debris, snags, and other components that are favorable for pine marten. These forests would support new standing dead trees for cavities, and more vigorous understory growth as habitat for voles and other prey.

Where old-growth forest habitat occurs in treatment units, prescribed burns would retain the existing, describable forest characteristics for pine marten at a landscape scale (see the analysis in the section for old-growth forest below), although the local consumption of small trees and woody debris by fire would

be unfavorable. At the broader scale, the prescribed fire treatments would improve old-growth characteristics by increasing water available to large trees (reduced competition for water), and creating a patchwork of habitats, providing canopy gaps and layering, and increasing diversity in tree species and age-classes. Old-growth stands would include numerous large diameter snags that provide nesting habitat and downed wood. Mechanical treatment of old-growth stands would be limited to about 87 acres in alternative 2 and 71 acres in alternative 3.

Cumulative Effects

The project area was identified as the cumulative effects analysis area. This area is large enough to encompass a local population of pine marten. The importance of the direct and indirect effects that result from the treatment alternatives would be diluted with the choice of a larger analysis area. Cumulative actions that potentially affect pine marten in the analysis area include numerous fuel reduction and timber harvest treatment (appendix E).

Determination and Management Indicator Analysis

The treatment alternatives carry negative effects on important components of pine marten habitat, as described above, primarily associated mechanical treatments in the project area and adjacent lands. However, the mechanical treatments are limited in spatial scope. Both alternatives would retain a substantial amount of the most important habitat (mature and old-growth spruce-fir habitats) in the project area as untreated. Design features that retain snags and downed logs would help reduce negative effects.

Rationale for Determination

The treatment alternatives carry several negative effects on pine marten habitat, as described above. However, the design features that retain old growth, snags, downed logs, woody debris, and understory cover would minimize negative effects of the treatments on marten habitat and prey. Few marten would be affected because little old-growth habitat would be treated.

Migratory Birds

Alternative 1 – No Action

Direct and Indirect Effects

This alternative would have no measurable direct impact to migratory birds or their habitat. Standing dead snags would not be removed and down woody materials that produce food and other requirements would not be affected by the treatments.

Continued fire suppression activities would have very minor and localized effects during nesting season because few fires (other than spot locations) would occur during this period. Some disturbance to birds and their habitat (fire lines and snag removal) would result from active fire suppression at a larger scale (over 1 acre) that would occur later, principally from mid-July to October.

Indirectly, species associated with the abundant mature forests and shrublands in the project area would benefit from taking no action, while birds associated with early seral vegetation would have less habitat as plant succession advances toward more contiguous and homogenous conditions, and less habitat diversity.

Alternatives 2 and 3

Direct and Indirect Effects

In general, migrants that require the vegetation structure and woody debris removed by mechanical and prescribed fire treatments would be negatively affected by implementation of these two alternatives.

Conversely, migrants that benefit from open conifer and woodland forests and rangeland habitats in early stages of succession would benefit from the prescribed fires. There would be no vegetation removal or disturbance to birds from the mechanical treatments during the most important portion of the nesting season, that is, prior to July 15 of each calendar year (design feature WL-1). Conducting burns prior to mid-May (WL-2) would also prevent take of most adults, eggs, and chicks within burn units; but could displace pairs that are selecting nest sites or building nests. Incidental nest losses caused by burning events could be compensated by re-nesting attempts within or outside the unit in adjacent suitable habitat (Johnson 2009).

Cumulative Effects

The project area was used to define the cumulative effects analysis area because it is large enough to encompass at least one home range for migrants pairs considered above. Appendix A lists the projects that contribute to cumulative effects on migratory birds. These include actions that often carry negative disturbance and habitat effects, the latter caused by changes in vegetation type, coverage, and structure. For example, livestock grazing locally reduce herbaceous cover needed for nesting and foraging (insects) and, at the extreme, affects shrub coverage and structure (willow and aspen). Recreational activities such as dispersed site camping and off-road vehicle use locally degrade habitat for some migrants by reducing herbaceous, shrub, and small tree cover. The mechanical and prescribed fire treatments in appendix A would carry effects on habitat similar to those described for the direct and indirect effects above.

The Green Knoll wildfire in 2001 added 4,165 acres of early seral vegetation in conifer and aspen forests, and shrublands. Aspen is regenerating in burned clones. The fire also created snags and coarse woody debris. Overall, the fire improved the diversity of early seral habitats and dead wood structure available to migratory birds in an otherwise homogenous landscape. The beetle-caused mortality of mature tree cover since 2002 increased open habitat, snags, and woody debris at ground level.

In sum, the cumulative effects for migratory birds are a mix ranging from no effects to minor negative effects depending on the species of migratory bird. Typically, negative effects would be minor because prescribed fires would not burn at high intensity over large areas and the mechanical treatments would be limited in spatial extent. Most treatment would last from 5 to 30 years, until understory or mid-story structure, and ground cover is reestablished for ground, shrub, and tree nesting species.

Determination

The impacts of treatment operations and habitat changes are not expected to have a measurable negative effect on migratory bird populations (E.O. 13186, Migratory Bird Treaty Act) in the project area or on the Bridger-Teton National Forest.

Rationale for Determination

Overall, the treatment alternatives and their cumulative effects would carry some negative effects on migratory birds depending on the ecological requirements of individual species. However, the project area would continue to provide diverse migratory bird habitat because of the limited spatial extent of the treatments, particularly mechanical vegetation removal. In addition, the adverse effects of prescribed fires on some migrants would be dispersed and localized because a mosaic burn pattern of variable burn intensity is expected. Although harm and displacement of migrant nesting pairs could occur from prescribed burning operations, disturbances to migratory birds and loss of nests, eggs, or young from project operations would be minimal. The long-term benefits from prescribed fire include more diverse habitats supporting foraging, resting, and nesting habitats for migratory birds across the project area as a whole. Project design features to avoid prescribed burning and mechanical treatments during the nesting season (May 15 to July 15) and to implement best management practices associated with mechanical and fire treatments would minimize or avoid impacts to breeding and nesting migratory birds.

Snag Habitat

Standing snag habitat is critical for the survival of many species and is a naturally occurring component of forest timber stands, in particular as a result of the bark beetle infestations which have killed many trees in the project area in recent years. Snag data collected in 2009 and 2010 shows that large snags (10-inch dbh and greater) are abundant in the treatment units and in the project area, and Forest Plan standards for snag habitat are met.

Direct and Indirect Effects

The proposed treatments would not remove all snags. Most large-diameter snags would be retained as part of the project design. Individual, selected snags would be removed:

- where they present a direct hazard to field crews,
- in a 200-foot corridor in the defense zone for firefighter safety,
- where it is absolutely necessary to remove a snag in order to meet fuel reduction objectives, and
- along intermittent portions of prescribed fire boundaries where fire line construction is a necessary part of the prescription.

The treatment alternative action include design feature to retain snags: "The removal of snags in the defense zone would be limited to levels minimally necessary for firefighter protection and to meet fuel reduction objectives. Two dead or cull trees per acre would be retained where it does not compromise project objectives."

Given this project design feature, snags would remain at levels similar to the current condition across the project area. The defense zone corridor would have the largest snag removal, but the birds and mammals that depend on snags are mobile through flight, or by using ground vegetation or standing live trees as cover, and would be able to disperse across the 200-foot vegetated corridor to areas with more available snags. The treatment units outside of the defense zone and sites treated by thinning may have more snags removed (up to 30 percent) for field crew safety and to meet fuels reduction objectives. However, the remaining number of snags would still be adequate to meet wildlife needs inside the proposed units. Even after removal of a maximum of 30 percent of the larger diameter snags, approximately 9 snags per acre greater than 10 inches dbh would remain, on average, inside those units. This number of structures is adequate to support wildlife occupancy and movements. Finally, a small number of snags would be inadvertently lost within prescribed fire units. It is expected that the prescribed fire would create additional new snags by occasional burning of live trees that would offset the losses described above. Within prescribed fire units, it is likely that the number of available snags would have slight to moderate increase with the addition of these new snags.

Cumulative Effects

Snags removed in the action alternatives would be cumulative to snags removed from other fuels reduction and hazard tree treatments within the project area (see appendix E). Considering the action alternatives combined with cumulative effects, the surveyed number of available snags, and the suspected large number of snags based on tree mortality in the last decade, the project proposal would result in a condition that remains within Forest Plan standards for snag retention, and adequate habitat for snag-dependent wildlife species.

Old-Growth Habitat

The Forest Plan direction for old growth states:

> Only silvicultural practices which achieve desired old-growth attributes would be used in stands managed as old-growth. Twelve percent or more of existing old-growth Douglas-fir and spruce forest would not be harvested in order to provide for viable populations of old-growth dependent species. Designated old-growth stands would be at least 200 acres contiguous patches, generally spaced 1 to 2 miles apart, but attached by stringers of forested riparian areas or mature timber (USDA 1990:129).

The Forest Plan map of stands to be managed as old growth shows no old growth in the project area, however, analysis conducted for this project includes evaluation of forest stands exhibiting old-growth attributes, identified based on forest composition and structure. These stands were identified through modelling (Murphy 2011a) using current vegetation data and field surveys, and identified 6,300 acres in the project area with old-growth attributes. This equals about 15 percent of the conifer stands in the project area.

Mechanical Treatments in Old Growth

Old growth attributes occur in 87 acres of the proposed mechanical treatments in alternative 2 and 71 acres in alternative 3. After treatment, more than 13.5 percent of existing old growth would remain harvested in contiguous 200 acre patches under both alternatives, which is consistent with the Forest Plan standard that 12 percent or more of existing old growth remain unharvested. Also, because the treatments would remove only a portion of understory trees and woody fuels, the resulting landscape, even in the harvested areas, would retain old-growth characteristics including large trees, scattered large diameter snags, and coarse woody debris.

Prescribed Fire Treatments in Old Growth

Old growth attributes occur in 875 acres of the proposed prescribed burn units in alternative 2 and 556 acres in alternative 3, each about 15 percent of the 6,300 acres of modelled old growth in the project area. There may be small effects within the areas treated through localized burning or removal of downed wood, and the burning of some understory trees. However, the prescribed fire treatments would create long-term improvement in old-growth characteristics by improving the growth of large trees, and creating a patchy distribution of habitat similar to that created from historic burn rates and intensity canopy gaps and layering, all of which promote species and age-class diversity among trees. The structural and spatial character of old-growth forest conditions would be maintained including the presence of numerous large diameter snags that provide nesting habitat and large diameter downed wood throughout, but with localized burn areas where those characteristics are affected.

Conclusion for Modeled Old Growth Forests

Alternatives 2 and 3 are consistent with the Forest Plan standard. In addition, a project design feature to protect old growth would help retain this resource. Because of the small amount of overlap between project units and old-growth stands, alternatives 2 and 3 are also unlikely to affect old-growth connectivity and spacing. Project design features would be applied to protect the riparian corridors from high intensity fire which would further protect old growth where it occurs in bottomlands.

Comparison of Wildlife Effects

Table 25 is a summary of effects to wildlife in relation to primary habitat needs or other limiting factors, by species. Details and supporting information for these effects are in the species sections above and in individual specialists reports in the project record.

Table 25. Comparison of effects to key wildlife indicators and determinations by alternative. MIIH determination: may impact individuals or habitat, but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species on the forest.

Species	Primary Habitat Need and Limiting Factor	Alternative 1	Alternative 2	Alternative 3	Comments
Canada lynx	Lynx habitat condition in lynx analysis units	No short-term effect on lynx habitat; long-term detrimental effect of fire suppression	Detrimental in the short-term to snowshoe hares, but compliant with Northern Rockies Lynx Management Direction based on wildland-urban interface.	Detrimental in the short-term to snowshoe hares, but compliant with Northern Rockies Lynx Management Direction. Preferred for Canada lynx. The direct effects of alternative 3 on lynx would be less project-related disturbance (truck and helicopter traffic) and mortality risk (vehicle-strike) because fewer acres are proposed for both prescribed fire and mechanical treatment.	Mechanical treatments are more detrimental to hares and lynx than prescribed fires.
Gray wolf	Available prey	No short-term changes in available prey; long-term detrimental effect of fire suppression.	Same for alternatives 2 and 3. Improved availability of prey for wolves.		
Grizzly bear	Large un-roaded landscapes with a variety of foraging habitats	No potential project-related disturbances to bears. No foraging habitat improvement.	Same for alternatives 2 and 3. Foraging habitat improvement. The mechanical and prescribed fire treatments would produce favorable early seral habitat conditions within the historic range experienced by the species. Project is consistent with the recovery and delisting of grizzly bears in the Yellowstone Ecosystem and the Forest Plan objective of supporting the recovery of listed species.		
Yellow-billed cuckoo	Large cottonwood galleries with tall willows	No effect	Same for alternatives 2 and 3. Suitable habitat consists of large cottonwood galleries with tall willows. None of these habitats would be modified. Cuckoos are not known or expected to be present within treatment areas.		

Species	Primary Habitat Need and Limiting Factor	Alternative 1	Alternative 2	Alternative 3	Comments
Bald eagle	Nesting along large lakes and rivers	No short-term effect; detrimental long-term effect on bald eagle hunting and scavenging through fire suppression.	Same for alternatives 2 and 3. Prescribed fires cause some loss of snags and live trees that could be used as occasional roosts or perchs. Determination: MIIH.		
Three –toed woodpecker	Decadent timber	No short-term effect; mixed positive and negative effects of long-term fire suppression.	Negative effects of mechanical treatments; positive effects of prescribed fires. Determination: MIIH	Preferred for woodpecker. Treats 27 percent fewer safety corridors in defense zone units for snag removal (36 percent fewer acres) compared to alternative 2. Determination: MIIH.	The small losses of snags that may occur through mechanical treatments are expected to be offset by retention of existing large snags, new foraging and nesting habitat created by prescribed fire, and new habitat that is being created across the landscape by the current mountain pine beetle epidemic.
Northern goshawk	Nesting habitat in dense mid-size timber with minimal understory	No short-term effect; contributed to long-term risk of high-intensity fires that reduce nesting habitat.	2,806 acres negatively affected by prescribed burn and mechanical treatments. Determination: MIIH	Preferred for goshawk. 272 acres negatively affected by modified through prescribed burn and mechanical treatments. Determination: MIIH	In alternative 3, boundaries of some prescribed fire and mechanical treatments were redrawn and some units dropped completely to avoid treatments (66 percent fewer than alternative 2) in forested areas of goshawk nesting habitat.
Boreal owl	Dense spruce-fir and nesting cavities in forested areas.	No short-term effect; contributes to long-term risk of high-intensity fires that reduce nesting habitat.	385 acres of mature subalpine forests affected (more important habitat to boreal owls). 2,516 total acres of subalpine forest affected. Determination: MIIH.	Preferred for boreal owls. 87 acres of mature subalpine forests affected (more important habitat to boreal owls), 77 percent reduction from alternative 2. 1,730 total acres of treated subalpine forest; a 31 percent reduction from alternative 2. Determination: MIIH.	Both action alternatives may impact individuals, but no trend toward loss of viability.

Species	Primary Habitat Need and Limiting Factor	Alternative 1	Alternative 2	Alternative 3	Comments
Great gray owl	Mature forest with moderate to lower stand densities and adjacent to large meadows.	No short-term effect; mixed positive and negative effects of long-term fire suppression.	Slightly preferred for great gray owls. Treats and improves 6,800 acres in lodgepole pine habitat preferred by great gray owls.	Treats and improves 3,600 acres in lodgepole pine habitat preferred by great gray owls. Determination: MIIH	Both alternatives result in small to moderate improvements of great gray owl habitat by improving foraging opportunities through a reduction in stand density within forested habitat. Design features (WL-6, WL-7) would be implemented to protect the great gray owl and its habitat.
Flammulated owl	Open pine forests with cavities.	No short-term effect Long-term habitat loss through succession and/or high intensity fire.	Slightly preferred for flammulated owls. Treats and improves 13,389 acres of forested habitat. This is 71 percent more than alternative 3; however, the degree to which the species would benefit is undetermined. Determination: MIIH.	Treats and improves 7,823 acres of forested habitat. Determination: MIIH.	Both alternatives result in small to moderate improvements of flammulated owl habitat by improving foraging opportunities through a reduction in stand density within forested habitat.
Columbia spotted frog; boreal toad	Streams and ponds where present.	No short-term effect; mixed positive and negative effects of long-term fire suppression.	Minimal negative effects of alternatives 2 and 3. The project is designed to include no-treatment buffers within 100 to 300 feet of wetlands, streams, and riparian areas which is the habitat most occupied by amphibians and most important to reproduction. Known breeding areas are avoided. Both action alternatives may impact individuals, but no trend toward loss of viability. Determination for both alternatives: MIIH.		
Wolverine	High alpine talus slopes and tundra.	No short-term effect; negative long-term effect of fire suppression on prey and carrion.	Minimal negative effects of alternatives 2 and 3. The project poses no risk of mortality to individuals, nor do they pose a risk of modifying occupancy or use within a home range. Determination both alternatives: MIIH.		

Species	Primary Habitat Need and Limiting Factor	Alternative 1	Alternative 2	Alternative 3	Comments
Brewer's sparrow	Sagebrush shrublands	No short-term effect; long term decline in habitat through encroachment and successional changes.	Minimal negative effects of alternatives 2 and 3. Slight improvements in potential habitat where low- to moderate-severity prescribed fire would enhance age class diversity of sagebrush communities by removing encroaching tree species and some late/old seral and decadent sagebrush. A design feature would reduce the extent of sagebrush burning in large stands. Potential Brewer's sparrow habitat is of sufficient quality and abundance across the project area and forest to allow the species to continue to be well distributed across the planning unit (Bridger-Teton National Forest).		
Elk	Grass/shrub winter ranges and forests	Maintains stable populations within Wyoming Game and Fish Department objectives over the short term; long-term decline in foraging conditions.	Maintains stable populations within Wyoming Game and Fish Department objectives.	Maintains stable populations within Wyoming Game and Fish Department objectives. Slightly preferred over alternative 2 because of fewer roads being used (2.44 miles fewer).	Action alternatives have offsetting effects related to improved forage verses loss of cover for hiding and thermal protection.
Mule deer	Winter range shrublands	Maintains stable population below Wyoming Game and Fish Department objectives; long-term decline in foraging conditions.	Contributes positively toward achieving Wyoming Game and Fish Department objectives.	Contributes positively toward achieving Wyoming Game and Fish Department objectives. Slightly preferred over alternative 2 because of fewer roads being used (2.44 fewer miles).	Action alternatives have offsetting effects related to improved forage verses loss of cover for hiding and thermal protection. Herd population of 23,000 animals is primarily influenced by winter range conditions and disturbances caused by housing and industry development within winter range that is off the project area.
Bighorn sheep	Winter range open areas and nutritious spring forage.	Winter range habitat would continue a steady decline related fire suppression and loss of forage. Population is at herd objective.	Minimal negative effects of alternatives 2 and 3. Treatments would not contribute measurable changes in the sheep population but could improve forage availability and nutrition in summer ranges. Few sheep presently use the project area which is at the very southern edge of their summer seasonal range. Sensitive species determination: MIIH.		

Species	Primary Habitat Need and Limiting Factor	Alternative 1	Alternative 2	Alternative 3	Comments
Moose	Willow bottoms with adjacent forest	No short-term effect; mixed positive and negative effects of long-term fire suppression. Moose populations are expected to remain stable and near herd objectives.	Maintains stable population near Wyoming Game and Fish Department objectives.	Determination: positively contribute toward achieving and maintaining the Sublette herd at the Wyoming population objective. Slightly preferred over alternative 2 because of fewer roads being used (2.44 miles fewer).	Across the hunt area and herd unit, moose habitat is of sufficient quality and abundance to allow the species to continue to be well-distributed across federal lands. Moose populations in the Sublette herd have been stable and slightly improving since 2004 and are near objectives.
American marten	Dense spruce-fir forest with understory cover and subnivean spaces.	Perpetuates existing conifer habitats used by marten. Potential for long-term decline based on probability of high intensity wildfire.	Alternatives 2 and 3 would retain a substantial amount of the most important habitat (old growth spruce-fir) as untreated, in compliance with Forest Plan standards. The prescribed fire treatments will create a mosaic of burns characterized by light and moderate-intensity fires, and unburned sites that will retain, at a broad scale, multistory forest structure, woody debris, snags, and other components that are favorable for pine marten. Mechanical treatments would negatively affect forest structure (woody debris and cover) on 385 acres of mature subalpine forests in altnernative 2 and 87 acres in alternative 3. The negative effects of the alternatives would not affect population trend on the project area or the planning unit.		
Boreal chorus frog	Streams and ponds where present.	No short-term effect; mixed positive and negative effects of long-term fire suppression.	Minimal negative effects of alternatives 2 and 3. The project is designed to include no-treatment buffers within 100 to 300 feet of wetlands, streams, and riparian areas which is the habitat most occupied by amphibians and most important to reproduction. Known breeding areas are avoided. Determination both alternatives: MIIH.		
Migratory birds	Habitat acres treated	0	22,162 acres treated with mixed positive and negative effects to species	14,281 acres treated; mixed positive and negative effects to species are reduced by 36 percent	

Species	Primary Habitat Need and Limiting Factor	Alternative 1	Alternative 2	Alternative 3	Comments
Old growth	Old growth converted to non-old-growth status (acres) and percent of total old growth in the project area	0	962 total acres (about 5 percent of old growth in the project area). Negative effect of mechanical treatments on old-growth characteristics (87 acres).	627 total acres (about 5 percent of old growth in the project area). Negative effect of mechanical treatment old-growth characteristics s (71 acres).	This assumes stand replacement prescribed fire (unlikely) on all acres.
Snag Habitat		No short-term effect.	Same for alternatives 2 and 3. Snags available in the defense zone and mechanical treatment areas would be reduced. Number of remaining snags would be adequate to support wildlife occupancy and movements, and new snags would be created by prescribed fire treatments and ongoing natural processes.		

Fire and Fuels

The following resource information and analysis summarizes the Fire and Fuels Report (Buhl 2011), available on the Bridger-Teton National Forest website and in the project record. Information is also included from the Wildfire Hazard Report (Helmbrecht and Scott 2011) available in the project record.

Existing Condition

The natural fire regime is a general classification of the role fire would play across the landscape in the absence of modern human intervention, but including the influence of aboriginal burning (Agee 1993). The natural or historical fire regimes are classified by number of years between fires (frequency) and the severity of the fire on the dominant overstory vegetation. The mixture of forest types found in western Wyoming developed under a variety of fire regimes, with varying moisture, temperature, and vegetation composition (Bradley and Fischer 1992). The historic fire regime in the project area consisted of low- to mixed-severity small fires occurring almost yearly, mixed-severity fires occurring during drought periods in the absence of high winds, and large, moderate- to high-severity fires occurring during drought periods and high winds. The result was forested patches (including aspen) of varying ages and sizes in an herbaceous and shrub-dominated landscape. In the early 1970s, Loope and Gruell noted the successional plant changes in the absence of fire have resulted in a deterioration of aspen stands, increases in conifer cover, heavy fuel buildup, and an increase in shrubs, including big sagebrush. This is still quite evident in the Teton to Snake Project Area where a dense component of young trees and shrubs has created concentrations of ladder fuels. For more information on this subject, refer to the fire regimes and ecosystem processes report (Abendroth 2011).

Fire History and Occurrence

Fire has been the major influence on vegetation patterns, composition, structure, function, age, and development of both individual stands and the larger landscape. Historically, wildfires in the project area appear to have been more frequent and greatly impacted forest vegetation. The below excerpt by T. S. Brandegee (1899) described the forests around Jackson Hole.

> Only a fraction of its area, probably not more than one-fourth, is covered with trees, and most of these are young, small, and of species of little value for lumber. This condition appears to be due simply and solely to fires which have swept over the country so completely and persistently that scarcely any part has been entirely exempt from them, while nearly all portions have been burned again and again within a generation. A large proportion of the area has been burned so persistently and frequently that the forests have ceased, temporarily at least, to attempt to restore themselves, and these regions are now grass-covered parks.

About 21,918 acres within the project area have been burned by wildfires greater than 80 acres since the early 1930s, not including the numerous small wildfires that occurred and were suppressed or simply went out. Most of that acreage burned during three wildfires in 1934, which was prior to the institution of aggressive fire suppression policy in 1935, which led to reductions in the numbers of wildfires. Historic fire occurrence data also show 198 fires, an average of 4 fires per year, have been suppressed in the project area from 1953 to 2007. Although fires occur in the project area during most years, the drought years of 1934 and 2001 saw large acreages burned.

There have been occasional large, stand-replacement fires occurring under very dry and windy conditions. Recent examples on the Bridger-Teton National Forest include the Purdy Fire in 2006 which burned approximately 17,000 acres and the Green Knoll Fire in 2001. The Green Knoll Fire burned

approximately 4,700 acres and threatened the communities of Wilson, Teton Village, and many private land parcels in the surrounding area. The fire resulted in the evacuation of many homeowners.

Fire Behavior and Fuel Condition

Fire behavior is driven by the combination of fuels, topography, and weather across the landscape. Surface fires spread according to the direction and speed of wind and/or the steepness of a slope. Passive crown fire encompasses a wide range of fire behavior from individual trees torching to nearly active crown fire. Active crown fire spreads rapidly and involves surface and canopy fuels and spreads from tree to tree through the canopy. Crown fires are more difficult to control and have more severe effects as compared to a surface fire due to higher rates of spread, increased fire intensity, and increased probability of spot fires igniting ahead of the fire front. Fuel conditions exist in the project area that could contribute to high-intensity fire adjacent to communities.

Treatments that decrease surface, ladder, and canopy fuels generally make the area more resistant to stand-replacing wildfires. Keane and others (2002) state that since the early 1930s, fire suppression programs in the United States and Canada successfully reduced the amount of wildland fires in many Rocky Mountain ecosystems. This lack of fires has created forest and range landscapes with atypical accumulations of fuels that pose a hazard to many ecosystem characteristics. The health of many Rocky Mountain ecosystems is now in decline because of fire exclusion; fire exclusion has actually made it more difficult to suppress fires, and this poses greater risks to the people who suppress fires and for those who live in and around Rocky Mountain forests and rangelands. They also indicate that the role of fire would continue to change in the Rocky Mountains as we continue to exclude fires from landscapes. It is not a question of *if* a landscape would burn, but rather, *when* it burns and how severe and intense that fire would be.

Fuel conditions vary widely throughout the project area. In the defense zone many of the areas proposed for treatment are densely stocked and have developed ladder fuels as well as increased concentrations of surface fuels[2] due to insect and disease mortality and natural forest succession. With concentrations of fuels, individual trees or groups of trees may torch and fire could continue through the tree crowns aided by high winds. Ignition in many of these areas could produce extreme fire behavior and threaten private land and other valued resources. In addition, concentrations of fuels may hinder the ability of firefighters to construct fireline.

Rothermel (1972) defined a fire behavior fuel model as a complete set of fuel inputs for the mathematical fire spread model. This model can predict surface fire behavior and transition to crown fire. In 2005, Scott and Burgan developed the Standard Fire Behavior Fuel Models to improve the accuracy of fire behavior predictions outside of the severe period of the fire season, such as during prescribed fire and resource benefit fire applications. These models were used to determine the distribution of fuel model throughout the project area. The majority of the fuels in the project area (36 percent) are modeled as a low load of grass and shrub fuel mixed with forest litter[3]. Dry aspects and drought stricken north aspects consisting of heavy forest litter with a shrub or small tree understory which can lead to crown fire due to an abundance of ladder fuels are modeled as primary carriers of fire. A third fuel model found in the project area consists of moderate load fine litter and coarse fuels. Fuel loading and arrangement in these areas varies considerably with most of the tonnage in the form of logs and timber litter. Two non-forested fuel models

[2] Surface fuel is defined as fuel lying on or near the surface of the ground, consisting of leaf and needle litter, dead branch material downed logs, bark, tree cones, and living plants of low stature.
[3] Litter is defined as leaves, needles, fine twigs, and other organic material on the forest or grassland floor that have undergone little or no decomposition.

are prevalent within the project area. The first consists of moderate load grass and shrubs, which are represented by the open grass and brush areas and can exhibit high rates of spread and flame lengths under drier conditions. The second consists of dry-climate grass. The distribution of all fuel models in the Teton to Snake Project Area is shown in table 26.

Table 26. Current distribution of fire behavior fuel models in the Teton to Snake Project Area

Fuel Model Descriptor	Acres	percent of Total
Low load, dry climate timber-grass-shrub	28,775	36
Very high load, dry climate timber-shrub	13,899	17
Moderate load, dry climate grass-shrub	10,951	14
Small downed logs	10,291	13
Short, sparse dry climate grass	8,524	11
Moderate load, dry climate shrub	2,260	3
Moderate load, conifer litter	1,844	2
Low load, dry climate grass	560	under 1
Low load, dry climate grass-shrub	524	under 1
Low load, compact conifer litter	34	under 1
High load, conifer litter	6	under 1
Non-burnable	2,226	3

Fireline intensity is widely used as a means to relate visible fire characteristics and interpret general suppression strategies. There are several ways of expressing fireline intensity. A visual indicator of fireline intensity is flame length (Rothermel 1983). These flame length classes and interpretations are familiar to fire managers and are widely accepted as an intuitive communications tool. Table 27 compares fireline intensity, flame length, and fire suppression difficulty interpretations.

Table 27. Fireline intensity interpretations

Fireline Intensity	Flame Length	Interpretations
Low	Less than 4 feet	Direct attack at the head and flanks with hand crews; handlines should stop spread of fire.
Moderate	4–8 feet	Fires are too intense for direct attack on the head by persons using hand tools. Handline cannot be relied on to stop fire spread. Equipment such as dozers, engines, and retardant aircraft can be effective.
High	8–11 feet	Fires may present serious control problems such as torching, crowning, and spotting. Control efforts at the fire head are likely ineffective. This fire would require indirect attack methods
Very High	over 11 feet	Crowning, spotting, and major fire runs are probable; control efforts at the head are likely ineffective. This fire would require indirect attack methods

Source: Rothermel (1983).

Fire modeling was used to evaluate the existing potential of flame length associated with fireline intensity and crown fire for the proposed project area under high fire behavior weather conditions. Results of these modeled outcomes are summarized in table 28 and displayed in figure 8 and figure 9.

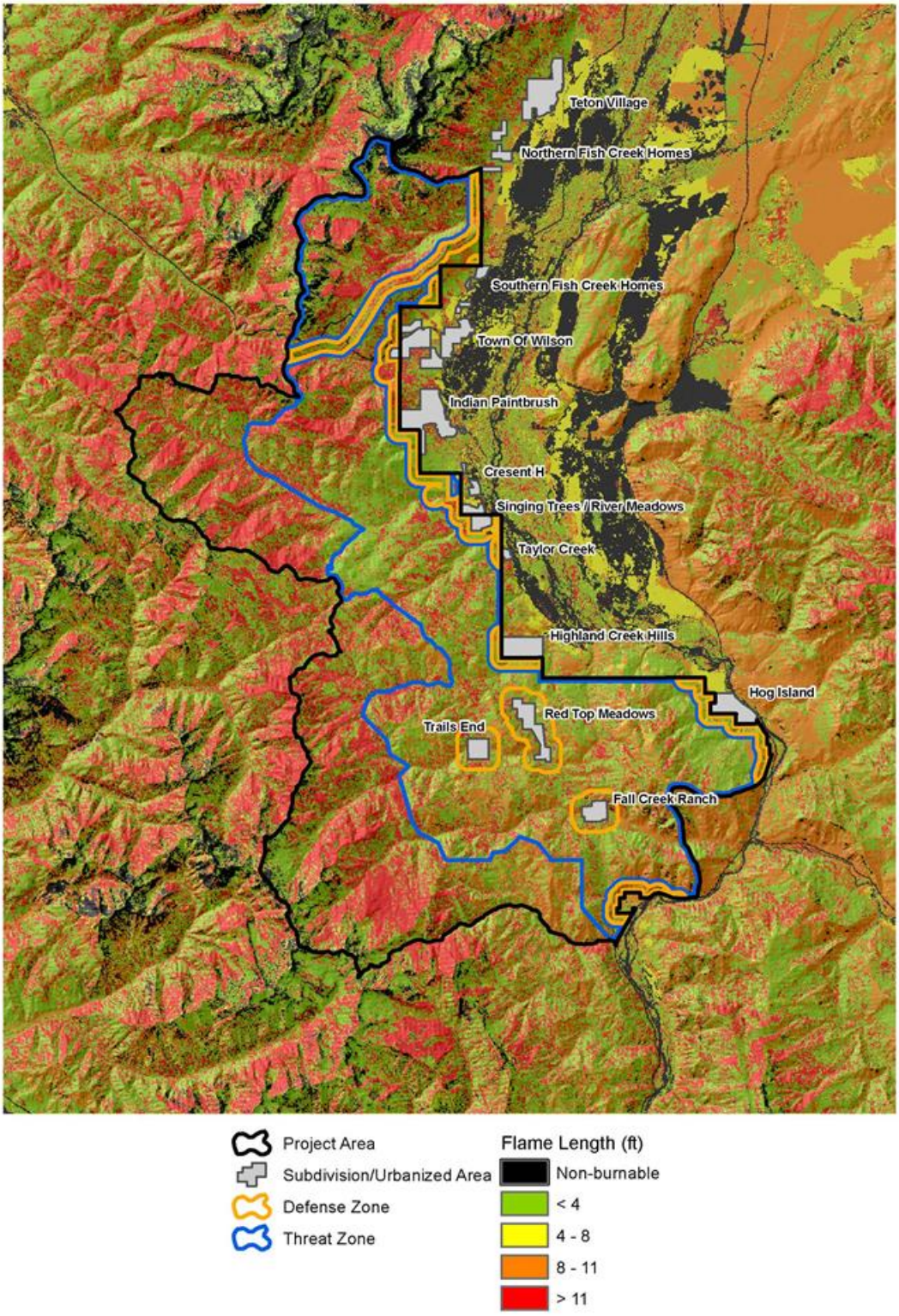


Figure 8. Existing condition for potential flame lengths in the project area

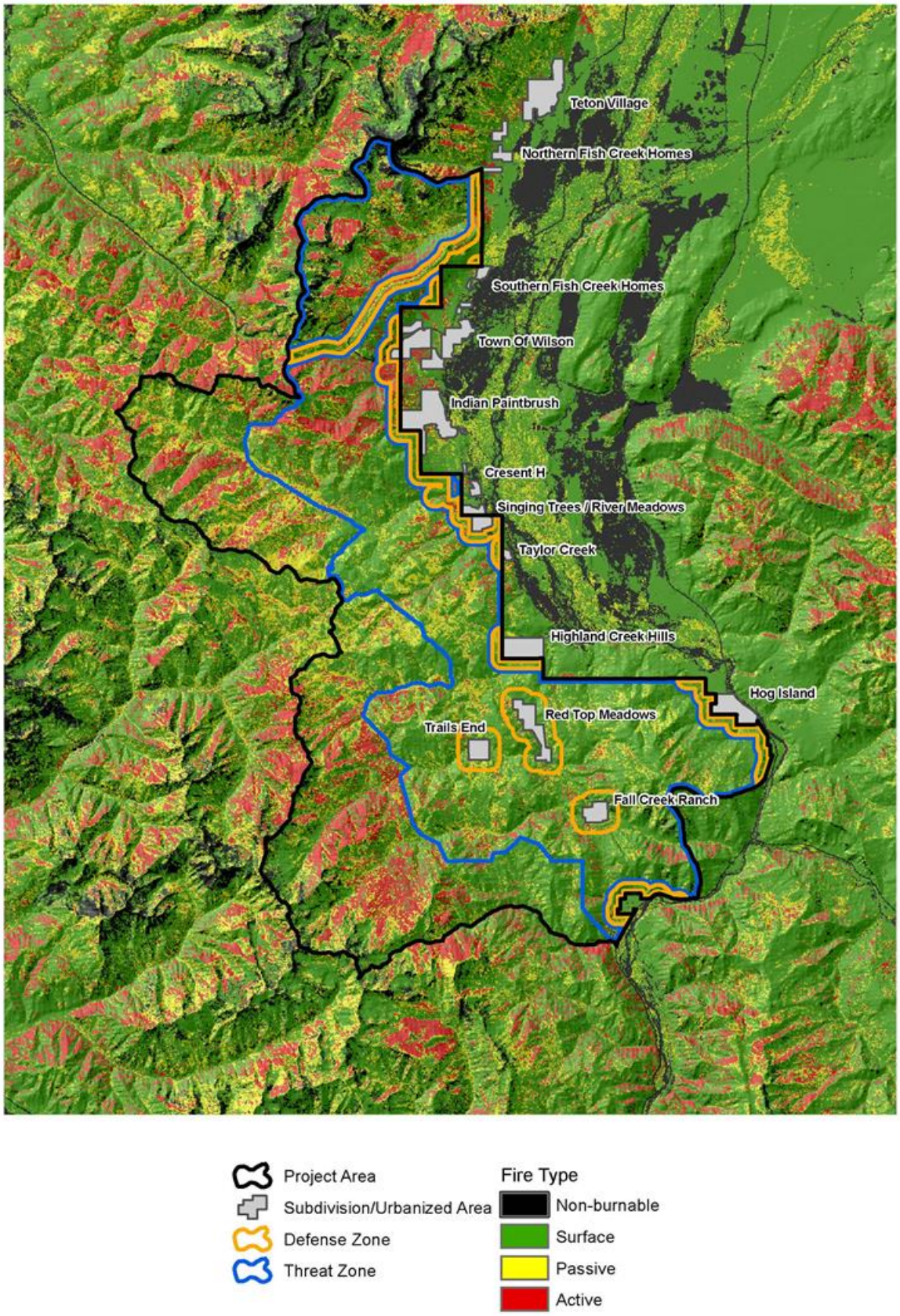


Figure 9. Existing condition for potential fire types in the project area

Table 28. Potential fire behavior characteristics modeled under a dry fuel moisture scenario with 25 mph upslope 20-foot winds

Potential Fire Behavior Characteristic		Defense Zone		Threat Zone	
		Acres	Percent[a]	Acres	Percent[1]
Flame Length	Less than 4 feet	3,519	58	23,951	56
	Greater than 4 feet	2,530	42	18,764	44
Fire Type	Surface	4,557	75	30,102	70
	Passive crown	820	14	7,670	18
	Active crown	671	11	4,943	12

a - Percent of burnable acres. Non-burnable acres are not shown in table.

As shown in table 28, modeling results show that 42 percent of the defense zone and 44 percent of the threat zone have potential fire behavior characteristics that make direct suppression strategies ineffective or unsafe for firefighters, making it necessary to utilize mechanized equipment, and possibly aircraft, for suppression activities. Although the total acreage of the project area exhibiting these conditions is relatively low, their proximity to homes and critical infrastructure is a concern. Conditions like these can lead to high acreage burned and significant adverse effects on resources.

Local fire managers state that fires generally spread due to spotting[4] and wind-driven crown fires. The Green Knoll Fire in 2001 was an example of this type of fire behavior. In 8 days the fire grew from 150 acres to over 4,470 acres with spotting observed beyond a one-quarter mile. Any areas expected to experience passive or active crown fire have the potential for spotting. Fires initiating within these areas may threaten private lands and residences within and adjacent to the project area.

Powerline

The Bonneville Power Administration powerline corridor that transects the project area is routinely cleared of vegetation by the power company to maintain access and reduce the risk of vegetation interfering with the lines. Reducing fuels adjacent to the powerline corridor is consistent with need for action described in chapter 1, and these areas are logical places in the overall landscape for fuel breaks to stop a fire from reaching private lands. Because fuels reduction adjacent to powerlines also fits the Bonneville Power Administration's purpose and need to maintain and protect powerline corridors, the Forest Service and Bonneville Power Administration are collaborating to share analysis, cost, and implementation responsibilities associated with this project.

Environmental Consequences

The following measures were used to assess the degree to which each alternative meets the purpose and need.

1. **Fireline Intensity expressed as flame length:** Change in potential flame length across the project area. Flame lengths generally less than 4 feet are desired, allowing for safe direct attack by hand

[4] "Spotting" is defined as behavior of a fire producing sparks or embers that are carried by the wind and which start new fires beyond the zone of direct ignition by the main fire.

crews. Flame lengths greater than 4 feet generally require equipment to be employed such as dozers and aircraft; beyond 8 feet torching, crowning and spotting can occur (Rothermel 1983).

2. **Fire type:** Change in the potential fire type across the project area, measured as acres of surface fire versus passive or active crown fire[5.] Surface fire is desired to allow for safer and more effective fire suppression action.
3. **Snag density levels**: Reduction in the number of standing dead trees (snags) per acre within 200 feet of homes. Reducing snag density levels would allow a better margin of safety for firefighting forces engaging in fire suppression actions.

Methodology and Scientific Accuracy

Fuels specialists made two field visits in 2009 and 2010 to observe fuel conditions in the project area and identify areas where treatment may be needed. Stand exam and fuels data collected from representative stands was processed through the Forest Vegetation Simulator (FVS) (Stage 2003) to simulate the effects of the proposed mechanical and prescribed burn treatments on forest canopy characteristics including canopy cover, canopy bulk density, canopy base height, and canopy height. These outputs were then applied to the Bridger-Teton National Forests calibrated Landfire Data[6] to build a post-treatment landscape file for use in the FlamMap fire behavior model (Finney 2006). The FlamMap model was then used to assess the distribution of potential wildland fire behavior characteristics under a set of fuel moisture and wind conditions as determined in the existing condition fire modeling report (Helmbrecht 2010). Post treatment modeling was conducted assuming all fuels treatments have been applied. Fire behavior fuel models used were derived from Scott and Burgan (2005) as a measure to display general changes in fuel profiles by vegetative cover type. Fuel models were adjusted over the project area to reflect the current and post treatment conditions. Interpretation, professional judgment, and local knowledge of fire behavior were used to evaluate the inputs and outputs of the models. Given the uncertainty of any modeling exercise, the results are best used to compare the relative effects of the alternatives, rather than as an indicator of absolute effects (Graham et al. 2004). For more information on modeling methodology and assumptions refer to the Fuels and Fire Behavior Report for this project (Helmbrecht 2011).

Information Sources

Information sources used for this analysis are listed below and represent some of the best available science that was available at the time of report completion.

- National Agricultural Imagery Program (USDA Farm Service Agency 2011) aerial photo digital imagery.
- Site visits during the summer of 2009 and 2010
- GIS spatial data acquired from the Bridger Teton National Forest and other sources where noted:

[5] "Surface fire" is a fire that burns loose debris on the surface, which include dead branches, leaves, and low vegetation. Surface fire burns only in the surface fuelbed. "Passive crown fire" is a fire consuming single or small groups of trees or shrubs. "Active crown fire" is a fire that ignites crowns and the fire spread is able to propagate through the tree canopy.

[6] LANDFIRE (www.landfire.gov) is a national vegetation and fuels mapping project that provides nationally consistent and seamless geospatial data products for use in wildland fire analysis and modeling. LANDFIRE National data on elevation, aspect, slope, fire behavior fuel model, canopy cover, canopy height, canopy base height, and canopy bulk density were used as the basis for geospatial wildland fire modeling. The LANDFIRE National data was refined in 2009 by the fire and fuels staff on the Bridger –Teton National Forest to better represent conditions at the local level.

- Landfire spatial data.
- Bridger Teton National Forest Plan management area boundaries
- Property ownership boundaries
- Project area boundary
- Historic wildfires
- Past management activities
- Wildland urban interface classification and boundaries
- Historic weather records
- Scientific literature
- Other unpublished documents

Incomplete and Unavailable Information

None known.

Spatial and Temporal Context for Effects Analysis

Spatial Bounds: The direct and indirect effects analysis focused primarily within the project area boundary. The cumulative effects area boundary extends approximately 1 mile beyond the perimeter of the project boundary. This is considered adequate in size from which treatments could influence fire behavior on a landscape level and to address wildland fire and proposed treatment effectiveness in reducing home losses within and adjacent to the project area.

Temporal Bounds: The time frame considered is approximately 10 years in the future at which time the proposed treatment activities would be completed. The need for future treatments to maintain effectiveness would be evaluated periodically by the Forest Service. Any future treatments would be subject to the required environmental analysis process before a decision is made. Future treatments may not be necessary if natural fires can be managed to maintain fuels at acceptable levels.

Cumulative Effects

Cumulative effects for the fire and fuels resource consider the impacts of the alternatives when combined with the following past, present, and foreseeable future actions and events: Fuel profile changes resulting from fires and fuels reduction activities. The actions contributing to cumulative effects were selected because they have caused or have the potential to cause changes in fire behavior. The spatial scale of the cumulative effects analysis was selected because impacts to fuels and fire behavior accumulate at a given location on the ground, irrespective of actions in surrounding areas. The temporal scope was selected because the impacts to fuels and fire behavior at a given location can accumulate over time from different activities or events.

Alternative 1 – No Action

Direct Effects

The no-action alternative would not meet the purpose and need of this project. It would not alter the fuel profile to reduce fire behavior and there would be no direct effect to forest fuels or potential fire behavior. Without modifying fuel loading and forest structure, fire behavior under summer conditions would persist as described under the existing condition. Potential fire behavior characteristics would be similar to those described under the existing condition and summarized in table 28.

In the absence of human-caused or natural disturbance, there would be an increased accumulation of fuels due to insect and disease activity; and the natural progression of forest growth may change.

Indirect Effects

The result would be increased surface, ladder, and crown fuels that affect flame length, contribute to the torching of trees, and make crown fire more likely (Peterson et al. 2005; Graham 2004). Wildfires that escape initial attack may impact adjacent private lands and other resource values (Helmbrecht and Scott 2011). Direct suppression tactics by firefighting forces would not be as effective as compared with the action alternatives. The no-action alternative would restrict options for using fire to achieve various land management objectives and would not reduce snag levels to provide a greater margin of safety for firefighters engaging in fire suppression activities. Fire suppression activities under most circumstances would continue in the project area without opportunities to allow natural fire ignitions to be managed in the Palisades wilderness study area. It is probable another large wildfire may threaten private lands adjacent to the project boundary just as the Green Knoll Fire did and consequently we could be forced to use heavier handed fire suppression tactics due to the amount of area within the defense zone exhibiting the potential for high fire behavior.

Cumulative Effects

Other known fuels reduction activities from the recent past, present, and the foreseeable future would complement other Forest Service, state, and private fuel reduction treatments that have occurred or are occurring in the area. These actions would collectively reduce fire behavior (flame length and crown fire potential) by removing surface, ladder and crown fuels.

Other present or reasonably foreseeable future fuels reduction and vegetation management projects in the area include the 5,304-acre Hoback Junction Project, of which 93 acres are mechanical treatment and the remaining acres are prescribed fire. The Snake River Canyon Wildlife project is located in the southern portion of the Teton to Snake Project Area and consists of approximately 12,000 acres of prescribed burning to improve wildlife habitat, of which approximately 2,300 acres are within the Teton to Snake Project Area. This project is planned to undergo a NEPA 18.1 review of the 1999 NEPA document. In 2004, the Bridger-Teton National Forest conducted several thinning and pile burning treatments at the eastern project boundary. These treatments overlap this project and occur in several of the units proposed for treatment including units in the Rec Trail, Red Top Meadows, Singing Trees, Highland Hills and Phillips Bench areas.

The Wyoming State Forestry Department also has several projects in the vicinity. They are planning the Indian Paintbrush project, which is a 160-acre fuels reduction project, and the 30-acre Butler Creek Fuels Reduction Project.

Known projects that are occurring or have been completed on private land include the Snake River Ranch project, which is 300 acres adjacent to the Teton to Snake Project Area; Crescent H Fuels; Cribiore Fuels; Kerr Fuels; Pine Glen South; and HSP Fuels. Adjacent landowners have also received Firewise information and an indeterminate amount of activities could be or have been planned and implemented on adjacent private lands in the future. The Bonneville Power Administration routinely clears the powerline right-of-way that runs through the project area and it is anticipated this activity would continue.

The Snake River Ranch Fuels Reduction project has also included reducing snags as an objective. Other projects discussed above did not specifically address snag reduction; however, it is general practice snags posing a hazard to operations would be felled and removed. It is probable these combined activities would result in a decrease in snags in treated areas subsequently increasing the margin of safety for firefighters outside of the project area.

As a result of the no-action alternative, certain areas would remain at risk for high-intensity wildfire and would be more vulnerable to stand-replacing wildfire under extreme conditions. In addition, the USDA Forest Service might be viewed as not meeting commitments it has made as a member of the community and the Teton Area Wildfire Protection Coalition (Coalition). The Coalition is an interagency working group developed to enhance a comprehensive, collaborative approach to community wildland fire protection (National Park Service 2011).The continual suppression of fires in the Palisades wilderness study area would result in increased fuel accumulation and changes to vegetation composition and structure. Continuing this course may lead to larger landscape fires burning in fewer, more unmanageable events, with more severe consequences (Reinhardt et al. 2008).

Alternative 2 – Proposed Action

Fire behavior was modeled based on surface fuels, stand composition and structure to evaluate potential fireline intensity (flame length) and crown fire potential for the project area. These results are summarized below and displayed in table 29, figure 10 and figure 11.

Alternative 2 would result in the following improvements in potential fire behavior characteristics:

- 35 percent decrease in areas with the potential for flame lengths greater than 4 feet in the defense zone
- 30 percent decrease in areas with the potential for flame lengths greater than 4 feet in the threat zone when compared to the existing condition

Similarly, results show a decrease in area with the potential for active crown fire:

- 65 percent decrease in the defense zone, and
- 25 percent decrease in the threat zone

The numbers above reflect the overall decrease for the total area within the defense and threat zones. Within the mechanical units we expect a substantial decrease in fire behavior potential under the fire types modeled.

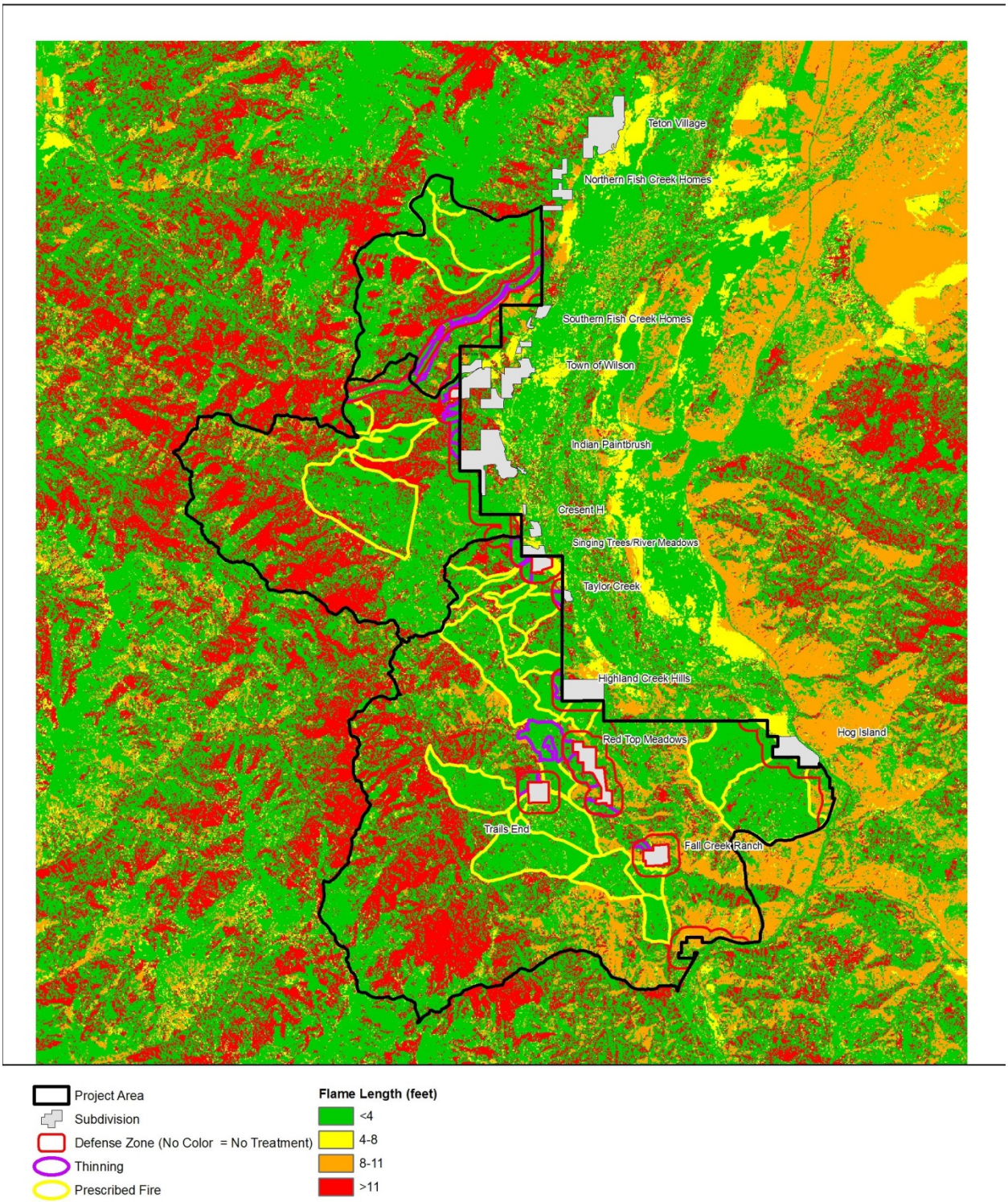


Figure 10. Potential flame lengths in the project area under alternative 2

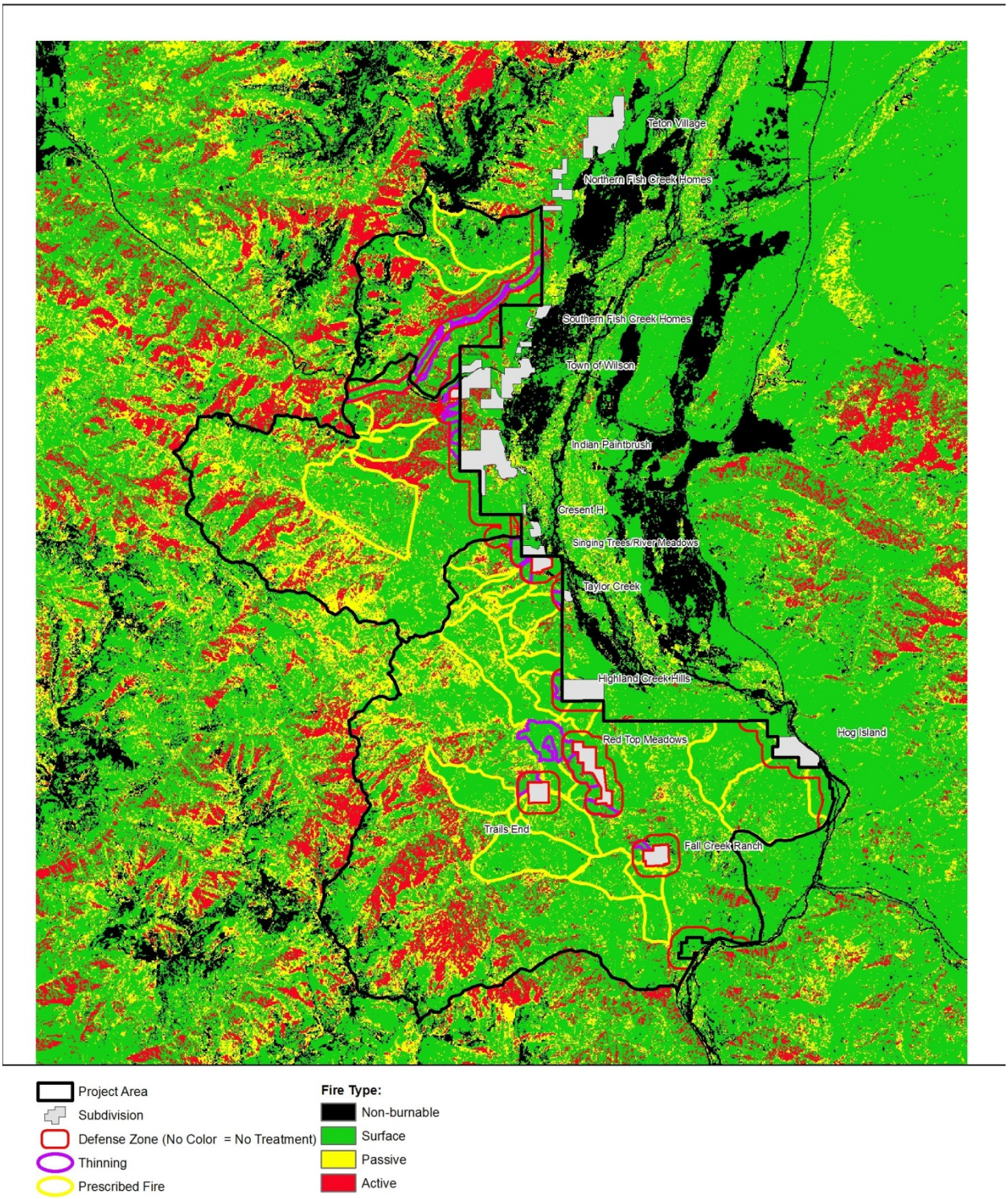


Figure 11. Potential fire types in the project area under alternative 2

Alternative 2 would include reducing snags in designated areas of 37 units being proposed for treatment.

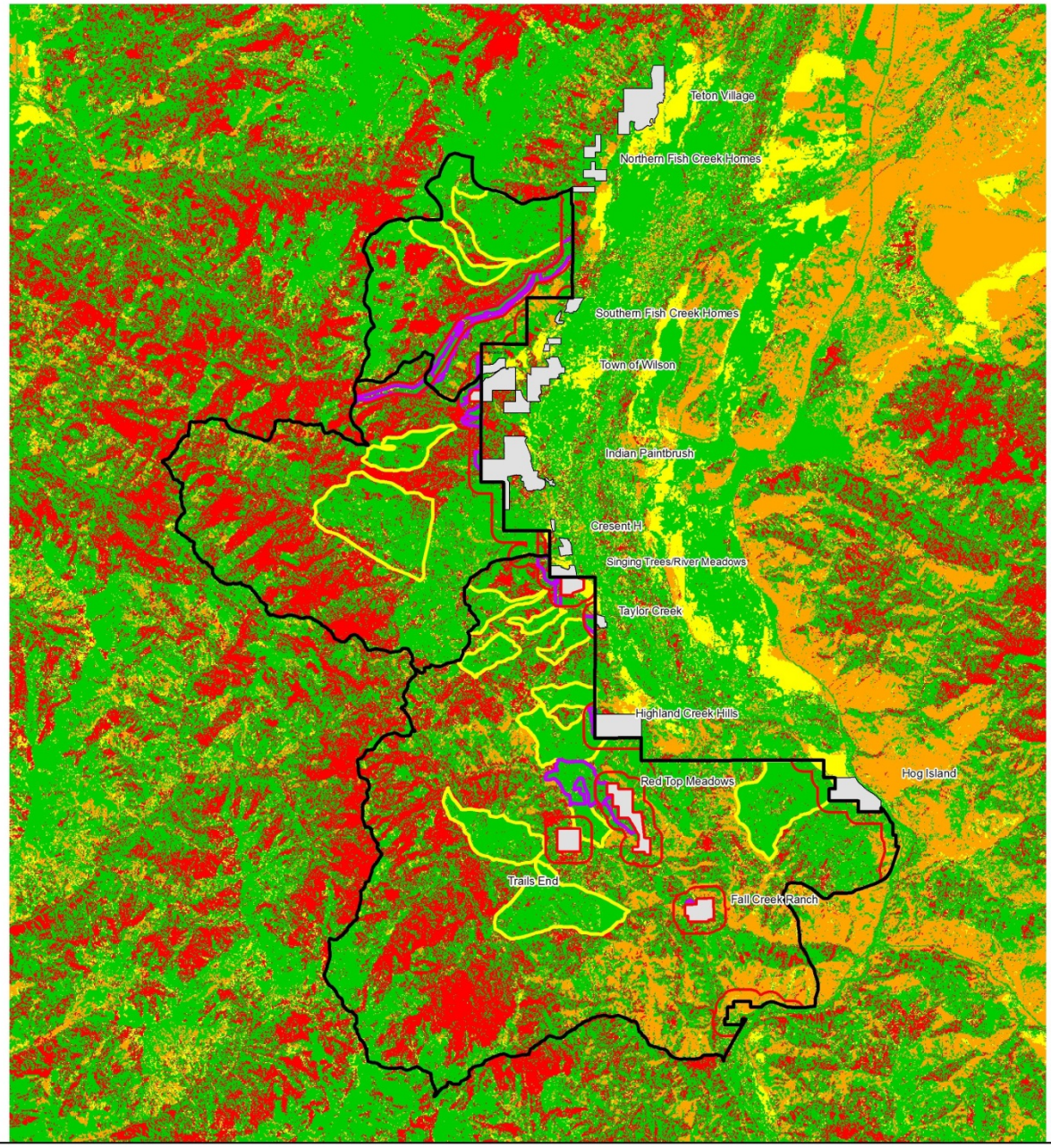
Alternative 3 – Reduce Potential Impacts to Special Areas and Wildlife Habitat

Alternative 3 has fewer treatment units, and some unit boundaries and treatment methods were modified to address the issues related to special areas and wildlife habitat. These changes result in less overall change in fire behavior (summarized below and displayed in table 29, figure 12 and figure 13). Alternative 3 would result in the following improvements in potential fire behavior characteristics:

- 20 percent decrease in area with the potential for flame lengths greater than 4 feet in the defense zone
- 22 percent decrease in the threat zone when compared to the existing condition

Similarly, results show a decrease in the area with the potential for active crown fire:

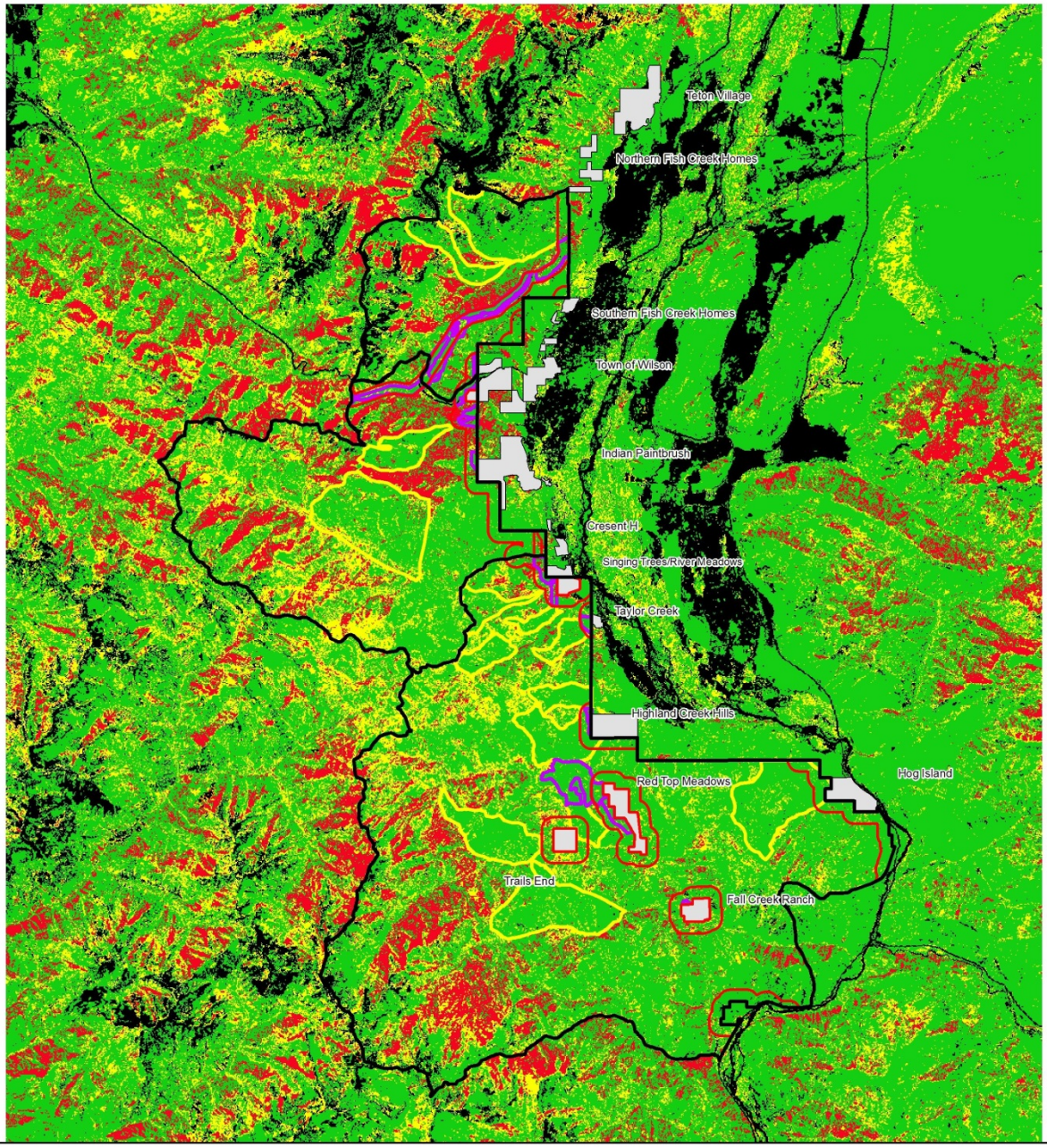
- 41 percent decrease in the defense zone
- 12 percent decrease in the threat zone



Project Area
Subdivision
Defense Zone (No Color = No Treatment)
Thinning
Prescribed Fire

Flame Length (feet)
<4
4-8
8-11
>11

Figure 12. Potential flame lengths in the project area under alternative 3



Project Area
Subdivision
Defense Zone (No Color = No Treatment)
Thinning
Prescribed Fire

Fire Type:
Non-burnable
Surface
Passive
Active

Figure 13. Potential fire types in the project area under alternative 3

Alternative 3 would include reducing snags in designated areas of 27 units being proposed for treatment.

Comparison of Alternatives 2 and 3

Table 29 shows the modeled comparison of fire behavior potential across the defense and threat zones under each alternative and the percent decrease in area with the potential for flame lengths greater than 4 feet and potential for active crown fire for both zones as compared to the existing condition.

Direct and Indirect Effects Common to Alternatives 2 and 3

Proposed treatments would result in a relatively small percentage of change in the total project area. Once completed, treatments would reduce surface, ladder, and crown fuels and therefore change the fuel model profile, reducing the areas with potential for flame lengths greater than 4 feet and reducing potential crown fire risk. Implementing either of these alternatives would reduce risks to firefighter safety by reducing snags in the defense zone and increase the success of firefighters engaging in fire suppression actions. In addition, alternative 2 or 3 would reduce the risk of wildfire impacts to adjacent private lands and other resource values. By treating these areas they become more resilient to stand-replacing wildfire and allow greater protection within the wildland-urban interface zone. Treatments would also help fire managers introduce more low-intensity prescribed fire in the future. National forest and adjacent private lands within this wildland-urban interface setting would be positively affected from the reduction of hazardous fuels and subsequent modification of potential fire behavior.

In addition to the direct effects on fire behavior potential, a supplemental analysis by Helmbrecht and Scott (2011) suggests that the treatments would also have an effect on burn probability and mean fireline intensity within the project defense zone. The analysis simulated 50,000 potential wildfire ignition and weather scenarios (i.e., fire seasons) based on the historic record. Results show a 14 percent reduction in mean annual burn probability within the defense zone from the existing condition for alternative 2 and a 7 percent reduction for alternative 3. Mean fireline intensity was reduced by 24 percent from the existing condition under alternative 2 and 11percent under alternative 3. These results are in line with the project objectives of reducing the threat to adjacent assets (i.e., residential structures) and firefighter and public safety.

Table 29. Comparison of fire behavior potential by zone and alternative

Zone	Alternative	Flame Length			Fire Type			
		Less than or equal to 4 feet	Greater than 4 feet	Percent Change[a]	Surface	Passive Crown	Active Crown	Percent Change[b]
Defense Zone	Existing Condition	3,519	2,530	0	4,557	820	671	0
	Alternative 2	4,393	1,655	35	5,303	514	232	65
	Alternative 3	4,024	2,024	20	4,995	659	394	41
Threat Zone	Existing Condition	23,951	18,764	0	30,102	7,670	4,943	0
	Alternative 2	29,596	13,119	30	33,074	5,910	3,731	25
	Alternative 3	28,004	14,711	22	32,104	6,286	4,325	12

a - Percent decrease in area of the zone with the potential for flame lengths greater than four feet compared to the existing condition.
b - Percent decrease in area of the zone with the potential for active crown fire compared to the existing condition.

Scientific findings indicates the most appropriate fuel treatment strategy is often thinning (removing ladder fuels and decreasing crown density) followed by prescribed fire, piling and burning fuels, and mechanical treatments. These treatments would provide maximum protection from severe fires in the

future (Peterson 2005). Other research shows that areas treated before a fire begins can decrease fire severity (Peterson et al. 2005; Omi and Martinson 2004; Agee and Skinner 2005; Graham et al 2004; Pollet and Omi 2002; Fule et al. 2001). However, in extreme weather conditions, such as drought and high winds, fuel treatments may have little effect on fire spread or severity (Pollet and Omi 2002).

It should be noted that treatments on national forest land would reduce fire intensity and crown fire potential, but may not directly protect all homes. Studies indicate that wildfire mitigation focused on structures (type of construction) and their immediate surroundings is the most effective way to reduce structure ignitions (Cohen 1999, 2000, 2003; Scott 2003). While individual home-by-home treatments can also help reduce the risk of loss of individual homes, relying solely on such treatments would forego strategic opportunities for controlling fires within this wildland-urban interface area. Although homes in the path of a wildfire are perhaps the most immediately recognized value at risk, research shows that treatments need to go beyond the home ignition zone for other resource values (Graham et al 2004).

A study conducted by Graham and others (2009) of wildfires during the summer of 2007 that burned over 500,000 acres within central Idaho found that the limited loss of structures and resource damage was largely due to the existence of the fuel treatments and how they affected suppression activities. In addition to modifying wildfire intensity[7], the burn severity[8] to vegetation and soils within the areas where the fuels were treated was generally less compared to neighboring areas where the fuels were not treated. They noted that by modifying the fire behavior, the fuel treatments presented suppression opportunities that otherwise may not have been available. These opportunities ranged from providing locals to conduct burnouts[9] to the location of both hand and machine constructed firelines. In particular, the mechanical fuel treatments were very effective in creating conditions where surface fires dominated. Because of the lower-intensity surface fire in these areas, there were safe zones for firefighters and crews who could then readily suppress the numerous spot fires that often occurred. Their observations suggest fuel treatments that create irregular forest structures and compositions, both within and among stands, tend to produce wildfire resilient forests.

Fire modeling for the Teton to Snake Project suggests the proposed treatments would effectively reduce fire behavior. Following implementation of a chosen alternative, the treated areas should exhibit surface fire under the modeled conditions, making fire suppression efforts safer and more effective.

With these alternatives desired fuel loadings and fire behavior characteristics would be achieved for the defense and threat zones. Natural or prescribed fire could occur with less risk. By reducing the snags and treating fuels the risks to firefighters should be lower.

Cumulative Effects Common to Alternatives 2 and 3

Past wildfire events have had an effect on the landscape and would continue in the future. Decades of fire suppression in many western forests have resulted in high tree densities from infilling with shade-tolerant, fire-sensitive regeneration. Cumulative effects from wildfires and past management activities are discussed in the existing condition section. The existing condition has been influenced by fire exclusion and large fires, as well as natural and artificial activities including insects and disease and past timber harvest. It is impossible to predict when a wildfire may occur in the future and the subsequent effects of that fire.

[7] “Fire intensity” is defined as the amount of energy of heat release per unit time.
[8] “Fire severity” is defined as the effect of a fire on ecosystem properties, usually defined by the degree of soil heating or mortality of vegetation.
[9] “Burnout” is defined as the act of setting fire inside a control line to consume fuel between the edge of the fire and the control line.

alternative 2 or 3 combined with other fuels reduction activities previously discussed under the no-action alternative would modify fire behavior by contributing to the overall reduction of surface, ladder, and crown fuels, therefore reducing fire intensity and crown fire potential within and adjacent to the project area. These combined treatments would complement the purpose and need goals for fire and fuels management by reducing the wildland fire threat. In addition, public and firefighter safety would be improved due to reducing snag density levels within the defense zone and from other project activities in the adjacent area.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternatives 2 and 3 comply with Bridger Teton Forest Land Management Plan goals, standards, and guides and National Fire Plan goals. The alternatives are consistent with the Bridger-Teton National Forest Fire Management Plan and responsive to the Teton County Community Wildfire Protection Plan.

Summary

Table 29 displays the quantitative comparison among the alternatives. The mechanical treatments being proposed would reduce surface fuels, raise canopy base heights by reducing ladder fuels, and reduce stand density resulting in reduced fire behavior potential in the wildland-urban interface defense zone. The primary objective in these units is to modify the fuel profile creating conditions where flame lengths are reduced to less than 4 feet in height and crown fire initiation is unlikely. The result would be safer, more efficient and direct initial attack of unwanted fires by fire suppression forces. Reducing snag density levels in strategic areas of the defense zone would also allow a better margin of safety for firefighting forces engaging in fire suppression actions.

The prescribed burn treatments would reduce fuels and break up contiguous vegetation resulting in areas with a heterogeneous fuel profile rather than a homogeneous fuel profile. Fire management has evolved over time and fire managers look for opportunities to manage fire for resource benefits .Allowing fire ignitions to play a natural role in the wilderness study area is desired in order to move the landscape toward the desired condition as outlined in the Forest Plan.

The Teton to Snake Project would be important to the success of future fire management efforts and complements past treatments and those currently occurring or being proposed on adjacent Federal, state, and private lands.

Air Quality

The following resource information and analysis summarizes the Air Quality Report (Buhl 2011), available on the Bridger-Teton National Forest website and in the project record.

The smoke from combustion contains a number of pollutants, including microscopic particles called “particulate matter” (PM). Exposure to PM can cause significant health problems, especially for people suffering from respiratory illnesses. Smoke also adversely affects the clarity of the air, or visibility. The Environmental Protection Agency has revised the air quality standards to provide improved health and visibility protection. With these standards in place land managers must consider using techniques that minimize prescribed fire emissions and the adverse impacts of smoke on public health and the environment. Careful planning and cooperation among land managers, air quality regulators, and local communities ensures that prescribed fire, clean air, and public health goals can be met.

Existing Condition

The majority of the project area lies within Teton County, with a small portion of the project in Lincoln County, Wyoming. The Wyoming Department of Environmental Quality-Air Quality Division (Air

Quality Division) regulates and implements the smoke management program in Wyoming. The Teton to Snake Project lies within the Snake Headwaters Airshed.

Air Quality within the project area is generally good with limited local emission sources and consistent wind dispersion during much of the year. Emissions are limited much of the year with winter being the period with the greatest emission production due to residential wood burning for heat. Wildland fires can produce substantial emissions in the summer and fall for short to moderate durations. Occasional inversions develop in the winter during winter burning periods with stable atmospheres. Dispersion of emissions within the project area is good due to the mountainous terrain and wind activity. Up valley winds during the day and down valley wind at night can dominate winds more than overall prevailing wind direction on ridge tops.

The Environmental Protection Agency air quality index rates air quality in the vicinity of the project area as "good" the majority of the time for the two counties. The air quality index is a system for measuring and rating pollution levels for five of the six "criteria" pollutants regulated under the Clean Air Act (see pollutants section for discussion of the criteria pollutants). The air quality index monitoring results for Teton and Lincoln counties for the period 1998 to 2008 show only 6 days where air quality was unhealthy for sensitive groups, and 1 day where air quality was unhealthy for the general population (table 30).

Table 30. Air quality index summary for Teton and Lincoln counties

Year	Unhealthy Days for Sensitive Groups	Unhealthy Days
1998	0	0
1999	3	0
2000	1	0
2001	0	0
2002	0	0
2003	1	0
2004	0	0
2005	0	0
2006	1	1
2007	0	0
2008	0	0

Non-attainment Areas

If a community does not “attain” the national air quality standard for one or more pollutants, the Environmental Protection Agency would designate it a “non-attainment area.” Teton and Lincoln counties are considered in attainment for the criteria pollutants by the US Environmental Protection Agency: Criteria Pollutant Area Summary Report (Green Book) (Environmental Protection Agency 2011b)

Smoke-sensitive Areas

Smoke sensitive areas are defined as:

> Populated areas and other areas where an air district determines that smoke and air pollutants can adversely affect public health or welfare. Such areas can include, but are

not limited to, towns and villages, campgrounds, trails, populated recreational areas, hospitals, nursing homes, schools, roads, airports, public events, shopping centers, and class I Areas (areas that are mandatory visibility protection areas designated pursuant to section 169A of the Federal Clean Air Act).

This analysis covers sensitive receptors within 30 miles of the project area. A complete listing of those receptors can be found in the air quality report located in the project record.

Pollutants

Six common pollutants known as “criteria pollutants” are used to measure air quality. The pollutants are: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), sulfur dioxide (SO_2) and particulate matter (PM). The main pollutant monitored for prescribed fire emissions is particulate matter. PM is fine material, of any substance, in sizes small enough to remain suspended in air for long periods. Particles with diameters between 2.5 and 10 micrometers are referred to as "coarse." These particles can be harmful to human health because their small size allows them to bypass the filtration of the upper respiratory system and become lodged deep within the lungs. While PM-10 has been the historic standard against which the Environmental Protection Agency has been measuring Clean Air Act compliance; more recent findings, the Environmental Protection Agency is moving toward regulations that would make the smaller PM-2.5 the new standard (Environmental Protection Agency 2011c).

PM-2.5 describes particles even smaller in size that are no larger than 2.5 microns (approximately one-thirtieth the average width of a human hair). These are harmful similar to larger PM-10 particles, but can become lodged even deeper in the lungs due to their smaller size and have been associated with premature mortality and other serious health effects. Particulate material also has adverse effect on maximum sight distance and scenic visibility. Sources of fine particles include all types of combustion activities (motor vehicles, power plants, wood burning) and certain industrial processes. PM-2.5 is the particulate level that would have the greatest impact on the area and people surrounding the project area and is the focus of the assessment.

Visibility at Class I Areas

The Clean Air Act establishes as a national goal “the prevention of any future, and the remedying of any existing impairment of visibility in mandatory class 1 Federal areas which impairment results from manmade air pollution” (42 U.S.C. §7491 et seq.).

Impaired visibility is a basic indicator of air pollution. The Environmental Protection Agency has determined that regional variation in visibility needs to be addressed. The “Regional Haze Regulations for Protection of Visibility in National Parks and Wilderness Areas” are intended to improve visibility or visual air quality in 156 national parks and wildernesses across the country. The regional haze regulations apply to all states, including those that do not have any class 1 areas. Pollution that occurs in those states may or may not contribute to impairment in other states or class 1 areas, but must be accounted for. To address regional haze concerns the Wyoming Smoke Management Program proposes coordination between the State of Wyoming and the adjacent states of Colorado, Idaho, Montana, Nebraska, South Dakota, and Utah, as well as the adjacent Shoshone and Arapaho tribes and the Crow Tribe.

On July 7, 1977, the Teton and Bridger Wildernesses of the Bridger-Teton National Forest were designated as class 1 areas as part of an amendment to the Clean Air Act of 1977.

The Teton to Snake Project is adjacent to Grand Teton National Park, a class 1 Federal area managed by the National Park Service and within 30 miles of the Teton Wilderness. These class 1 areas could be affected by the proposed project during periods of atmospheric stability.

Fugitive Dust from Vehicle Traffic on Unpaved Roads

Fugitive road dust is a result of motorized vehicle use on dry unpaved roads and is caused by the force of the wheels moving across the road surface causing pulverization of surface material. Because of the transitory nature of fugitive dust, it was not modeled for this analysis.

Environmental Consequences

Effects to air quality are measured by the predicted smoke emissions (PM-2.5) on sensitive receptors up to 30 miles downwind of the project area and how that compares with appropriate Federal and state regulatory standards and requirements. A distance of 30 miles is required by the State of Wyoming under their smoke management program for projects with a higher predicted level of smoke (SMP-II level) (Wyoming Smoke Management Guidance Document 2004). The Teton to Snake Project would be considered an SMP-II level project.

A maximum perimeter distance of 30 miles allows for consideration of the effects to class I areas as required in the Wyoming Smoke Management Guidance Document. The effects time span of 1 to 5 days is used because smoke from prescribed burning is transitory in nature and impacts to air quality are expected to be relatively short lived, lasting 1 to 5 days after ignition.

Alternative 1 – No Action

Direct and Indirect Effects

Under this alternative, no treatments would occur and there would be no activities degrading air quality. This alternative is not expected to have any direct effects on air quality. However, a future wildfire burning through the projects area could lead to higher potential for air quality degradation. Air quality can be degraded by smoke from wildfires to the point of illness. Smoke from wildfire could also cause visual impacts to the surrounding areas; create hazardous driving conditions on adjacent state, county, and National Forest System roads for extended periods of time; and shut down the Bonneville powerline. Heavy smoke, flames, and heat from wildfires can create an electrical path between an energized wire and ground causing electric transmission lines to short circuit (Weigand 2005). In the short term, air quality impacts from alternative 1 would be less because prescribed burning and pile burning would not occur. In the long term, wildfire has the potential to result in extensive smoke and air quality impacts from PM-2.5, PM-10, and other pollutant emissions. In fact, emissions from wildfire are typically twice those of a prescribed fire on the same acreage due to greater emission factor (Ottmar 2001), fuel consumption, and fire intensity.

Cumulative Effects

The no-action alternative has no direct effect on air quality. This alternative does have the potential for a significant indirect effect if an unwanted wildfire were to occur in the project area. Previous wildfire activity and increasing conifer mortality due to insect and disease can influence the amount of material which would be available for consumption in the event of a future wildfire.

Emissions sources contributing to particulate matter and other pollutants would continue to be present. These sources include wood burning stoves, vehicle exhaust, emissions from recreational campfires, emission associated with prescribed fire, fugitive dust, and wildfires within or near the project area. Wildfire frequency is expected to continue as in the past. An unwanted wildfire could lead to negative cumulative effects and would be dependent upon the size and intensity of the wildfire. Visibility impairment and human health impacts due to sudden and dramatic pollutant release are likely with a large wildfire event. Cumulative effects of smoke are unknown because the intensity and size of a wildfire is

unknown. Although research has indicated that wildfires can produce nearly twice the amount of smoke as prescribed fire (Huff et al. 1995).

Alternative 2 – Proposed Action

Table 31 displays the extent of proposed burning under alternatives 2 and 3.

Table 31. Acreage comparison by alternative

Treatment	Alternative 2	Alternative 3
Landing pile burning	32 piles	27 piles
Underburning after mechanical treatment	252 acres	0 acres
Prescribed fire	19,991 acres	12,524 acres

Direct and Indirect Effects

Prescribed fire, underburning of existing and activity-generated material, and burning of landing and hand piles would have direct, short-term impacts on air quality in the project area, and possible short-term impacts to regional air quality. Prescribed fire and underburning would occur when conditions are favorable, generally during the spring or fall. Burning of landing and hand piles generally occurs during late fall, early winter, or spring and typically occurs after an area has received significant rain or snow to prevent the pile from spreading and reduce the risk of escape. All burning operations are conducted under the guidelines set forth in a prescribed fire burn plan developed by fire managers specifically for the project area. Prescribed burn plans address parameters for weather, air quality, and contingency resources and address notification and coordination with Wyoming DEQ. All burning would occur over the life cycle of the project estimated at 5 to 10 years.

Table 32 lists modeled PM-2.5 emissions from prescribed burning and pile burning in the project area. The modeling shows the 24-hour maximum PM-2.5 value would be below the Federal 35 $\mu g/m^3$ threshold within 0.5 mile downwind of the project area.

Table 32. PM-2.5 estimated concentration by treatments

Treatment Type	Acres	0.5 Mile	1 Mile	5 Miles	10 Miles	20 Miles	30 Miles
Underburning after mechanical treatment	113	12.48	5.52	2.05	0.88	0.420	0.270
Prescribed fire	1,875	2.44	0.86	0.34	0.16	0.076	0.052
Landing pile burning	N/A	28.86	7.36	0.85	0.38	0.190	0.130

The units modeled represent a “worst case” scenario for the amount of emissions that could be produced from burning. They were selected because of the large unit size, vegetation cover type to be burned and/or the unit’s proximity to homes, communities or other smoke sensitive receptors. Modeling results show there would be no significant impacts to any class 1 area resulting from this project. Modeling further shows the impacts to populations 10 miles downwind from the project areas would be estimated at a 0.88 $\mu g/m^3$ of PM-2.5, well below the Federal PM-2.5 standard of 35 $\mu g/m^3$.

Transitory smoke as a result of implementation of alternative 2 could produce some smoky days in the local area and may also result in the form of nuisance smoke, smell, or haze under the worst-case

scenario. Smoke would also be expected to settle into the lower draws and drainages during the evening hours following ignition.

Wildfires produce high levels of emissions including greenhouse gases that violate National Ambient Air Quality Standards and cause poor visibility. Decades of fire suppression in many western forests in the United States resulted in high stem densities from infilling with shade-tolerant, fire-sensitive regeneration. This putative carbon increase poses a problem for land managers because fuel-loaded forests are susceptible to large, unpredictable, carbon emissions if they burn in a wildfire. Although both treatments have direct carbon emissions associated with implementation, vegetation management treatments provide the opportunity on a long-term basis to mitigate air quality problems by coordinating prescribed fire operations with air quality experts, local communities, and other sensitive receptors. Wiedinmyer and Hurteau (2010) indicate that prescribed burning emissions on a per-fire basis are considerably lower than emissions from wildfire. In general, mechanical thinning, prescribed fire, or both, are often used to reduce fuels, producing an immediate carbon release in an effort to reduce potential future wildfire emissions (Hurteau and North 2009). Because the total amount of pollutants released by prescribed burning under alternative 2 would be spread out over several years, and with mitigation measures in place to reduce impacts to sensitive receptors, emissions would unlikely have significant adverse effects.

Cumulative Effects

Cumulative effects on air quality as a result of the implementation of alternative 2 would result in an incremental decrease in air quality as pollutants from this source combine with other particles produced by the implementation of other aspects of this project, specifically fugitive road dust, as well as other local and regional sources. Because of the widespread and short-lived impacts of emissions from fire, no other projects were explicitly considered for cumulative impact analysis. Emitted pollutants from fire do have an effect on an area, which depends on atmospheric conditions at the time of the fire. Within this area, pollutants from fires can be cumulative with emissions from many sources, including other fires, vehicles, industrial sources, buildings and agriculture. It is impossible to predict what pollution sources may be present at the time of a fire occurring at an unspecified date in the future.

Alternative 3 – Reduce Potential Impacts to Special Areas and Wildlife Habitat

Alternative 3 was not analyzed in detail because the effects to air quality would be less than the effects predicted for alternative 2 due to fewer prescribed fire activities proposed.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

All prescribed burning would be implemented in full compliance with the Wyoming Department of Environmental Quality air program with coordination through the Smoke Management Program. All action alternatives would meet Forest Plan standards for air quality by following coordination requirements with the Wyoming Air Quality Division. The project complies with the Federal Clean Air Act.

Fire Regimes and Ecosystem Processes

The following resource information and analysis summarizes the Fire Regimes and Ecosystem Processes Report (Abendroth 2011), available on the Bridger-Teton National Forest website and in the project record.

This analysis describes the fire regimes in the project area and uses literature review and geospatial analysis to compare the current distribution of vegetation successional classes to what are believed to be the historic proportions. The same comparisons are made for future scenarios under alternatives 2 and 3.

Because scale strongly influences geospatial analysis, these comparisons were made for 6th-order hydrologic units within the proposal area as well as the entire unit.

A fire regime is a set of characteristics that describe the frequency, severity, seasonality, spatial pattern, and effects of fire on a particular environment (Agee 1993; Brown and Kapler-Smith 2000; Baker 2009). Often these characteristics are associated with plant community types and geographic regions. They are also assumed to represent the historic or pre-settlement environment. When a fire regime is described as "natural," it also refers to a pre-European settlement era. Indigenous human-caused fires are usually incorporated as a part of these fire regimes, although there is limited information on the role of such fires for the Greater Yellowstone mountain areas.

Mixed-severity Fires

Douglas-fir, aspen, and sagebrush communities are characterized as having a "mixed severity" fire regime (Schmidt et al. 2002), which refers to areas where fire burns with inconsistent severity, high spatial heterogeneity, and irregular frequency. Fire return intervals in mixed-severity regimes range from just a few years, to over a century (Arno 2000). Douglas-fir, for example, is known to have creeping understory fires every 25 to 100 years. Some of these fires creep through the understory, killing small conifers while only scorching the bases of bigger trees. It is also normal for Douglas-fir forests to experience occasional crown fires under more severe burning conditions that kill most of the trees (Arno 2000).

While many of the Northern Rockies forest types have been characterized as "stand replacing" (Arno 2000; Schmidt et al. 2002), there is, in actuality, more variability in how fire burns within them than that label implies. Even large fires occurring during drought and high winds in lodgepole pine, Douglas-fir, aspen, sagebrush, riparian, and mixed conifer communities are characterized by patchy distributions of burn severity within the burn perimeter (Arno 2000). During wet or average summers, fires often show especially discontinuous, patchy burn patterns with low- and moderate-severity effects (if they are not immediately suppressed). It is therefore possible to argue that even spruce-fir forests fall into the "mixed-severity fire regime" category.

The ecological effects of mixed severity fires are less well understood than the scenario of primary succession following a crown fire. In these forests, fire suppression over the recent decades has disrupted a moderately frequent pattern of fire. While the effects of this change may be subtle from our perspective, the Teton to Snake landscape—including the Palisades Wilderness Study Area—is not experiencing the ecological processes that it once did historically. Small and patchy fires that occurred during average or moist summers may have provided important opportunities for fire adapted plants and animals to remain in local areas until a larger disturbance occurred, which supported a more widespread and dominant response.

Arno documented how fire suppression in Glacier National Park and the Bob Marshall Wilderness of Montana has led to denser growth with heavier fuel loading. They noted that these forests are moving toward conditions that are more likely to experience crown fire. Keane et al. (2002) suggested that due to successful suppression of easily extinguished starts, recent large fires (since 1900) have been less frequent and more severe.

Given the above, it is clear that the fire disturbance processes that have shaped the Teton to Snake ecosystem were complicated, and they have changed since fire suppression took hold. Future fires are expected to continue to exhibit a variety of effects, spatial patterns, and challenges to control.

Existing Condition

The fire regimes in the project area correspond to six main vegetation types, or biophysical units. These include aspen, Douglas-fir mix, lodgepole pine mix, spruce-subalpine fir mix, sagebrush, and mountain shrubland (figure 14). Each of these historically interacted with fire's disturbance to create successional stages that historically were distributed on the landscape in certain proportions. Since European settlement, there have been various impacts on these fire regimes, including direct suppression and indirect alteration of fuels. In order to better understand how fire functioned in the past, the National LANDFIRE program, together with NatureServe, have researched and described the proportions that successional stages that vegetation communities used to occupy on the landscape using vegetation dynamics modeling, literature review, and local expert opinion (Schmidt et al. 2002).

It is difficult to give precise information about the impacts to fire regimes when the regimes themselves are only partly understood. Most of the state of knowledge about fire-return intervals, for example, is determined from sampling fire-scarred trees, which are difficult to extrapolate from, and not always present. Fire-return intervals are an important factor because they dictate what the appropriate distribution of successional stages should be across the landscape. The analysis conducted for this report must be interpreted with the understanding that models are imperfect, and map data includes errors and generalizations. However, it gives a picture of the current distribution of successional stages and an indication of how prescribed fire and mechanical thinning would affect the disturbance regimes of the ecosystem.

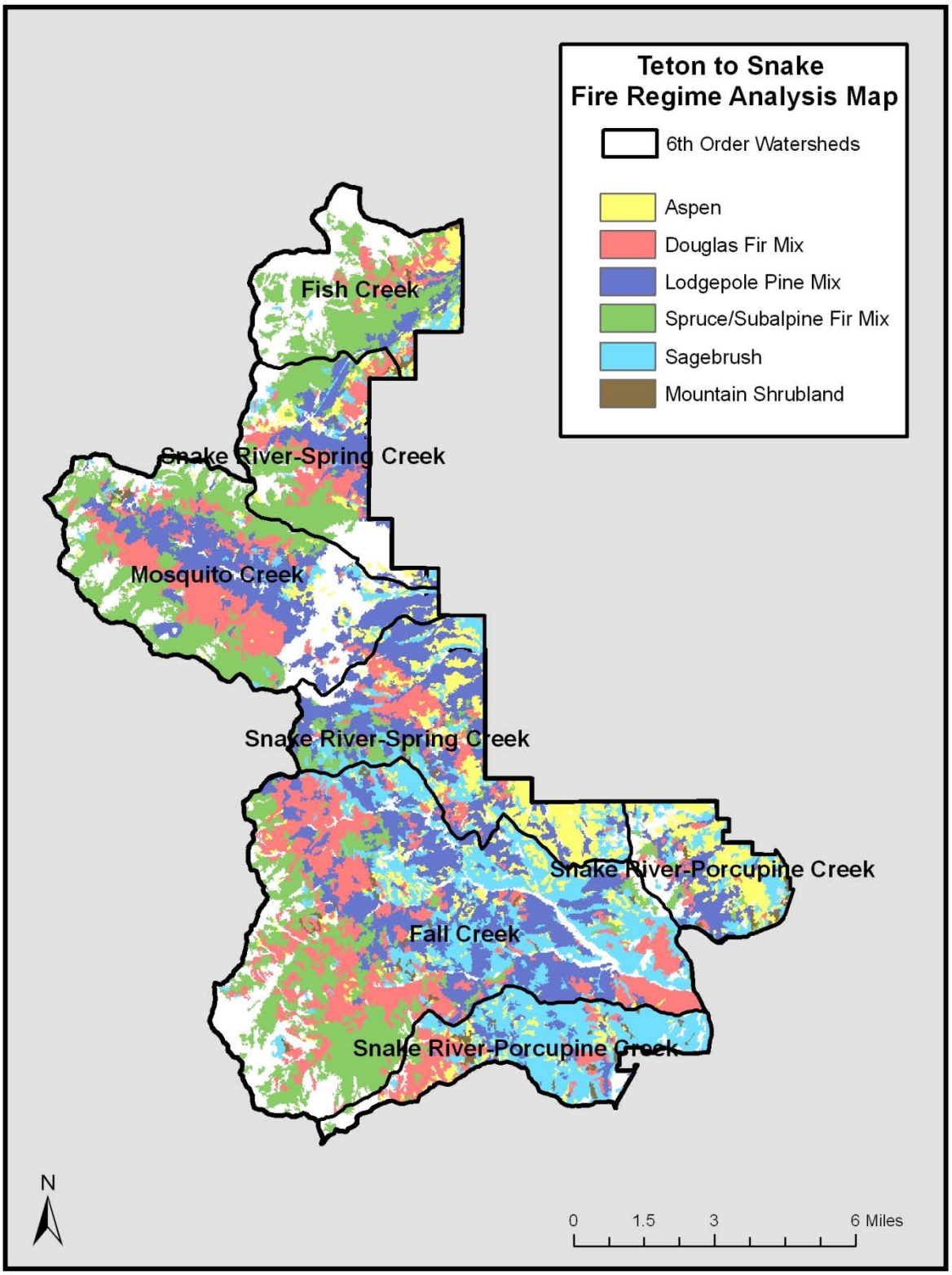


Figure 14. Current fire regimes in the project area by 6th-order watershed

Tables displaying the historic and current succession classes for 6th-order watersheds and the overall project area for each vegetation type are in the Fire Regimes and Ecosystem Processes Report (Abendroth 2011); summaries follow.

Aspen

The current distribution of aspen successional stages favors mid-seral conditions, although late-seral aspen-conifer mix is likely under-represented in the Bridger-Teton National Forest vegetation map (which was used in this analysis). There is an overall lack of early-seral aspen except within the 2001 Green Knoll Fire. Aspen is well adapted to disturbance, due to its ability to send up a profusion of root sprouts after the overstory is killed. Aspen is a particularly competitive colonizer of burned areas. Even where it was barely detectable as part of the pre-burn forest, it often quickly dominates the site after a fire.

Douglas-Fir

Douglas-fir forests presently follow historic distribution patterns, except for a deficit in the mature open-understory stand type, which is thought to be maintained by surface fire.

Lodgepole Pine Mix

According to recent Bridger-Teton National Forest vegetation map data, the lodgepole pine mix forest type is almost entirely comprised of mid-seral stands, except within the 2001 Green Knoll Fire. Even plantations and areas burned in the 1930s fires fall into this category, which may reflect some errors in tree size in the map. With mechanical thinning and surface fire treatments, it is unlikely that the current seral stage categories would be changed. Lodgepole pine forests in the project area would benefit from stand-replacing fire events, which would create additional early-seral stands.

Spruce-subalpine Fir

Spruce-subalpine fir forest is the least likely fire regime to be affected by fire suppression over the past century, due to the long, historic stand-replacement interval and typical small size of lower-severity fires. The current distribution of seral stages shows a bias toward dense, young stands; however, this may be due to (1) high-elevation krumholz trees being grouped into the analysis; and (2) effects of 1930s wildfires that would have regenerated conifers currently in this category.

Sagebrush and Mountain Shrubland

Sagebrush and mountain shrubland communities in the proposed Teton to Snake Project Area both lack an early-seral component. Prescribed fire under alternatives 2 and 3 would create an abundance of these categories, which would persist for approximately 10 years. After that time, additional fire would be needed to continue restoring the desired/historic balance.

Environmental Effects

Effects to fire regimes are measured by changes to the successional class compositions predicted to occur as a result of the proposed treatments.

Alternative 1 – No Action

Direct and Indirect Effects

The effects on fire regimes of taking no action and continuing the current practice of suppressing most fires in the project area are based on the effects of fire suppression—the effects of reducing fire frequency.

Fire suppression activities affect the fire regime directly by creating firebreaks, removing trees, and transporting exotic species into burned areas on equipment and personnel. These impacts are quite minor on small fires, but may be considerable on large fires. They may affect the function of fire regimes by influencing how future fire spreads.

The effects of reducing fire frequency are difficult to quantify because there are areas that would have burned one to several times over the past 100 years had fires not been suppressed. The effects of this disruption of fire frequency are estimated by comparing the current distribution of successional stages with what are thought to be appropriate for the major biophysical units (see Fire Regimes and Ecosystem Processes Report in the project file).

Imbalances between current and historic proportions, which show an overall lack of early-seral would continue or worsen under this alternative. The exception to this would be possible disturbances resulting from fires that escape suppression under extreme conditions. In this case, fire effects would tend to be biased toward severe and stand replacing characteristics, rather than moderate or mixed ones.

Cumulative Effects

The effects of taking no action combined with past, present, and reasonably future projects in the analysis area would both exacerbate departures from historic fire regimes and mitigate them by introducing early-seral successional stages to the greater landscape. Trail and road development may increase conflicts with allowing naturally ignited fires to burn, thus continuing current successional trajectories. Prescribed fire treatments on adjacent forest lands (roughly 4,960 acres completed and 19,060 acres that are under consideration for fuels treatments on the Caribou-Targhee National Forest) would help to balance fire regimes at a larger landscape scale.

Mechanical fuels treatments in forested areas near the wildland-urban interface often function to convert late-successional communities to mid-successional conditions. Within the Teton to Snake Project Area, 344 acres of this type of effect has been accomplished in recent years. This represents less than 1 percent of the coniferous forest vegetation in the unit. An additional 563 acres of thinning is under consideration on the Caribou-Targhee National Forest for the next few years.

Alternative 2 – Proposed Action

Direct Effects

Prescribed Fire

Fuels reduction goals for prescribed burns include reduction of surface and ladder fuels (and enhancement of aspen in certain units). In order to accomplish this treatment, surface fire with occasional tree torching is the desired fire behavior. This equates to low to moderate burn severity. In shrub communities, a stand replacing fire is to be expected. Table 33 describes the likely effects of this type of fire on succession class composition for the target vegetation.

Table 33. Succession class conversion in the project area from proposed prescribed fire treatments

Biophysical Unit/ Vegetation Type	Pre Burn	Post Burn
Aspen	A: Early development aspen suckers under 2 m tall	A: Early development aspen suckers under 2 meters tall
	B: Mid development aspen 2–10 meters tall, dense sapling stand	A: Early development aspen suckers under 2 meters tall
	C: Late development closed, mostly pure aspen over 10 meters tall	A: Early development aspen suckers under 2 meters tall
	D: Late development open, widely spaced aspen with overstory mortality, over 100 years old	A: Early development aspen suckers under 2 meters tall
	E: Late development closed, becoming conifer-dominated	A: Early development aspen suckers under 2 meters tall
Douglas-fir Mix	A: Early development dominated by grasses and seedling trees less than 40 years post fire	A: Early development dominated by grasses and seedling trees less than 40 years post fire
	B: Mid development closed, dense pole stand 40–80 years post fire	C: Late development open pole stand
	C: Late development open pole stand	C: Late development open pole stand
	D: Late development open, medium to large trees	D: Late development open, medium to large trees
	E: Late development closed, multi-storied	D: Late development open, medium to large trees
Lodgepole Pine Mix	A: Early development dominated by herbaceous plants, shrubs, and seedling trees less than 20 years post fire	A: Early development dominated by herbaceous plants, shrubs, and seedling trees less than 20 years post fire
	B: Mid development closed, moderate to dense pole trees	A: Early development dominated by herbaceous plants, shrubs, and seedling trees less than 20 years post fire
	C: Late development closed, lodgepole pine dominated	C: Late development closed, lodgepole pine dominated
Spruce-Subalpine fir Mix	A: early development dominated by grasses and seedling trees less than 40 years post fire	A: Early development dominated by grasses and seedling trees less than 40 years post fire
	B: Mid development closed, dense pole stand 40+ years post fire	A: Early development dominated by grasses and seedling trees less than 40 years post fire
	C: Mid to late development, open canopy	C: Mid to late development, open canopy
	D: Late development patchy or mid canopy cover mature spruce-fir	D: Late development patchy or mid canopy cover mature spruce-fir
	E: Late development closed, old spruce-fir stands	D: Late development patchy or mid canopy cover mature spruce-fir
Sagebrush	A: Early development dominated by grasses and seedling trees less than 40 years post fire	A: Early development dominated by grasses and seedling trees less than 40 years post fire
	B: Mid development shrub cover under 25 percent, between 10 and 40 years post fire	A: Early development dominated by grasses and seedling trees less than 40 years post fire

Biophysical Unit/ Vegetation Type	Pre Burn	Post Burn
	C: Late development sagebrush dominated, canopy cover over 25 percent,	A: Early development dominated by grasses and seedling trees less than 40 years post fire
Mountain Shrubland	A: Grass/forb dominance, shrub regeneration less than 10 years post fire	A: Grass/forb dominance, shrub regeneration less than 10 years post fire
	B: Mid development Immature and/or open shrub community	A: Grass/forb dominance, shrub regeneration less than 10 years post fire
	C: Late development mature and dominant shrubs, some tree seedlings may be present	A: Grass/forb dominance, shrub regeneration less than 10 years post fire

Mechanical Thinning

Mechanical treatments would remove subdominant trees, limb low-hanging branches, and remove seedlings and poles in forest vegetation. Table 34 describes the likely effects of this type of fire on succession class composition for the target vegetation.

Table 34. Succession class conversion in the project area from proposed mechanical thinning treatments

Biophysical Unit/ Vegetation Type	Pre Burn	Post Burn
Aspen (if treated)	A: Early development aspen suckers under 2 m tall	A: Early development aspen suckers under 2 m tall
	B: Mid development aspen 2–10 m tall, dense sapling stand	B: Mid development aspen 2–10 m tall, dense sapling stand
	C: Late development closed, mostly pure aspen over 10 m tall	C: Late development closed, mostly pure aspen over 10 m tall
	D: Late development open, widely spaced aspen with overstory mortality, over 100 years old	D: Late development open, widely spaced aspen with overstory mortality, over 100 years old
	E: Late development closed, becoming conifer-dominated	C: Late development closed, mostly pure aspen over 10 m tall
Douglas-fir Mix	A: Early development dominated by grasses and seedling trees less than 40 years post fire	A: Early development dominated by grasses and seedling trees less than 40 years post fire
	B: Mid development closed, dense pole stand 40–80 years post fire	C: Late development open pole stand
	C: Late development open pole stand	C: Late development open pole stand
	D: Late development open, medium to large trees	D: Late development open, medium to large trees
	E: Late development closed, multi-storied	D: Late development open, medium to large trees
Lodgepole Pine Mix	A: Early development dominated by herbaceous plants, shrubs, and seedling trees less than 20 years post fire	A: Early development dominated by herbaceous plants, shrubs, and seedling trees less than 20 years post fire

Biophysical Unit/ Vegetation Type	Pre Burn	Post Burn
	B: Mid development closed, moderate to dense pole trees	A: Early development dominated by herbaceous plants, shrubs, and seedling trees less than 20 years post fire
	C: Late development closed, lodgepole pine dominated	C: Late development. closed, lodgepole pine dominated
Spruce-Subalpine fir Mix	A: Early development dominated by grasses and seedling trees less than 40 years post fire	A: Early development dominated by grasses and seedling trees less than 40 years post fire
	B: Mid development closed, dense pole stand 40+ years post fire	C: Mid to late development, open canopy
	C: Mid to late development, open canopy	C: Mid to late development, open canopy
	D: Late development patchy or mid canopy cover mature spruce-fir	D: Late development patchy or mid canopy cover mature spruce-fir
	E: Late development closed, old spruce-fir stands	D: Late development patchy or mid canopy cover mature spruce-fir

Construction of temporary fireline for prescribed burns and a temporary road associated with the proposed treatments would have negligible effects to fire disturbance processes. Firelines would be rehabbed post burn, and would no longer serve as fuel breaks. All fires adjacent to subdivisions would be suppressed, regardless of the presence of temporary roads used for fuels reduction activities.

Indirect Effects

The succession class conversions described in table 33 and table 34 above were used to analyze the effects of the prescribed burns and mechanical thinning treatments included in alternative 2 on the six fire regimes. GIS maps of the proposed treatments were compared to maps of current succession classes, and incorporated to assign new classes within their boundaries.

Table 35. Summary of succession class proportions in the project area for historic, current, and future biophysical settings under alternative 2

Vegetation Type	Succession Class				
Aspen (6,993 Acres)	**Succession Class A: Early Development Aspen Suckers under 2 Meters Tall**	**Succession Class B: Mid Development Aspen 2–10 Meters Tall, Dense Sapling Stand**	**Succession Class C: Late Development Closed, Mostly Pure Aspen more than 10 Meters Tall**	**Succession Class D: Late Development Open, Widely Spaced Aspen With Overstory Mortality, over 100 Years Old**	**Succession Class E: Late Development Closed, Becoming Conifer-Dominated**
Historic Proportion	10 percent	25 percent	25 percent	25 percent	15 percent
Current Proportion	3 percent	25 percent	52 percent Over-represented	17 percent	3 percent Under-represented
Future Proportion Under alternative 2	49 percent Over-represented	12 percent Under-represented	28 percent	10 percent Under-represented	1 percent Under-represented
Douglas-fir Mix (13,167 Acres)	**Succession Class A: Early Development Dominated by Grasses and Seedling Trees less than 40 Years Post Fire**	**Succession Class B: Mid Development Closed, Dense Pole Stand 40–80 Years Post Fire**	**Succession Class C: Late Development Open Pole Stand**	**Succession Class D: Late Development Open, Medium to Large Trees**	**Succession Class E: Late Development Closed, Multi-Storied**
Historic Proportion	10 percent	10 percent	10 percent	50 percent	20 percent
Current Proportion	10 percent	29 percent	22 percent	14 percent Under-Represented	25 percent
Future Proportion Under alternative 2	10 percent	17 percent	34 percent Over-represented	29 percent Under-represented	10 percent
Lodgepole Pine Mix (16,536 Acres)	**Succession Class A: Early Development Dominated by Herbaceous Plants, Shrubs, and Seedling Trees less than 20 Years Post Fire**	**Succession Class B: Mid Development Closed, Moderate to Dense Pole Trees**	**Succession Class C: Late Development Closed, Lodgepole Pine Dominated**		
Historic Proportion	6 percent	35 percent	59 percent		
Current Proportion	4 percent	0 percent Under-represented	96 percent Over-represented		
Future Proportion Under alternative 2	4 percent	0 percent Under-represented	96 percent Over-represented		

Vegetation Type	Succession Class				
Spruce/Subalpine Fir (15,711 Acres)	**Succession Class A: Early Development Dominated by Grasses and Seedling Trees less than 40 Years Post Fire**	**Succession Class B: Mid Development Closed, Dense Pole Stand more than 40 Years Post Fire**	**Succession Class C: Mid to Late Development, Open Canopy**	**Succession Class D: Late Development Patchy or Mid Canopy Cover Mature Spruce-Fir**	**Succession Class E: Late Development Closed, Old Spruce-Fir Stands**
Historic Proportion	10 percent	20 percent	10–50 percent	15–40 percent	20 percent
Current Proportion	1 percent	47 percent Over-represented	9 percent	24 percent	20 percent
Future Proportion Under alternative 2	7 percent	40 percent Over-represented	9 percent	26 percent	17 percent
Sagebrush (11,930 Acres)	**Succession Class A: Grass/Forb Dominance, Shrub Regeneration Less than 10 Years Post Fire**	**Succession Class B: Mid Development Shrub Cover under 25 percent, Between 10 and 40 Years Post Fire**	**Succession Class C: Late Development Sagebrush Dominated, Canopy Cover over 25 percent**		
Historic Proportion	6 percent	35 percent	30 percent		
Current Proportion	1 percent Under-Represented	36 percent Under-Represented	62 percent Over-Represented		
Future Proportion Under alternative 2	32 percent Over-represented	27 percent	41 percent Over-represented		
Mountain Shrubland (677 Acres)	**Succession Class A: Grass/Forb Dominance, Shrub Regeneration Less than 10 Years Post Fire**	**Succession Class B: Mid Development Immature and/or Open Shrub Community**	**Succession Class C: Late Development Mature and Dominant Shrubs, Some Tree Seedlings May be Present**		
Historic Proportion	5-10 percent	20-50 percent	40-70 percent		
Current Proportion	0 percent	41 percent	59 percent		
Future Proportion Under alternative 2	36 percent Over-represented	32 percent	33 percent		

Aspen

Full implementation of alternative 2 would shift a significant portion of the mapped aspen communities to an early-seral stage. This reflects the objective of increasing the presence of this disturbance-dependent community on the landscape for fuels management purposes. Early-seral aspen would function to dampen the spread of future fires during much of the fire season for decades into the future. After completion of the proposed treatments, naturally-caused and managed fires would be necessary to address additional aspen-conifer mix communities (which are poorly identified in the vegetation map) and maintain the balance of this fire regime over the long term.

Douglas-fir Mix

Alternative 2 would restore some of the class D open mature Douglas-fir, but this successional stage would still be under-represented overall. It would create an excessive proportion of class C, mainly by thinning class B pole stands. Over time, class C would move naturally toward additional class D. Douglas-fir communities would benefit from future low- to moderate-severity burns that would result from the ability to allow more natural starts to burn in the future.

Lodgepole Pine Mix

Succession class A was present only in the Green Knoll Fire area, which is not slated for treatment under either of the proposed alternatives. Succession class B was also not present in the Teton to Snake Project Area, according to the vegetation map and classification rules (table 35). Mechanical thinning and low-severity-prescribed fire are not expected to have the effect of converting class C lodgepole pine stands to a different succession class. Therefore, no changes are predicted for this forest type. Stand-replacing fires allowed to burn in the future would benefit lodgepole pine communities where lower-severity-prescribed fires are not as effective.

Spruce-Subalpine fir Mix

Under alternative 2, approximately 16 percent of the mapped spruce-fir vegetation type would be treated with prescribed fire and mechanical thinning. Even with surface fire effects, early successional class A types would be created. Mechanical thinning would shift some of the class E dense forest to class D. Class B would continue to be over-represented, which (as mentioned above) may be an artifact of mapping.

Sagebrush

Prescribed fire under alternative 2 would target 30 percent of the sagebrush vegetation in the proposal area. This would convert it to class A, bringing it into a higher-than-historical proportion for approximately 10 years. Proportions of class B and C, however, would be brought closer into line with what is thought to be the pre-suppression balance. Class C would continue to be over-represented, however. Mechanical thinning would not target sagebrush vegetation.

Mountain Shrubland

Approximately 240 acres (35 percent) of mountain shrub vegetation in the proposal area would be burned under alternative 2. This would lead to the class A stage being over-represented for roughly 10 years. Otherwise the mountain shrubs would remain in balance with historical proportions. Mechanical thinning would not target sagebrush vegetation.

Cumulative Effects

Alternative 2, when combined with other past, present, and reasonably foreseeable future projects in the analysis area, would mitigate departures from historic fire regimes in the project area and surrounding landscape. The effects to the fire regimes would be only slightly increased by the recent 344 acres of mechanical thinning completed in recent years. The creation of fuel breaks using prescribed fire and

mechanical thinning is intended to increase opportunities to contain naturally-caused fires after allowing them to spread naturally over portions of the landscape where they can benefit plant communities. As such burned patches are created, it is expected that fuel breaks would be created, enhanced and self-perpetuated. Currently, these fires are suppressed immediately due to the fuel continuity and loading in the wildland-urban interface.

Over the long term, alternative 2 would most likely create a greater degree of fuel breaks to protect developed areas than alternative 3, which would increase the opportunities for allowing lightning-ignited fires to burn more acres. Under this scenario, the balance of succession classes of the six major fire regimes can be expected to be closer to the historic pattern, perhaps sooner than it would under alternative 3. Scale of analysis would influence how this balance is calculated.

Alternative 3 - Reduce Potential Impacts to Special Areas and Wildlife Habitat

Direct Effects

Only the quantity of acres treated (and converted to different succession classes) is changed in the effects to the fire regime under the third alternative versus alternative 2.

As with alternative 2, connected actions such as firelines for prescribed burns and temporary roads would have only minimal and short-lived effects to fire regimes, even at a small scale.

Indirect Effects

Using the same analysis process as above, table 36 shows the predicted effects to the distributions of succession classes for vegetation types in the project area. Overall the effects of alternative 3 are diminished in magnitude compared to alternative 2.

Table 36. Summary of succession class proportions in the project area for historic, current, and future biophysical settings under alternative 3

Vegetation Type	Succession Class				
Aspen (6,993 Acres)	**Succession Class A: Early Development Aspen Suckers under 2 Meters Tall**	**Succession Class B: Mid Development Aspen 2–10 Meters Tall, Dense Sapling Stand**	**Succession Class C: Late Development Closed, Mostly Pure Aspen over 10 Meters Tall**	**Succession Class D: Late Development Open, Widely Spaced Aspen with Overstory Mortality, more than 100 Years Old**	**Succession Class E: Late Development Closed, Becoming Conifer-Dominated**
Historic Proportion	10 percent	25 percent	25 percent	25 percent	15 percent
Current Proportion	3 percent	25 percent	52 percent Over-represented	17 percent	3 percent Under-represented
Future Proportion Under alternative 3	29 percent Over-represented	18 percent	39 percent Over-represented	12 percent Under-represented	2 percent Under-represented
Douglas-fir Mix (13,167 Acres)	**Succession Class A: Early Development Dominated by Grasses and Seedling Trees less than 40 Years Post Fire**	**Succession Class B: Mid Development Closed, Dense Pole Stand 40–80 Years Post Fire**	**Succession Class C: Late Development Open Pole Stand**	**Succession Class D: Late Development Open, Medium to Large Trees**	**Succession Class E: Late Development Closed, Multi-Storied**
Historic Proportion	10 percent	10 percent	10 percent	50 percent	20 percent
Current Proportion	10 percent	29 percent	22 percent	14 percent Under-represented	25 percent
Future Proportion Under alternative 3	10 percent	16 percent	35 percent Over-represented	18 percent Under-represented	22 percent
Lodgepole Pine Mix (16,536 Acres)	**Succession Class A: Early Development Dominated by Herbaceous Plants, Shrubs, and Seedling Trees less than 20 Years Post Fire**	**Succession Class B: Mid Development Closed, Moderate to Dense Pole Trees**	**Succession Class C: Late Development Closed, Lodgepole Pine Dominated**		
Historic Proportion	6 percent	35 percent	59 percent		
Current Proportion	4 percent	0 percent Under-represented	96 percent Over-represented		
Future Proportion Under alternative 3	4 percent	0 percent Under-represented	96 percent Over-represented		

Vegetation Type	Succession Class				
Spruce/Subalpine Fir (15,711 Acres)	**Succession Class A: Early Development Dominated by Grasses and Seedling Trees less than 40 Years Post Fire**	**Succession Class B: Mid Development Closed, Dense Pole Stand more than 40 Years Post Fire**	**Succession Class C: Mid to Late Development, Open Canopy**	**Succession Class D: Late Development Patchy or Mid Canopy Cover Mature Spruce-Fir**	**Succession Class E: Late Development Closed, Old Spruce Fir Stands**
Historic Proportion	10 percent	20 percent	10–50 percent	15–40 percent	20 percent
Current Proportion	1 percent	47 percent Over-represented	9 percent	24 percent	20 percent
Future Proportion Under alternative 3	4 percent	44 percent Over-represented	9 percent	24 percent	19 percent
Sagebrush (11,930 Acres)	**Succession Class A: Grass/Forb Dominance, Shrub Regeneration Less than 10 Years Post Fire**	**Succession Class B: Mid Development Shrub Cover under 25 percent, Between 10 and 40 Years Post Fire**	**Succession Class C: Late Development Sagebrush Dominated, Canopy Cover over 25 percent**		
Historic Proportion	6 percent	35 percent	30 percent		
Current Proportion	1 percent Under-represented	36 percent Under-represented	62 percent Over-represented		
Future Proportion Under alternative 3	21 percent Over-represented	32 percent	48 percent Over-represented		
Mountain Shrubland (677 Acres)	**Succession Class A: Grass/Forb Dominance, Shrub Regeneration Less than 10 Years Post Fire**	**Succession Class B: Mid Development Immature or Open Shrub Community**	**Succession Class C: Late Development Mature and Dominant Shrubs, Some Tree Seedlings May be Present**		
Historic Proportion	5–10 percent	20–50 percent	40–70 percent		
Current Proportion	0 percent	41 percent	59 percent		
Future Proportion Under alternative 3	22 percent Over-represented	37 percent	41 percent		

Aspen

Alternative 3 would shift a smaller portion of the mapped aspen communities to class A, keeping class B within historic range. Classes C would continue to be over-represented, and classes D and E would be reduced below historic levels, although class E may be under-represented in the vegetation map. As with alternative 2, the increased early-seral aspen would address fuels reduction goals.

Douglas-fir Mix

Alternative 3 would be less effective in restoring some of the class D open mature Douglas-fir than alternative 2. As with alternative 2, it would create an excessive proportion of class C, mainly by thinning class B pole stands.

Lodgepole Pine Mix

The lack of change in lodgepole pine succession classes under alternative 2 would also be evident under alternative 3.

Spruce-Subalpine fir Mix

The effects of alternative 3 on the subalpine fir/spruce fire regime are subtle, and slightly reduced from alternative 2.

Sagebrush

Prescribed fire under alternative 3 would target 19 percent of sagebrush, versus 30 percent under alternative 2. Class A would be over-represented to a lesser degree, for approximately 10 years. As with alternative 2, proportions of classes B and C would be brought closer into line with what is thought to be the pre-suppression balance (with class C continuing to be over-represented). Mechanical thinning would not target sagebrush vegetation.

Mountain Shrubland

Approximately 22 percent of mountain shrub vegetation in the proposal area would be burned under alternative 3. This would lead to the class A stage being over-represented for roughly 10 years, but to a lesser degree than alternative 2.

Cumulative Effects

Alternative 3 would have a reduced influence on fire regimes as compared to alternative 2. When combined with past, present, ongoing, and reasonably foreseeable future projects, sufficient fuel breaks would be created under alternative 3 to allow flexibility in managing future lightning-ignited fires. Those future fires would be important for maintaining the desired composition of succession classes in the project area over the long term.

Other Relevant Mandatory Disclosures

Fire regimes and fire disturbance processes have been studied by referring to the pre-settlement ranges of fire effects, successional pathways, and fire frequency. The evidence gathered through fire scarred trees, forest composition, successional pathways, and charcoal in lake sediments informs a backward-looking science. As our environment changes though species introduction, land use by humans, and most notably climate change, the past patterns may no longer be possible to recreate. If fire regimes are to be managed for the long term, an adaptive approach would be needed. Restoration in an empirical sense may no longer be possible. Active fire management in the short term that results in more widespread burning may be particularly desirable in order to mitigate more severe, homogeneous fires in the future. Fires that disturb the forests now are likely to recover with the current suite of tree, shrub, and herbaceous species that characterizes our landscape. Several decades into the future, the opportunity for this may be reduced as growing conditions alter and new dominant species are introduced.

Compliance with the Forest Plan and Other Regulatory Direction

Under the no-action alternative, management imperatives to protect adjacent developments would continue to drive conservative fire management in the Teton to Snake area. While fire suppression does not technically violate the regulations governing wilderness and fire management, it does counter the intent of wilderness, the Forest Plan, and the Fire Amendment, which seek to promote fire disturbance processes as part of the ecosystem.

Alternatives 2 and 3 propose to use prescribed fire and mechanical thinning to manipulate fuels in juxtaposition with developments where prevailing winds may carry fire from public lands to private. Strategically-located treatments add opportunities for indirect fire suppression or containment that are meant to increase the total area affected by beneficial fire while protecting values. This follows the Forest Plan's broad direction to manage fire to "accomplish resource objectives while protecting identified values within acceptable levels of risk." The number, size and intensity of the prescribed fires would resemble the spatial variability and disturbance effects found in the pre-settlement fire regime. Mechanical treatments would be focused on high risk interface areas, and roughly approximate the fire effects of low severity burns in the defense zone.

The Bridger-Teton National Forest Plan and Fire Amendment call for a greater component of early succession post-fire communities than is currently in place over the Teton to Snake proposal's landscape. The directives do not provide easily measurable standards for fire disturbances or processes; however the proposed burns and mechanical thinning projects are aligned with their intent. If natural fire processes are facilitated by strategic placement of fuels treatments, then a key element of the Forest Plan would be addressed. Younger post-fire stands of herbaceous and shrub communities contribute to the objectives for Forest Plan desired future condition 10 and 12 areas.

Short-term Uses and Long-term Productivity

Fire ecology describes disturbance and renewal processes that embody the long term benefits of undesirable events. It is certain that the prescribed fires planned for the Teton to Snake would have short term drawbacks such as smoke, blackened trees, and removal of surface plant material that people enjoy and animals use. The post-fire heterogeneity of habitats and patterns of regrowth, however, are desired for many years into the future. This tradeoff is the very dilemma that has led to decisions to suppress most fires – and the need to take management action.

Unavoidable Adverse Effects

Under the no-action alternative, fire processes would be generally prevented unless firefighters are unable to stop the spread of a fast-moving fire. In this case, it is likely that suppression efforts would include aerial retardant drops, chain saw use, fireline construction, and potentially dozer use. Unburned plant communities would continue to grow and advance to climax conditions that diverge from historic arrangement, structure and function. Fuel buildups may exacerbate the severity of fire effects in future decades. These effects may be more homogeneous, and take longer to recover than would prescribed burns or fires that occur today. They also may lead to the introduction and or dominance of different species that are adapted to warmer climates.

Under alternatives 2 and 3, the smoke effects of prescribed burns are adverse conditions for humans and animals. Plants, insects, and other animals are killed and damaged by fire. As noted above, these effects are part of an ecosystem process that leads to renewal, but not without doing certain inevitable harm. Mechanical thinning if forest fuels causes saw marks, short term noise, and mortality of some trees.

Summary

Table 37 compares successional class compositions among the alternatives.

Table 37. Comparison of successional class compositions among alternatives

Successional Class Composition	Alternative 1	Alternative 2	Alternative 3
Aspen	Late-seral aspen would be over-represented. Early-seral aspen would be missing in 5–10 years.	Early-seral aspen would be strongly over-represented for approximately 15 years. Late-seral aspen would be less abundant but still over-represented. Long-term balance of succession classes would be maintained through increased management of lightning-ignited fires.	Early-seral aspen would be over-represented for approximately 15 years. Late-seral aspen would be somewhat less abundant but still over-represented. Long-term balance of succession classes would be maintained through increased management of lightning-ignited fires.
Douglas-fir Mix	Mature, open forest dominated by large Douglas-fir would continue to be under-represented.	Pole-sized, Douglas-fir-dominated stands would be over-represented. Mature open strands would continue to be somewhat under-represented. Future naturally-caused fires would address this need as risks to developed areas are mitigated.	Pole-sized, Douglas-fir-dominated stands would be somewhat over-represented. Mature open strands would continue to be under-represented. Future naturally-caused fires would address this need as risks to developed areas are mitigated.
Lodgepole Pine Mix	Mature lodgepole-dominated stands would continue to dominate. Pole stands would be missing until the Green Knoll Fire area reaches that stage. Early-seral stands are absent except in the 2001 Green Knoll Fire, and may disappear without stand-replacing fire in approximately 30 years.	No change in stand successional stages is expected. Early-seral component (created by stand-replacement fire) may disappear in approximately 30 years. Stand-replacing effects from unplanned fires would be needed to maintain the lodgepole fire regime.	No change in stand successional stages is expected. Early-seral component (created by stand-replacement fire) may disappear in approximately 30 years. Stand-replacing effects from unplanned fires would be needed to maintain the lodgepole fire regime.
Spruce-Subalpine Fir	Successional classes would remain within historic range, but the early-seral component is missing except in the 2001 Green Knoll Fire. This component would disappear without stand-replacing fire in approximately 40 years.	Successional classes would remain within historic range, but the early-seral component would disappear without stand-replacing fire in approximately 40 years. Fuels treatments are intended to provide opportunities to allow this.	Successional classes would remain within historic range, but the early-seral component would disappear without stand-replacing fire in approximately 40 years. Fuels treatments are intended to provide opportunities to allow this.
Sagebrush	Early-seral stages would be absent except in the Green Knoll Fire area (for another +/- 10 years). Mid-successional stages would be absent until Green Knoll stands reach that stage. Late-seral	Early-seral sagebrush would be strongly over-represented for approximately 10 years. The late-seral component would continue to be over-represented somewhat. Mid-successional stages would be under-represented until recently burned	Early-seral sagebrush would be over-represented for approximately 10 years. The late-seral component would continue to be over-represented. Mid-successional stages would be under-represented until recently

Successional Class Composition	Alternative 1	Alternative 2	Alternative 3
	mature sagebrush would continue to be over-represented.	areas reach that stage. Management of lightning-caused fires would introduce early-seral communities to balance sagebrush class B succession to class C.	burned areas reach that stage. Management of lightning-caused fires would introduce early-seral communities to balance sagebrush class B succession to class C.
Mountain Shrubland	With the Green Knoll Fire contributing some early-seral stages to the area, mountain shrublands would temporarily remain within historic range, for a few years. Then the early-seral stage would be absent.	The early-seral component would be strongly over-represented, for approximately 10 years. Class B would then dominate. Additional fire disturbances would be needed over time to maintain class A on the landscape.	The early-seral component would be somewhat over-represented, for approximately 10 years. Additional fire disturbances would be needed over time to maintain class A on the landscape.

Vegetation

The following resource information and analysis summarizes the Silviculture Report (Amell 2011), available on the Bridger-Teton National Forest website and in the project record.

Existing Condition

Existing Vegetation Cover Types and Size Classes

Vegetation in the project area is a mixture of a number of vegetation cover types, but in general the project area is dominated by conifer forests, aspen, and shrublands. About 58 percent of the area is dominated by conifers and 11 percent dominated by deciduous trees of all types (table 38). As has happened throughout the West as a result of fire exclusion, landscape coverage of conifers has increased, most aspen stands have deteriorated, and subalpine fir has expanded into lodgepole pine and Douglas-fir stands (Loope and Gruell 1973).

Conifer forests are almost evenly split between Douglas-fir dominated, mixed-species forest (Douglas-fir mix), lodgepole-pine-dominated, mixed-species forest (lodgepole pine mix), and spruce/subalpine fir-dominated, mixed-species forest (spruce/subalpine fir mix). The main deciduous forest type is quaking aspen, but there is a small acreage of cottonwood in the southeast corner of the project area in the Snake River flood plain. Most aspen is classified as relatively pure stands (aspen), but there is a small portion of the area classified as dominated by aspen mixed with conifer (aspen/conifer mix).

Shrublands of all types cover about 16 percent with the major shrubland being classified as mountain big sagebrush at about 15 percent of the project area. Herblands of all types cover about 14 percent of the project area. Note that acreage values in table 38 do not sum to the project area acreage due to minor differences between the project area boundary and the Forest's existing vegetation spatial data.

The highest elevations in the project area supports a patchy mixture of whitebark pine, spruce/subalpine fir mix, grassland and forbland. Limber pine occurs at the highest elevations as well, but in areas too small to be classified as a cover type. As one descends in elevation, spruce/subalpine fir mix and Douglas-fir mix dominate, with Douglas-fir mix on the dryer combinations of aspect and slope. Lodgepole pine and aspen occur in smaller amounts that increase at lower elevations while the subalpine fir decrease and sagebrush shrubland appears in the mosaic. In the lowest elevations, the landscape becomes a patchy mixture of forested and non-forested with Douglas-fir mix, lodgepole pine mix, aspen, and shrublands. Superimposed upon this general elevational trend are the influences of slope, aspect, and riparian moisture, and cool-moist species such as subalpine fir and Engelmann spruce occur at the lowest elevations on some sites.

The majority of trees in most of the forest types are in the 5–9.9-inch dbh size class, except for whitebark pine types which are dominated by the 10–19.9 inch dbh size class. Modeled tree growth rates and tree ages measured in 2009–2010 indicate that trees in the 5–10-inch dbh class are roughly 70 to 160 years old. This coincides with observations of Loope and Gruell (1973) for the Jackson Hole area that large fires occurred in the early 1840s, about 1856, and in the interval of 1878–1885 and that "most forest stands in the valley originated following the fires of 1856 and 1879." The lower end of the age range is also consistent with historic fire records showing several large fires having burned in the project area in 1934.

See the silviculture report in the project record for detailed discussion of stand characteristics typical for various forest cover types on different kinds of sites in the project area.

Aspen clones in the project area are generally:

- Pure (or almost pure) clones associated with shrubs or grassland, or growing between conifer and herbland ecotones. These are stable clones on non-conifer sites without likelihood of further expansion. They occur in almost all proposed burn units, and in some units, such as the east side of North Fork Phillips Canyon Burn Unit 1 or the Munger Mountain units, they cover a substantial portion of the unit. Most of the mature stems are about 80 to 170 years old and were probably established from root suckers following wildfires.
- Relatively large and almost pure aspen clones growing within conifer stands. Age ranges from middle-aged to old with some clones healthy while others have overstory mortality and reduced vigor. Suckering is evident is some but not all clones, and most clones have increasing competition from conifers.
- Small aspen clones growing within conifer stands. These are generally old with poor vigor and few suckers. The clones range in size from a single old aspen stem to one-quarter acre. Many of these areas are too small to be inventoried in the vegetation classification system so they are under-represented in the data.

Whitebark pine, a candidate species under the Endangered Species Act, is present in the project area and within some of the proposed treatment units. The species is present as a climax species at the highest elevations in the project area, but is seral to subalpine fir in most stands.

Table 38. Existing vegetation cover types across the project area

Cover Type	Acres	Percent of Project Area
Agriculture	17	0.02
Alpine Vegetation	154	0.20
Aspen	6,737	8.53
Aspen/Conifer Mix	275	0.35
Barren/Rock	413	0.52
Cottonwood	77	0.10
Douglas Fir Mix	13,198	16.71
Grassland/Forbland	6,881	8.71
Lodgepole Pine Mix	16,579	20.99
Mountain Big Sagebrush	11,490	14.54
Mountain Shrubland	678	0.86
Riparian Herbland	102	0.13
Sagebrush/Bitterbrush Mix	468	0.59
Silver Sagebrush/Shrubby Cinquefoil	40	0.05
Sparse Vegetation	242	0.31
Spruce/Subalpine Fir Mix	15,723	19.90
Tall Forbland	4,196	5.31
Urban/Developed	15	0.02
Water	7	0.01
White Bark Pine	223	0.28

Cover Type	Acres	Percent of Project Area
White Bark Pine Mix	198	0.25
Willow	1,286	1.63

Table 39. Percent of forest cover type in each dbh class across the project area

Forest Type	under 5 inches dbh Size Class (percent)	5–9.9 inches dbh Size Class (percent)	10–19.9 inches dbh Size Class (percent)	20–29.9 inches dbh Size Class (percent)
Aspen	26	61	13	0
Aspen/Conifer Mix	17	59	24	0
Douglas-fir Mix	0	61	38	1
Lodgepole Pine Mix	under1	70	28	2
Spruce/Subalpine Fir Mix	0	55	41	4
Whitebark Pine	0	23	75	2
Whitebark Pine Mix	0	33	67	0

Environmental Consequences

Methodology and Scientific Accuracy

Data used in this analysis included:

- 10-meter Digital Elevation Model Geographic Information Systems (GIS) raster layers from which we attained elevation, percent slope and aspect.
- 2009 National Agricultural Imagery Program aerial photo data (USDA 2011a).
- Bridger-Teton National Forest's GIS polygon layers including:
  - existing vegetation classification for land cover type, dominant tree size class, and percent cover class (USDA 2007)
  - Bridger-Teton Forest Plan desired future condition (management area) boundaries
  - 2001-2010 aerial insect and disease mortality survey data (USDA 2011b)
  - property boundaries
  - project area boundary
  - historic fire activity
  - past management activities
- Common Stand Examination data measured during the year 2009 and 2010 for selected stands (USDA 2011c).
- site visits and informal exam data collection during the fall of 2009 and summer of 2010
- the Bridger-Teton Forest Plan

Information Sources

The Forest Vegetation Simulator program was used to model the general effects of treatments on crown base height, crown bulk density, and percent crown cover, as well as tree species composition and stocking. Forest Vegetation Simulator modeling is further described in the Fire and Fuels Specialist Report, appendix B.

Incomplete and Unavailable Information

There is no incomplete or unavailable data for the vegetation management resource.

Spatial and Temporal Context for Effects Analysis

For the effects analysis below, three spatial scales would be used. The spatial scale being used depends upon the measurement indicator being discussed. First, treatment effects on individual trees or classes of trees would be discussed. For example, the increase in growth, vigor or size of small aspen clones due to the removal of competing conifers. Second, treatment effects on stand-level attributes would be discussed., For example, changes in stand structure or stocking levels. Third, treatment effects on a landscape scale would be discussed. For example, proportion of the landscape being impacted by the proposed action. The project area (79,056 acres) was chosen as the landscape for direct and indirect effects analysis, because it (1) encompasses all proposed treatments, (2) is bounded by a major watershed divide on the west side, (3) is bounded by private land and the Snake River on the west side, (3) is bounded by a substantial divide between Dog and Coburn Creeks on the south side. For cumulative effects analysis, we extend the boundary north to include all Forest Service administered land north of the Dog Creek/Coburn Creek divide and east of the Snake River so that vegetation changes in the Jackson Hole Ski Area are included.

The baseline year used for this analysis is the year 2010 as the existing condition. Proposed thinning treatment stands were examined in the fall of 2009 and summer of 2010 and aerial damage survey data was collected in 2010. In the discussion below, “short-term” effects refers to effects over the 10-year period from the time the activity was accomplished. For modeling, analyzing and discussing changes in the existing condition due to activities, we are assuming that the accomplishment year is 2012. Also, in the discussion below, “long-term” effects refers to effects greater than 10 years from the time the activity was accomplished. We realize that activities, especially prescribed burning, may actually be accomplished some time after the year 2012 and for simplicity-in-analysis purposes, we are making the assumption that no unforeseen occurrences such as fire, blowdown, or insect mortality would occur from 2010 until the time of implementation. We are also assuming that additional bark beetle mortality would not be substantial because although over 4,000 acres of activity was mapped for 2010, ADS data indicated low levels of mortality on those acres and during 2010 site visits, very few current-year beetle-attacked trees were observed. All pertinent past activities and events are incorporated into the existing condition discussion. In the cumulative effects analysis, cumulative effects are discussed as changes in the existing condition due to present and future activities, including the effects of the alternative being discussed.

Effects indicators used in this analysis are:

- Tree species composition
- Stand structures in terms of tree diameter distributions and qualitatively in terms of structural diversity
- Aspen clone regeneration, vigor, and size

The following direct and indirect effects analysis uses the spatial scales of individual trees or classes of trees; stand level; and landscape scale (project area). Cumulative effects are analyzed in a larger area that

includes all national forest land north of the Dog Creek/Coburn Creek divide and east of the Snake River so that vegetation changes in the Jackson Hole Ski Area are included. The baseline timeframe for analysis begins at 2010 for the existing condition, and extends 10 years from accomplishment of proposed activities for short-term effects. Long-term effects occur greater than 10 years from the time the activities are accomplished.

Alternative 1- No Action

Direct and Indirect Effects

There would be no direct effects to vegetation under this alternative. Stand structures, stocking levels, seral stages, species compositions, and aspen and whitebark pine condition would remain as described above in the existing condition section.

The indirect effects on stand structures would be to move single- and two-story stands to multi-story stands over time, so that in the long term, all stands would be multi-story with dense understories. This process could take 40 years or more for young lodgepole pine stands such as Phillips Bench Unit 4, which is about 40 years old.

Species compositions on the subalpine fir habitat types would continue to change as subalpine fir replaces the seral species—lodgepole pine, whitebark pine, aspen, Douglas-fir, and Engelmann spruce—as they die due to insects or competition. This slow successional process may accelerate at times by mortality events such as bark beetle infestations. Short-term change would be negligible, but long-term effects would be profound with most of the project area becoming dominated by subalpine fir. In the Douglas-fir habitat types, species compositions would change little in the short term and long term because the current dominant Douglas-fir is the climax species.

Aspen clones occurring outside of conifer stands are stable and can be considered climax (Mueggler 1988). Short-term change would be negligible, but in the long term, the older trees would begin to die and some suckering would occur. This slow overstory decline and understory suckering would eventually create clones that are multi-storied and uneven-aged (DeByle 1985; Jones and DeByle 1985a; Jones and DeByle 1985b; Jones et al. 1985; Mueggler 1985).

The aspen clones within conifer stands are seral to Douglas-fir and subalpine fir. Short-term indirect effects include minor benefit to aspen as competing confers are killed by bark beetles, but for the most part, conifers would ultimately dominate the aspen. Without disturbance, many of the clones could decline and disappear from the landscape within a single aspen generation (Mueggler 1985). Many of the smaller clones which are already in poor health due to competing conifers would continue to decline and die out.

With no treatment, whitebark pine would continue to decline in stands where it is a seral species.

Alternative 2 – Proposed Action

Appendix B lists the project design features that would be applied to all thinning units. Table 40 displays the percent of vegetation cover type remaining in the treatment units after implementation of alternative 2.

Table 40. Alternative 2 percent of vegetation cover type within treatment areas

Cover Type	Prescribed Burn Units (Percent)	Thinning Units (Percent)	Total (Percent)
Alpine Vegetation	23	0	23
Aspen	45	5	50
Aspen/Conifer Mix	61	7	68
Barren/Rock	6	0	6
Douglas-fir Mix	21	2	23
Grassland/Forbland	13	1	14
Lodgepole Pine Mix	32	9	41
Mountain Big Sagebrush	31	0	31
Mountain Shrubland	35	1	36
Riparian Herbland	44	0	44
Sagebrush/Bitterbrush Mix	16	0	16
Silver Sagebrush/Shrubby Cinquefoil	31	1	32
Sparse Vegetation	15	0	15
Spruce/Subalpine Fir Mix	15	1	16
Tall Forbland	20	1	21
White Bark Pine	30	0	30
White Bark Pine Mix	41	0	41
Willow	23	2	25

Direct and Indirect Effects

The treatment unit areas would include about 23 percent of the Douglas-fir mix, 41 percent of the lodgepole pine mix, 16 percent of the spruce/subalpine fir mix, 30 percent of the whitebark pine, and 41 percent of the whitebark pine mix vegetation cover types. The thinning treatments would not considerably affect any one cover type.

Species Composition

In the short term, species compositions in all treatment units be shifted from shade-tolerant species (primarily subalpine fir) toward shade-intolerant species such as whitebark pine, lodgepole pine, limber pine, Douglas-fir, and aspen. The extent of the change would depend upon the type of treatment and the current composition of each unit, but in general all stands would move toward earlier seral stage species compositions.

Thinning

Units with both commercial and noncommercial harvest would likely be shifted more toward the preferred species as described in the thinning criteria listed above than those with noncommercial thinning only because of the greater opportunity to modify the species mix.. Units with both commercial- and noncommercial harvest would likely better meet the preferred species composition because of the greater opportunity to modify the species mix. For example, larger, merchantable trees of a less-preferred species may be cut while smaller, unmerchantable trees of a desired species can be retained.

Prescribed Burning

Prescribed burning treatments would reduce the number of trees in the short term, especially the small-diameter trees and the fire-intolerant tree species, most likely removing subalpine fir, Engelmann spruce, small Douglas-fir, and small lodgepole pine. The shift to early-seral species compositions would be variable. Units would have a mosaic of unburned areas; lightly burned areas with mortality of only small understory trees susceptible to fire; moderately burned areas with mortality of less fire-resistant trees throughout the forest structure; and small severely burned patches in which only the most fire-resistant overstory trees survive. These open patches would serve as a seed bed for the establishment of early-seral species with a composition reflecting the surrounding forest and seed source.

Stand Structure

Stand structures in all treatments would be modified to some degree, but the magnitude and uniformity of the change would depend upon the treatment. Thinning treatments would allow for the greatest degree of control over the magnitude and uniformity of the structural changes, with the combination of commercial and noncommercial thinning allowing for the greatest degree of control.

Thinning

Non-commercial thinning only: Except for Phillips Bench units 3 and 4, which are young, even-aged and single-story plantations, the thinning units are two-storied to multi-storied. In the single-storied areas the noncommercial thinning would open up the tree canopies and slightly increase average diameter because larger trees would be favored over smaller. In the two-storied and multi-storied areas, the noncommercial thinning would open up the understories and mid-stories, depending upon the age and size distribution. The post-treatment stands would have flatter diameter distributions but would still be considered two-story to multi-story.

Commercial and noncommercial thinning: These are either multi-story (Phillips Bench Unit 5) or generally even-aged and single-storied (Red Top Thin Unit 1 and 2), although there are areas within the Red Top units where an understory of subalpine fir and aspen is developing. The result of the treatments in these units would be to open up the stands, but their structure would not change.

In the long term within all treated units, the establishment of additional trees would move the stands toward two-story and multi-story structures.

Prescribed Burning

Prescribed burn treatments, because of the variation in fire intensity and severity, would increase both horizontal and vertical structural diversity. Generally, the tree diameter distributions would flatten, but because of burn variability, the effect would not be as great or as uniformly distributed as in the thinning treatments. In the short term, some burned areas would be pushed toward a single-story structure because of understory mortality. Some areas would retain a multi-story structure because they are unburned or lightly burned, and some small areas would be pushed toward non-forested openings due to higher intensity fire. In the long term, trees would become established in the openings, creating a patchy new age class to the stand structures.

Aspen

Thinning

Thinning within and around aspen clones is effective for aspen restoration and regeneration. Treatment would remove as many competing conifers from within and around existing aspen clones as possible while retaining the largest and oldest trees. Heavier thinning produces more suckers, and removing all competing conifers from within and around aspen would produce the greatest increase in aspen suckering. The effectiveness depends on the type of thinning (commercial with noncommercial or noncommercial only) and the tree diameters and ages of the surrounding forest.

Non-commercial thinning only (trees less than 9 inch diameter): This treatment is proposed where aspen clones occur within conifer stands. Removing competing conifers would increase aspen vigor and suckering by varying degrees depending on the stocking of smaller versus larger trees. Non-commercial thinning would be most effective where confers are smaller and dense, and less effective where the tree density is higher in the larger diameters because larger trees would not be removed. Aspen vigor within the larger clones would increase only slightly because there are few competing conifers in the larger clones. Aspen suckering may not increase substantially because the larger aspen stems would continue to suppress suckering. The treatments would forestall succession in the clones from seral aspen to late-seral or climax conifer. Suckering would occur around the perimeters of the larger clones if conifers are removed in the surrounding area, and the clone would likely expand. The smaller clones are more suppressed, so expansion as well as increased vigor and suckering is more likely once competing conifers are removed. Non-commercial thinning on 1,798 acres (about 2 percent of the analysis area) would increase aspen regeneration and the area covered by aspen clones. The short-term effects such as suckering would decline over time, but overall aspen would be more present on the landscape and a new age class would be created.

Commercial and noncommercial thinning (generally 9-15 inch diameters): This treatment would occur where aspen clones occur within conifer stands. The effects to vigor, suckering, clone size, and succession in larger clones would be similar to noncommercial treatments as discussed above. In addition, removal of larger competing confers would result in increased aspen vigor, suckering, and clone size. The greatest potential for increased vigor, suckering, and aspen expansion is in the small scattered clones due to removal of larger competing confers. This treatment on 728 acres (about 1 percent of the analysis area) would result in a large increase in aspen regeneration and the area covered by aspen clones.

The pure or almost pure aspen clones growing in a mosaic with shrublands and grasslands are not within the thinning units and would not be affected. Where aspen is growing between conifer forest and herbland ecotones, conifers would be thinned from the forest side of the ecotonal area. Removing the conifers would decrease competition for moisture and increase clone vigor, and the aspen would expand into the forest side of the ecotone. In most thinning units, the area involved would be very slight. The greatest potential for promoting aspen expansion from these forest/herbland ecotones into surrounding forests is in the Red Top Unit 1 and 2, which would have commercial and noncommercial thinning involving lodgepole pine forests with non-forested “meadow system” inclusions.

Prescribed Burning

The proposed burn units include about 40 percent of the classified aspen and 57 percent of the classified aspen/conifer mix, as well as many unclassified small aspen clones. The effects of prescribed burning on aspen regeneration would vary because fuels and flammability vary considerably within the aspen and mixed aspen-conifer overstory types, leading to variation in prescribed burn intensity and severity.

The potential to promote aspen regeneration and initiate a new age class through prescribed burning depends on the amount of aspen in the unit and the aspen fuel type. Most units (about 40 percent) have moderate to high potential for successful aspen regeneration from prescribed burning (table 41).

Weather and fuel conditions upon ignition affect the outcome, and prescribed fire is unlikely to burn all aspen in the units; even so, burning would substantially regenerate aspen in the project area. The aspen suckering would occur in the short term and would decline over time, but there would be a long-term increase in aspen in the treatment units. Alternative 2 would substantially increase the number of aspen suckers produced in treated units and would initiate a new age class of aspen.

Table 41. Alternative 2 potential for aspen regeneration

Unit Name	Potential for Aspen Regeneration
Black Canyon Burn Unit 1	Low
Black Canyon Burn Unit 2	Low
Coburn Creek Burn Unit 1	Low
Coburn Creek Burn Unit 2	Moderate
Coburn Creek Burn Unit 3	Low
Fall Creek Ranch Burn Unit 1	Low
Fall Creek Ranch Burn Unit 2	Low
Highland Hills Burn	High
Mosquito Creek North Burn Unit	Low
Munger Mountain Burn Unit 1	High
Munger Mountain Burn Unit 2	High
North Fork Phillips Canyon Burn Unit 1	Moderate
Phillips Canyon Burn Unit 1	Low
Singing Trees Burn Unit 1	High
Singing Trees Burn Unit 2	High
Singing Trees Burn Unit 3	Moderate
South Fork Fall Creek Burn	High
Taylor Mountain Burn Unit 2	Moderate
Taylor Mountain Burn Unit 3	High
Taylor Mountain Burn Unit 4	High
Taylor Mountain Burn Unit 5	High
Trails End Road Burn Unit	High
Wilson Fall Creek Burn	High

In summary, the proposed treatments would affect a substantial portion of the aspen (50 percent) and aspen/conifer (68 percent) vegetation cover types, as well as many aspen clones that are too small to be classified in the vegetation cover classification. The treatments would greatly increase aspen suckering, especially the thinning treatments which would reduce or remove competing conifers from within and around established clones. A new age class of aspen would be initiated. Thinning treatments would result in the heaviest aspen regeneration, with the combination on commercial- and noncommercial thinning potentially resulting in heavier aspen suckering than the noncommercial thinning alone.

Whitebark Pine

Thinning and prescribed burning treatments are recommended as techniques that can be used to restore whitebark pine. The proposed treatments are consistent with recommendations to emulate historic fire regimes (Keane and Parsons 2010a; Keane and Arno 2001 and 1996; Tomback et al. 2001) by using variable-intensity prescribed burning, augmenting fuels where necessary; thinning to release whitebark pine trees; removing understories; and creating small openings. White bark pine occurs as seral to subalpine fir and as a climax species. It occurs in North Fork Phillips Canyon Burn Unit 1, Phillips

Canyon Burn Unit 1, and Phillips Bench units 5 and 7. It is also probably present in Mosquito Creek North Burn Unit, Black Canyon Burn Unit 1, Black Canyon Burn Unit 2, Powerline Unit 1, Phillips Bench Unit 1, and Phillips Bench Unit 6. Individual whitebark pine may also occur as a very minor component of lower-elevation units.

Thinning

Whitebark pine is seral and as a minor component, it is not reflected in the cover classifications occurring in the thinning units. It would be retained during thinning so it would not decrease in the short term. Tree vigor would increase as it would in all species after thinning. Whitebark pine seedlings may become established in small openings created by bark beetle mortality and removal of understory fir around whitebark pine and large Douglas-fir. This would help to maintain or increase its presence in the long term.

Prescribed Burning

About 15 percent of the whitebark pine and 28 percent of the whitebark pine mixed-species cover types are within proposed prescribed burn units. The species would be protected during prescribed burning as described in the design features. The prescribed burns would have little effect on whitebark pine located at high elevations with grassland/forbland, mountain shrubland, barren/rock, and sparse vegetation. Groups and individuals occurring at lower elevations mixed with subalpine fir and lodgepole pine would be favored because whitebark pine is more fire-tolerant. The result of the treatments in these areas would be to create a mosaic of lightly burned timbered areas and more severely burned patches in which most or all of the less fire-tolerant trees are killed. Given the expected nature of the proposed prescribed burns, these patches would be small, but they would provide areas for nutcracker caching and for whitebark pine to become established and grow. In the long term, the prescribed burns would maintain or increase whitebark pine in the units.

In summary, the whitebark pine and whitebark pine mix cover types are within prescribed burn units and due to their location, surrounding vegetation, and actions taken to protect them, they would be little affected. They are less likely to be killed by the prescribed burns than less fire-tolerant species such as subalpine fir, Engelmann spruce, and lodgepole pine. The seral whitebark pine component would be retained as much as possible. The overall effect of the project is to increase the stocking of whitebark pine relative to other species and initiate a small degree of regeneration, although regeneration would be limited due to the small number of openings created.

Cumulative Effects

Many years of fire exclusion, several large fires, timber harvest, and insect activity, especially the recent bark beetle activity, shaped the existing condition. Other past projects that impacted vegetation in the area are: (1) clearing of the powerline right-of-way which converted about 140 acres of the area to grass-shrub, (2) noncommercial thinning accompanied by handpiling and burning of material (307 acres) done in 2004, and (3) about 30 acres of fuels reduction on private land in the Pine Glen South Project. The foreseeable Snake River Canyon Project would substantially affect vegetation in about 2,308 acres of prescribed burning to improve wildlife habitat in the in the south portion of the project area. The area is classified as lodgepole pine mix and the 16 acres would comprise less than 0.1 percent of the cover class acreage and if not treated would not substantially change this analysis.

The proposed action overlaps the 2004 thinning project except for about 20 acres in small scattered parcels, the largest of which is about 10 acres between Recreation Trail units 2 and 4.

Altogether, the proposed action and the future Snake River Canyon unit would modify vegetation to some degree on about 31 percent of the project area and 28 percent of the area north of the Dog Creek/Coburn Creek divide and east of the Snake River. Table 42 displays the proportion of each vegetation cover type

within the cumulative impacts analysis area that is proposed for treatment in all current proposed future treatments. Cumulatively, a substantial proportion of the area classified as aspen (46 percent) and aspen/conifer mix (63 percent) would be within treatment units. But only 4 percent of the aspen and six percent of the aspen/conifer mix would be within thinning units. Most of the aspen would be within prescribed burn units. The expected effects of thinning and prescribed burn treatments on aspen clones is discussed above. Also, as discussed above, a large number of the clones found in the area are relatively small and are not reflected in the vegetation cover classification, and so increases in aspen due to all treatments would be greater than table 42 indicates.

Whitebark pine would be protected during all prescribed burning so no change in the whitebark pine cover type is expected. In the whitebark pine mixed species areas, we would expect the increases in whitebark pine regeneration discussed above.

Alternative 3 – Reduce Potential Impacts to Special Areas and Wildlife Habitat

Treatment criteria that apply in alternative 2 also apply to alternative 3.

Table 42. Alternative 3 percent of vegetation cover type within treatment areas

Cover Type	Prescribed Burn Units (Percent)	Thinning Units (Percent)	Total (Percent)
Alpine Vegetation	14	0	14
Aspen	28	3	31
Aspen/Conifer Mix	35	4	39
Barren/Rock	6	0	6
Douglas-fir Mix	14	1	15
Grassland/Forbland	11	1	12
Lodgepole Pine Mix	16	6	22
Mountain Big Sagebrush	22	0	22
Mountain Shrubland	24	0	24
Riparian Herbland	33	0	33
Sagebrush/Bitterbrush Mix	9	0	9
Silver Sagebrush/Shrubby Cinquefoil	0	1	1
Sparse Vegetation	15	0	15
Spruce/Subalpine Fir Mix	10	1	11
Tall Forbland	13	1	14
White Bark Pine	25	0	25
White Bark Pine Mix	40	0	40
Willow	15	1	16

The effects of the treatment on species composition, stand stocking and structures, aspen, and whitebark pine are discussed above in alternative 2. The following discusses and displays the difference between alternatives 2 and 3 in terms of the area being treated by treatment types.

Direct and Indirect Effects

The treatment units would include about 15 percent of the Douglas-fir mix, 22 percent of the lodgepole pine mix, 11 percent of the spruce/subalpine fir mix, 25 percent of the whitebark pine, and 40 percent of the whitebark pine mix cover types. Proposed activities in the project area would not considerably affect any one cover type. The treatments would impact the conifer forest types as described above for alternative 2, but for a smaller portion of the cover types within the project area.

As described above for alternative 2, species composition and stand structures would be changed by all treatments in the conifer cover types mentioned above. Tree species compositions would shift toward fire-tolerant and shade-intolerant species, with the greatest change expected in the commercial- and noncommercial units where all diameters can be considered for removal; less change expected in the noncommercial thinning units where tree removal is limited to less than 9 inches in diameter; and less and very variable change in the prescribed burn treatments. The magnitude of the change would be less over the project area than in alternative 2 due to the reduced treatment acreage.

The proposed treatments would affect about 31 percent of the aspen cover type and 39 percent of the aspen/conifer cover type, as well as many aspen clones that are too small to be classified in the vegetation cover classification. The treatments would greatly increase aspen suckering as described above under alternative 2, but for a smaller portion of the aspen in the project area.

The area of whitebark pine is slightly less under alternative 3. The treatment effects would be the same as discussed for alternative 2, but fewer acres would be treated.

Cumulative Effects

Alternative 3 and the future Snake River Canyon unit would modify vegetation on about 22 percent of the project area and 20 percent of the area north of the Dog Creek/Coburn Creek divide and east of the Snake River. This is substantially less than that treated under the proposed action, i.e., 31 and 28 percent respectively. Table 42 displays the proportion of each vegetation cover type within the cumulative effects analysis area proposed for treatment in the reasonably foreseeable future. A substantial proportion of the area classified as aspen (31 percent) and aspen/conifer mix (37 percent) would be within treatment units, but the proportion treated would be much less than under alternative 2, i.e., 46 and 63 percent respectively. Of that, only 3 percent of the aspen and 4 percent of the aspen/conifer mix would be within thinning units. The effects of thinning and prescribed burn treatments on aspen clones is discussed above in alternative 2. Also, as discussed above, a large number of the clones found in the area are relatively small and are not reflected in the vegetation cover classification and so increases in aspen due to all treatments would be greater than table 43 indicates.

The amount of area classified as whitebark pine and whitebark pine mix is about the same between the two alternatives. As discussed above, whitebark pine would be protected during prescribed burning no change in the whitebark pine cover type is expected. In the whitebark pine mixed species areas, we would expect the increases in whitebark pine regeneration discussed above.

Summary

Table 43. Summary of effects to vegetation

Indicator	Alternative 1	Alternative 2	Alternative 3
Tree Species Composition	*Subalpine fir habitat types:* seral species lodgepole pine, whitebark pine, aspen, Douglas-fir, and Engelmann spruce die out of the stands and are replaced by subalpine fir. Little short-term change, profound long-term change. *Douglas-fir habitat types:* species compositions would change little in the short and long term.	*Subalpine fir habitat types:* species compositions in all treatment units would be “pushed” away from dominance by shade-tolerant species toward shade-intolerant species such as whitebark pine, lodgepole pine, limber pine, Douglas-fir, and aspen. Substantial short-term extending into long-term change. *Douglas-fir habitat types:* slight shift in composition toward Douglas-fir.	Same as alternative 2 but less acreage treated.
Stand Structure	No increase in structural diversity. The multi-story stands would continue being multi-story, single-story and 2-storied stands would become multi-story. It would be a slow process, with little short-term change. In the long term all stands would become multi-story with dense understories.	Increase in structural diversity within individual stands and on landscape. *Thinning treatments:* short term the post-treatment stands would have flatter diameter distributions, and if 2-story to multi-story before the thinning, would still be considered 2-story to multi-story. In the long term single-story stands would move toward 2-story and multi-story structures. *Prescribed burning treatments:* in the short term, some burned areas would be pushed toward a single-story structure while others would retain a multi-story structure, and some small areas would be pushed toward non-forested openings. In the long term, trees would become established in the openings, creating a patchy new age class to the stand structures.	Same as alternative 2 but less acreage treated.
Aspen	*Climax aspen within shrublands, grasslands and conifer/herbland ecotones:* little short-term change, long-term shift toward multi-story aspen clones. *Seral aspen:* short-term benefits in places from recent bark beetle mortality, general long-term decline in health and presence as conifers outcompete aspen.	Short-term increase in aspen suckering, clone vigor and size. Long-term increase in aspen clone size, health, age-class diversity and presence on the landscape. Greatest changes in commercial thin-noncommercial thin treatment units, less in noncommercial thin only treatment units, variable but positive results in prescribed burn units.	Same as alternative 2 but less acreage treated.

Hydrology

The following resource information and analysis summarizes the Hydrology Report (Fryxell 2011), available on the Bridger-Teton National Forest website and in the project record.

Existing Condition

This analysis covers the five 6th-order watersheds in which project activities are proposed. Table 44 lists the watersheds and their watershed condition classes assigned by the Bridger-Teton National Forest. Watershed condition classes in the project area are defined as follows.

Watershed Condition Class I: Watersheds exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. The drainage network is generally stable. Physical, chemical, and biologic conditions suggest that soil, aquatic, and riparian systems are predominantly functional in terms of supporting beneficial uses. Less than 40 percent of the area is within a threshold of concern.

Watershed Condition Class II: Watersheds exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. Portions of the drainage network may be unstable. Physical, chemical, and biologic conditions suggest that soil, aquatic, and riparian systems are at risk in being able to support beneficial uses. Between 40 and 80 percent of the area is within a threshold of concern.

Table 44. Existing watershed condition classes for the project area

Watershed	Watershed Condition Class Rating	Comments
Fall Creek	I	Riparian areas degraded due to roads, grazing, and recreation[a]
Fish Creek	I	
Mosquito Creek	I	
Snake River-Porcupine Creek	II	Due to high road miles and stream crossings
Snake River-Spring Creek	I	

a - Identified as a Focus Watershed Area in the Forest's 2011 Watershed Condition Framework evaluation.

Streams within the project area range from headwater streams dominated by sediment transport to valley bottom streams which store sediment and large woody debris. Headwater streams typically have gradients greater than 9 percent while valley bottom streams have gradients around 2 to 3 percent. Table 45 displays the miles of stream by flow regime for the portion of the watersheds within the project area.

Table 45. Stream miles by flow regime in the project area

Watershed	Miles Perennial	Miles Intermittent
Fall Creek	38.8	91.3
Fish Creek	15.5	7.3
Mosquito Creek	24.4	22.1
Snake River-Porcupine Creek	5.9	30.6
Snake River-Spring Creek	19.1	29.7

Table 46 displays the values for effects indicators related to roads. The Snake River-Spring Creek watershed encompasses and is influenced by private development. The higher total miles of road is reflected in all of the remaining indicators.

Table 46. Summary of current road-related hydrology effects indicators within 6th-order watersheds

Watershed	Total Miles of Road	Existing Road Density (mi/mi²)	Existing Miles of Road within 300 feet of Stream	Existing Road Density within Riparian Areas within 300 feet of Stream (mi/mi²)	Existing Miles of Road within Riparian Area within 300 feet of a Stream	Existing Number of Stream Crossings
Fall Creek	24.6	0.3	10.2	0.1	3.0	42
Fish Creek	39.9	1.4	9.1	0.1	1.7	48
Mosquito Creek	16.7	0.7	7.0	0	0.7	19
Snake River-Porcupine Creek	67.2	1.0	20.4	0	2.9	83
Snake River-Spring Creek	185.0	2.4	57.4	0.1	10.7	296

There are some specific ongoing impacts to streams occurring in the project area. Deep rutting occurs on a non-system road in the riparian area in the Mosquito Creek North Burn Unit, and runoff from the Wilson Fall Creek Road and grazing in the vicinity of the proposed Wilson Fall Creek Burn unit are impacting a small tributary to Pritchard Creek.

OHV use on motorized trails can affect streams by causing sediment and surface runoff. As with roads, the greatest potential for sediment contributions from motorized trails occurs within 300 feet of streams. The Snake River-Spring Creek 6th-order Watershed has 2.3 miles of motorized trail within 300 feet of streams; Fall Creek 6th-order Watershed has 1.2 miles; and the Snake River-Porcupine Creek Watershed has 0.1 miles.

Water quality: There are no impaired or threatened streams (according to section 303(d) of the Clean Water Act) identified by the State Department of Environmental Quality in the project area. There are no municipal watersheds in the project area. The Department of Environmental Quality requires that Coburn Creek, Fall Creek, Marshall Creek, Mosquito Creek, Taylor Creek, and Trail Creek continue to support the beneficial uses of drinking water, game and non-game fish, fish consumption, other aquatic life, primary contact recreation, wildlife, industry, agriculture, and scenic values.

Water quantity: There are no stream gaging stations within the project area, but measurements from a nearby station are included in the Hydrology Report for reference. Research on Fish Creek shows that snowmelt plays a role in maintaining surface flow and recharging groundwater aquifers. Perennial streams gain water from groundwater contributions in spring and summer and lose water to groundwater from October through late winter (Eddy-Miller et al. 2009).

Stream channel condition, hydrologic function, riparian vegetation, and soil erosion and deposition were assessed for 20 perennial streams within or near 14 treatment units. All but three streams were rated as being in proper functioning condition. Pritchard Creek, a tributary to Pritchard Creek, and Fall Creek were rated as “functional at risk” due to impacts to the streams and riparian vegetation from roads, recreation, and grazing.

Riparian and wetland areas are most typically found in broad valley bottoms associated with the larger drainage systems, such as Mosquito Creek, Fall Creek and Taylor Creek, but also occur in high gradient headwater channels. Each of the five watersheds in this analysis includes wetlands and ponds, and a small lake is located in the Fish Creek Watershed.

The major floodplains in the project area include Mosquito Creek, Coburn Creek, and Fall Creek. All floodplains in close proximity to proposed treatment units appear to be in properly functioning condition except for a reach of Fall Creek near Red Top Unit 4, where impacts from roads, recreation, and grazing are evident.

No springs occur in the proposed treatment units, and there are no municipal watersheds in the project area.

Environmental Consequences

Roads are the single largest source and delivery system of sediment to stream channels (Rice et al. 1972). Roads intercept both surface and ground water through hillslope cuts, and surface runoff can enter streams either directly from the road surface or through drainage ditches. These factors can result in increased sediment delivery to streams as well as higher peak flows and accelerated timing of peak flows (Tangenberg 2002; Nelson 2002). Roads and their proximity to streams is an important component of this analysis, as well as the acres affected by mechanical and prescribed fire treatments.

The effects indicators used to determine effects to water resources and compare differences in potential impacts between proposed alternatives are:

- Miles of existing road proposed for use
- Miles of existing road proposed for use within 300 feet of streams
- Miles of temporary road proposed
- Miles of temporary road within 300 feet of streams
- Number of temporary road-related stream crossings
- Number of acres of prescribed burning
- Number of mechanically treated acres
- Miles of fire control line
- Miles of fireline within 300 feet of streams
- Equivalent clearcut area results by 6th-order Watershed involved in the project
- Potential sediment delivery results generated using WEPP: Road and Disturbed WEPP models

Methodology and Scientific Accuracy

Hydrologists and soil scientists conducted field reconnaissance in July 2010, evaluating existing soil and watershed conditions and the potential effects to these resources related to the proposed action. Proper functioning condition data was noted for the majority of the visited drainages. Field notes are located in the project file (Fryxell 2010).

Both proposed mechanical and prescribed fire treatment units were visited to assess stream channel type (perennial, intermittent, or ephemeral), presence or absence of wetlands, current ground cover, and existing soil disturbance percentages.

In addition to field data, best available science, literature reviews, Forest monitoring reports, Geographical Information System (GIS) data, and professional judgment support the conclusions in this report. Riparian data for Fall Creek, collected by the Bridger-Teton National Forest was used (USDA Forest Service, 2005). Modeling evaluated existing and potential project-related changes to cumulative effects using Watershed Erosion Prediction Program (WEPP): Road, Disturbed WEPP and equivalent clearcut area models. Thresholds of concern, established by the Forest, were used in this analysis where they exist. Where there are no thresholds, other means of comparing alternatives were used.

Spatial and Temporal Context for Effects Analysis

Effects analysis for this project considers direct, indirect and cumulative effects. Spatially, for these effects the context is the boundaries of the 6th level watersheds where any treatments, roads or other project-associated activities would occur. This level of analysis was selected as it provides an appropriate scale for determining potential effects. If too broad of a scale is used, the amount of area tends to overwhelm the ability to detect changes associated with the project and when finer scales are used the amount of area is too limited in scope.

Two levels of temporal context used in the effects analysis are short-term effects, defined as less than 10 years, and long-term effects, defined as greater than 10 years. These periods are based on professional judgment and discussions with other TEAMS hydrologists.

Alternative 1 – No Action

Direct and Indirect Effects

There would be no direct or indirect effects from proposed activities under this alternative.

None of the proposed activities would be implemented under this alternative. Current management would continue fire suppression of future wildland fires. Fire behavior would not be modified, so there may be increased risk of adverse effects to the hydrology of the project area from higher intensity wildland fires.

Scheduled road maintenance would occur on national forest system roads. Existing conditions described above would continue for soils, water quality, water quantity, riparian areas, floodplain and flood-prone area function, and stream channels. “Functional at risk” ratings would remain unchanged for Pritchard Creek, the unnamed perennial tributary to Pritchard Creek, and Fall Creek due to grazing, recreational use and road-related influences on the Fall Creek.

Cumulative Effects

There are no activities proposed for alternative 1, therefore, no cumulative effects.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Potential direct effects would be primarily ground-disturbance related to mechanical treatments, fire control line generation, hauling logs, road maintenance, temporary road and landing construction, prescribed fire, and pile burning. Potential indirect effects include increased sediment introduction into streams altering water quality and channel morphology.

Although the percent of equivalent clearcut area does increase slightly (2 to 3 percent) in each of the five analysis watersheds as a result of the proposed activities, overall watershed condition classes remain the same as described in the existing condition section.

Water Quality

The introduction of sediment into streams is a potential direct effect associated with mechanical vegetation treatments, road maintenance, construction and obliteration of roads, and prescribed burning. The indirect effects of sediment delivery to streams would be any changes to turbidity and stream temperature.

Treatment Units: Predictive modeling (WEPP) indicate that erosion amounts resulting from the proposed treatments average 0.012 tons per acre, which is within the acceptable limits for soil quality standards.

Implementation of alternative 2 would increase the average probability of runoff from zero to 2 to 3 percent, and the probability of sediment delivery from 0 to 2 to 7 percent in the analysis watersheds.

Predicted erosion and sediment rates are very low with this alternative, as are probabilities for erosion, runoff and sediment delivery, and are expected to be lower with the application of best management practices during implementation (appendix B). Required no-ignition stream buffers would further limit any potential for sediment introduction into streams. Based on these factors, indirect effects to water quality would not be expected in the five 6th-order Watersheds involved with prescribed burning, mechanical treatments, or both.

Riparian areas in all proposed units are protected with project design features and best management practices, and as a result, no effects to Wyoming water quality criteria are expected.

Fire Control Lines: About 84 percent of the proposed fire control line construction would be further than 300 feet from any stream, and because design features are in place to protect resources from ground disturbance (appendix B), there would be minimal and non-detectable effects to water quality from fire control lines.

Roads: Roads considered for environmental effects include system and non-system roads used for log hauling and temporary road construction and obliteration.

Of the 1.07 miles of temporary road construction and obliteration proposed, 0.1 miles would be located within 300 feet of an intermittent stream drainage in Red Top Unit 2. Effects of this road in the Snake River-Spring Creek Watershed with respect to potential changes in turbidity or stream temperature are expected to be minimal and short term. No impacts to water quality from temporary road construction would be expected in the other four 6th-order Watersheds.

Of the 14.4 miles of existing roads proposed for log hauling, 6.0 miles are within 300 feet of streams. Sediment movement out of existing and temporary road buffers due to log haul is estimated to be a minimum[10] of 3.5 tons per year. This would be reduced by use of best management practices, and also because hauling would be spread out over several years, thereby reducing the modeled estimate. Short-term effects of log hauling with respect to turbidity may occur in the Fall Creek, Snake River-Porcupine Creek, and Snake River-Spring Creek watersheds. However, effects may not be measurable and water

[10] The amounts of sediment leaving road buffers are projected to increase due to hauling and the estimates are minimums due to gaps in available soils data. However, road-related BMPs, proven to be effective, would be implemented (USDA Forest Service 2002, Seyedbagheri et al. 1996). In addition, proposed maintenance and reconstruction would be expected to improve road drainage over the life of the project. Due to these factors no measurable direct or indirect effects to channel condition would be expected over the short or long term in any of five of the 6th level watersheds involved with the proposed project.

quality criteria would not be violated. No direct or indirect effects on water quality-related parameters such as turbidity would be expected in the Fish Creek and Mosquito Creek watersheds.

Proposed road maintenance and reconstruction would occur on existing roads in the Fall Creek, Snake River-Porcupine Creek, and Snake River-Spring Creek watersheds, which have 3.2, 1.2, and 1.6 miles of existing road within 300 feet of streams, respectively. Short-term direct effects of sediment and turbidity increases may occur in areas immediately adjacent to where road work occurs, but would likely last 1 year or less (Sugden and Woods 2007), with no effect to Wyoming water quality criteria. No change in stream temperature is expected. Because the proposed road work would improve drainage and culvert function, no long-term adverse effects to streams are expected.

Water Quantity: Potential direct and indirect effects associated with vegetation treatments include a decrease in tree canopy and an associated increase in water available for stream flow and potential modifications to peak flow timing. The proposed treatments would not open the forest canopy or increase equivalent clearcut area to the point where measurable changes in existing peak or lows flows, or average flows, would be expected.

Stream Channel Conditions: No measurable direct and indirect effects, either short or long term, to stream channel function and morphology are expected as a result of the proposed treatments, temporary road construction, log hauling, or road maintenance and reconstruction.

Wetlands and Springs: Due to project design features and best management practices which specifically protect wetlands, springs, and ponds, no measurable impacts, either short or long term, to wetlands and springs are expected.

Riparian Areas: No ignitions would occur in riparian areas. Backburning with low intensity fire could occur in riparian areas, resulting in removal of ground cover, however it is unlikely that sediment delivery to streams would occur as a result.

Floodplains: Based on the lack of projected sediment and the very low probabilities of runoff and sediment delivery, no measurable direct or indirect effects over the short or long term would be expected.

Cumulative Effects

For municipal watersheds, water quantity, wetlands, floodplains, riparian areas, springs, stream channel conditions, and stream temperature, no direct and indirect effects would be expected, and therefore no cumulative effects.

Equivalent clearcut area analysis on the Fall Creek, Fish Creek, Mosquito Creek, Snake River-Porcupine Creek and Snake River-Spring Creek watersheds using ground-disturbing activities indicates:

- The biggest increase in equivalent clearcut area values would occur in the Fall Creek and Mosquito Creek watersheds due to the low equivalent clearcut area value for existing conditions.
- The smallest increases would occur in the Snake River-Spring Creek Watershed due to the high existing equivalent clearcut area values.

Given this information, short-term potential increases in sediment would be expected primarily due to road-related activity. However, given the fact that the roads proposed for use occur in three different watersheds the short-term potential increases may not be detectable in these 6th-order Watersheds.

Over the long term, watershed conditions would be expected to remain as Watershed Condition Class I and II or improve, and existing levels of cumulative effects reduced, due to the reduced fire behavior, less

aggressive suppression actions, and drainage improvements to existing roads. These reductions though may not be discernible at the 6th-order Watershed level.

Alternative 3 – Reduce Potential Impacts to Special Areas and Wildlife Habitat

Direct and Indirect Effects

The magnitude of potential effects is the same as those described for alternative 2, however, the extent of the effects is reduced due to fewer acres and miles of proposed activities.

Water Quality

Treatment Units: Modeling shows a 10 percent reduction in potential erosion as compared to alternative 2. As with alternative 2, the amount of average sediment generated would be non-detectable, with probabilities of erosion ranging from 2 to 7 percent and the probability of sediment delivery to streams at 2 to 3 percent, as compared to 0 percent for the no-action alternative. No direct or indirect effects to water quality from the proposed treatments are expected, and any differences between alternatives may not be discernible.

Fire Control Lines: About 92 percent of the proposed fire control line construction would be further than 300 feet from any stream, and because design features are in place to protect resources from ground disturbance, there would be minimal and non-detectable effects to water quality from fire control lines. No direct or indirect effects, short or long term, related to fireline construction are expected, and no difference in effects among the alternatives is expected.

Temporary Roads: Alternative 3 proposes 0.2 miles of temporary road construction and obliteration in the Fall Creek Watershed and 0.8 miles in the Snake River-Spring Creek Watershed, which is the same as alternative 2. Direct and indirect effects, both short and long term, would be the same as discussed under alternative 2. As a result, there is no difference in potential effects between alternative 2 and 3.

Existing Roads: Alternative 3 would use 0.2 miles fewer national forest system roads for log haul than alternative 2. No discernible difference in direct and indirect effects, both short and long term, would be expected between alternatives 2 and 3. Although increase traffic has been shown to increase the amount of sediment generated under alternatives 2 and 3, no discernible difference between these two alternatives, when compared to alternative 1 would be expected. No impacts to water quality, including stream temperature or turbidity, would be expected as discussed under alternative 2.

No impacts to water quantity, stream channel conditions, springs, and floodplains are expected in any of the five analysis watersheds for the reasons discussed under alternative 2.

Expected short-term and long-term direct and indirect effects to riparian areas would be the same in any of the five analysis watersheds as discussed under alternative 2.

Cumulative Effects

Cumulative effects would the same as discussed under alternative 2, but of a lesser magnitude and extent. Any difference in effects would likely be non-detectable at the 6th-order Watershed level.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The proposed action alternatives (alternatives 2 and 3) and the no-action alternative are consistent with, and in compliance with, Forest Plan water related goals, objectives, standards and all other applicable laws and direction.

Summary

Both action alternatives propose prescribed burning, thinning via mechanical treatment, and hand cutting, hand piling and burning, general road maintenance, construction and obliteration of temporary road, road reconstruction, and construction and rehabilitation of fire line. The direct and indirect effects are the same for both alternatives. However, due to treating fewer acres, reconstructing fewer roads and constructing, and obliterating less fire control line, the extent of potential effects would be less under alternative 3 when compared to alternative 2.

Direct and indirect effects related to project implementation are generally expected to be minimal for both alternatives based on modeling and the implementation of project design features and the implementation of best management practices. The amounts of sediment leaving road buffers are projected to increase due to hauling. However, modeling does not take into account effectiveness of best management practices or the fact that hauling would take place over a three year period. As a result, direct or indirect effects on water quality related parameters such as turbidity may occur primarily during the use of haul roads and effects would be expected to be short term. Effects may not be measurable and water quality criteria would not expect to be violated for both alternatives 2 and 3. Short term direct and indirect effects may also occur over the short term due to road reconstruction/maintenance-related ground disturbance. As a result, short-term, increases in sediment and turbidity may occur in areas immediately adjacent to where maintenance or reconstructive activities have occurred. Any increases in sediment would be expected to be limited to one-year or less (Sugden and Woods 2007). Increases in sediment-related measurements may be measurable, but water quality criteria would not be expected to be violated under both alternatives due to implementation of project design features and best management practices.

Under alternative 2 over the long term watershed conditions would be expected to remain as watershed condition class I and watershed condition class II or improve, and existing levels of cumulative effects reduced, due to the reduced fire behavior and drainage improvements to existing roads. These reductions though may not be discernible at the 6th watershed level. Under alternative 3 cumulative effects would be expected to be the same as alternative 2 but of a lesser magnitude and extent. Any difference in effects would likely be non-detectable at the 6th watershed level.

The Teton to Snake Project would comply with the Bridger-Teton Forest. The proposed silvicultural and fuel treatments in each alternative are not expected to adversely affect hydrologic resources as a result of project design criteria and best management practice implementation, regardless of alternative. Design features and best management practices would help to ensure that resource safeguards would be in place that would prevent adverse effects on hydrologic resources from occurring.

Table 47. Summary of indicators and related data

Indicator	6th-order Watershed	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3
Miles of Proposed Temporary Road	Fall Creek	0	0.2	0.2
	Snake River-Spring Creek	0	0.8	0.8
Miles of Proposed Temporary Road within 300 feet of Streams	Snake River-Spring Creek	0	0.1	0.1
Number of Temporary Road-related Stream Crossings	All 6th-order watersheds	0	0	0

Indicator	6th-order Watershed	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3
Miles of Existing Road Proposed for Use	Fall Creek	0	5.7	5.7
	Fish Creek	0	2.2	0.1
	Mosquito Creek	0	0	0
	Snake River-Porcupine Creek	0	2.2	2.2
	Snake River-Spring creek	0	5.5	5.2
Miles of Existing Road Proposed for Use within 300 feet of Streams	Fall Creek	0	3.2	3.2
	Fish Creek	0	0	0
	Mosquito Creek	0	0	0
	Snake River-Porcupine Creek	0	1.2	1.2
	Snake River-Spring Creek	0	1.6	1.6
Number of Acres Proposed for Prescribed Burning	Fall Creek	0	5,117.1	2,966.6
	Fish Creek	0	3,025.5	2,459.4
	Mosquito Creek	0	2,802.2	2503.1
	Snake River-Porcupine Creek	0	4.291.9	1,651.3
	Snake River-Spring Creek	0	4,722.8	2,932.9
Number of Acres Proposed for Mechanical Treatment	Fall Creek	0	528.0	194.3
	Fish Creek	0	382.4	363.9
	Mosquito Creek	0	89.6	59.6
	Snake River-Porcupine Creek	0	0	0
	Snake River-Spring Creek	0	1,526.5	1,137.9
Total Miles of Fire Control Line	Fall Creek	0	1.0	0
	Fish Creek	0	1.1	1.1
	Mosquito Creek	0	0.2	0.2
	Snake River-Porcupine Creek	0	4.3	2.9
	Snake River-Spring Creek	0	4.5	2.7
Miles of Fire Control Line within 300 feet of Streams	Fall Creek	0	0.3	0
	Fish Creek	0	0.2	0.2
	Mosquito Creek	0	0.1	0.1
	Snake River-Porcupine Creek	0	0.6	0.3
	Snake River-Spring Creek	0	0.6	0.3

Soils

The following resource information and analysis summarizes the Soils Report (Burgoyne 2011), available on the Bridger-Teton National Forest website and in the project record.

Existing Condition

Soil quality in the project area was assessed using the following indicators:

- Percent detrimental soil disturbance: defined as a decrease in soil porosity, or increase in soil bulk density, soil displacement, soil puddling, or severely burned soil that impairs site productivity
- Percent cover by category: rock, wood, vegetation, and litter
- Coarse woody debris (tons per acre)
- Litter and duff depths
- Percent of rock in the uppermost soil horizon
- Noted slope stability, erosion, and other soil concerns
- Verified soil mapping units

Soil Resources

There are two soil properties that are most influenced by timber harvest and fuel treatments, and closely related to forest integrity within the constraints of climate and topography: (1) soil organic matter (soil productivity and nutrients), and (2) soil porosity (Powers 1998). These soil properties are components of soil productivity as a whole and are used as a proxy to soil productivity because they can be measured.

These two properties are also the primary soil concerns for the project area. Soil organic matter is influenced by fire, silvicultural prescriptions, timber harvests, and decomposition and accumulation rates. Soil porosity is most influenced by mechanical compaction and a lack of biophysical resiliency.

Soil Organic Matter

The character of forest soil organic matter influences many critical ecosystem processes, such as the formation of soil structure, which in turn influences soil gas exchange, soil water infiltration rates and soil water-holding capacity. Soil organic matter is also the primary location of nutrient recycling and humus formation, which enhances soil cation exchange capacity and overall fertility.

These processes have direct and tremendous effect on site productivity and sustainability. Organic matter is the one component of the soil resource that, if managed correctly, can actually be improved by human activity. Manipulation of the organic constituents of the soil may be the only practical tool available for mitigating effects of harvesting systems that remove standing trees and dead and down trees, or cause extensive soil disturbance. Of the many organic materials incorporated in a forest soil, the woody component is in many ways the most important. To protect the sustainable productivity of the forest soil, a continuous supply of organic materials must be provided, particularly in harsh environments (Jurgensen et al. 1987).

Coarse Woody Debris and Soil Wood

Coarse woody debris and organic matter are good indicators of site resiliency and overall forest health. Organic matter including the forest floor and large woody material is essential for maintaining ecosystem function by supporting moderate soil temperatures, improved water availability, and bio diversity (Page-Dumroese et al. 2010). Coarse woody debris amounts meet recommendations throughout the project area, except in units Phillips Bench 3 and Singing Trees 1. For these forest types 5 to 10 tons per acre of large woody material is recommended (Graham et al. 1994), these units are below 5 tons per acre. Large woody material, both standing (future recruitment) and down is important so site resiliency and recovery.

Table 48. Current conditions in the surveyed units (includes temporary roads, landings, and firelines within these units)

Unit	Current Coarse Woody Debris (Tons/Acre)	Coarse Fragments (percent)	Total Organics (cm)	Current Disturbance (percent)	Reason for Disturbance	Slope %)	Aspect
Powerline Unit 1	28	10	5	3	A few old skid trails	20–60	Varies
Recreation Trail Unit 2	5	10–15	4	3	One old skid trail		
Recreation Trail Unit 3	30	10	6	3		0–10	
Red Top Unit 2	15	5	5	4			E
Trails End		5–10	6	4		10–40	
Philips Bench Unit 1	10	10–100	4	7	Skid trails and compaction and displacement from mountain bike use	20–70	Varies
Red Top Unit 4	13	5	4	7	Compaction from cattle	20–50	N/NE
Singing Trees Unit 1	3	5	5	8	Some old skid trails that are still compacted	5–70	N
Recreation Trail Unit 1	10	10	4	10	Some old skid trails that are still compacted, one old road	10–25	NE
Singing Trees Unit 4	10	5	3	10	All disturbance is from patch clearcuts in 1976	5–35	NE
Red Top Unit 1	10	5	4	10	Old roads and skid trails fairly common	5–30	W
Philips Bench Unit 4	10	30–35	5	11	Skid trails from old logging	20–25	W
Singing Trees Unit 2	7	0–5	3	11	Skid trails with compaction; unit thinned in 2003		
Philips Bench Unit 5	6	5–15	4	12	Skid trails	5–60	
Philips Bench Unit 3	2	10	2	23	Very high disturbance from old roads and skid trails, some soil displacement also present	5	NW

Currently, coarse woody debris (11 tons per acre average) is prevalent throughout the harvest units (table 48) as is the recruitment of large woody debris. Large-diameter trees and snags were present in the project

area. Some trees would die from prescribed burning prescriptions and contribute to woody debris recruitment (standing dead trees and trees killed from fire count towards meeting coarse woody debris standards). This does not apply to units or portions of units that are 300 feet from private property boundaries.

Residue left after advanced brown-rot decay is a brown, crumbly mass composed largely of lignin. In healthy forest ecosystems, especially coniferous forests, the upper-most soil horizon contains a significant portion of brown-rotted wood residues. The sponge-like properties of advanced brown-rotted wood act as a moisture and nutrient sink. Because of the high lignin concentrations, and low carbohydrate rates, it persists in the forest for a long time (Blanchette 1995).

Ground Cover and Forest Floor

Soil cover from organic matter averaged about 94 percent across all the units surveyed. The other 6 percent was bare soil or rock cover. In Phillips Bench Unit 3, 20 percent bare soil was found. This was likely due to intensive past harvesting activities. Average observed depth of litter (table 48) was 2 centimeters and duff was 2.2 centimeters (total organics is 4.2 centimeters). The average optimum level of fine organic matter is 21 to 30 percent (Graham et al. 1994), which equates to 2 to 6 centimeters of surface litter and humus, depending on forest type. Optimum levels of fine organic matter relate to ectomycorrhizae fungus, which is a good indicator of healthy forest soil (Graham et al 1994).

In addition to cover directly on the soil surface, cover from vegetation can provide litter contributions in the future. Vegetative cover in the ground-based thinning units was generally good, between 60 and 100 percent. Some of the units have large open patches with no shade. Shade and vegetative cover are important factors in the recovery of these sites. Charcoal was also found in all the units indicating this ecosystem experiences fire and may therefore have shallower litter/duff layers overall. Some of the charcoal is likely from site preparation activities from past management as well.

Soil Porosity

Within the Teton to Snake Project Area, soil porosity has been reduced on the skid trails and landings within the proposed treatments that have been harvested in the past. Reduced soil porosity leads to reduced ability of soils to exchange oxygen and carbon dioxide thus affecting the ability of soil organisms to survive. Reduced soil porosity also impedes root growth.

Soil porosity refers to the amount and character of void space within the soil. In a "typical" soil approximately 50 percent of the soil volume is void space. Pore space is lost primarily through mechanical compaction. Three fundamental processes are negatively impacted by compromised soil pore space:

- Gas exchange
- Soil water infiltration rates
- Water holding capacity

Compaction Hazard

Compaction hazard is a rating of the relative susceptibility of soils to compaction from equipment. Compaction hazards are associated with thinning units where ground based machinery would be utilized. Within the proposed thinning units under alternative 2, almost all the soils have a moderate compaction hazard, with 2 percent having a high compaction hazard, which is similar under alternative 3 as well. Landtypes with high compaction hazards are located in riparian areas and would be avoided by ground-based equipment. A moderate compaction hazard rating is due to the fact that most of the soils have lower

percentages of coarse fragments and are loamy in texture. Soils with a moderate compaction hazard rating would suffer a significant reduction in their long-term natural productivity level as a result of intensive use by wheeled off-road vehicles. 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.

Surface Erosion

Surface erosion potential is a rating of the relative susceptibility of exposed soils to sheet and rill erosion. Surface erosion hazards are most important in prescribed burn units in the Teton to Snake Project Area. Within the proposed prescribed burn units, 3 percent of soils have low surface erosion potential, 16 percent moderate erosion potential, and 81 percent have high erosion potential under alternative 2. Under alternative 3, the numbers are very similar. The potential for soil erosion concerns is not so much associated with treatments as with existing roads (Cacek 1998). The dominant processes in roaded areas are surface erosion from bare soil areas of roads, including the cutslope, fillslope, and travelway. Also erosion hazards are determined based on no soil cover. All prescribed fire and harvest units would have adequate soil cover following treatments.

Revegetation of cutslopes and fillslopes is often difficult due to lack of soil moisture, organic material, low productivity potential, and desiccation of seeds and seedlings, especially on south-facing slopes. On moist slopes, revegetation efforts are more successful since erosion of road cut slopes and fill slopes is generally lower. Cut and fill slopes are generally vegetated in the project area. Road erosion and sediment yield usually decline after construction (Jones 2000; Switalski et al. 2004), but can provide a chronic, long-term source of sediment to streams. Periodic large pulses of erosion may occur during intense water yield and overland flow events in interaction with road drainage systems. Roads and their associated impacts are analyzed in detail in the project area hydrology report, located in the project record.

Slope Stability (Mass Failure)

Removal of forest canopy and cover from either clearcutting or wildland fire increases landslide occurrence (Gray and Megahan 1981; Megahan et al. 1978). This is primarily due to root decay, soil disturbance, increased snow accumulation and altered melting rates, and soil water increases from reduced interception and transpiration.

Soil stability was determined as an attribute of the soil surveys conducted throughout the Bridger-Teton National Forest. Each soil map unit is rated for its risk of failure using one of four hazard levels. This rating is based on land characteristics which indicate potential for mass failures.

A mass failure hazard rating of stable indicates that evidence of past mass movement is not discernible and land characteristics are not conducive to future mass movement. A marginally stable rating indicates that evidence of past movement has not been discerned but there are land characteristics which are conducive to mass movement. A marginally unstable rating indicates that evidence of past mass movement exists but no current movement is discernible. An unstable rating indicates that the site is actively moving and probabilities of increased or additional movement, even without man-caused disturbances, are high (USDA Forest Service 1985). Mass failures detrimentally disturb soils because organic matter and even subsurface layers of the soil can be carried down slope during a failure. Sixty-one percent of landtypes in the units have stable or marginally stable soils; 37 percent have marginally unstable soils; and 2 percent have unstable soils. Marginally unstable soils are associated with landtypes 340, 391, 455, 506, 610, 618, 646, 651, and 654. Field review found that these slopes are stable at this time, but evidence of previous slumping exists. Unstable soils are associated with landtypes 484 and 456 on Munger Mountain. These unstable soils have the potential for mass failure and slumping.

Little research has been conducted to determine if partial cutting affects landslide rates. Megahan et al. (1978) found that landslide occurrence increased only slightly when overstory canopy was reduced from 100 percent to 11 percent, but increased dramatically when canopy closure went below 11 percent. They also found that crown cover from shrubs affected landslide occurrence after 80 percent crown removal and indicated that landslide occurrence is more sensitive to shrub than tree crown removal.

Environmental Consequences

The effects of the proposed activities on soils are indicated by changes in soil productivity as measured by acres of detrimental soil disturbance. Detrimental soil disturbance includes potential erosion, compaction, loss of organic matter, and soil displacement. Indicator measures are:

- Acres of detrimental soil disturbance-includes harvesting, prescribed fire
- Miles of temporary road
- Number of new landings
- Miles of fire control line

Methodology and Scientific Accuracy

During July of 2010, all units proposed for ground based activities and several areas proposed for prescribed fire were surveyed. For the soil resource, the treatment unit serves as the “analysis area,” as we do not expect activities within units to influence soil characteristics outside of unit boundaries.

The project file contains area-specific field notes and specific methods used for sampling. The sampling protocol used was a modified Howes Survey (Howes 2000). This soil effects protocol is designed to conform to Regional standards and the Regional standards are designed to comply with the National Forest Management Act and conform to the Region 4 Soil Management Direction and Soil Quality Standards and the Bridger-Teton Forest Plan.

The natural soil biophysical resiliency of each unit was assessed to gain insight that would tie current conditions to proposed treatments and cumulative effects. Understanding the complex web of processes and elements that maintain how and why the soil is resilient to disturbance is key to sustained soil productivity.

In determining a significant change in productivity, a 15 percent reduction in inherent soil productivity potential would be used as a basis for setting threshold values. This 15 percent reduction is generally considered a significant reduction of productivity if occurring over 15 percent of a treatment unit. Threshold values would apply to measurable or observable soil properties or conditions that are sensitive to significant change. The threshold values, along with aerial extent limits, would serve as an early warning signal of reduced soil productive capacity, where changes to management practices or rehabilitation measures may be warranted. Management activities have potential to cause various types and degrees of disturbance. Soil disturbance (a measure of soil productivity) is categorized into compaction, displacement, puddling, severe burning, and erosion.

Information Sources

Field soil quality assessment of existing soil conditions were performed by a professional journey level soil scientist and trained soil crews in July 2010. A modified Howes Soil Condition Assessment protocols were used; field surveys consisted of random transects with confidence intervals at or above 80 percent +/- 5 percent (Page-Dumroese et al. 2009). A soil prescription was completed in coordination with the

project silviculture forester and fuels specialist. Soil survey protocol details can be found in the project file.

Incomplete and Unavailable Information

There is no incomplete or unavailable data for soils.

Spatial and Temporal Context for Effects Analysis

Spatial and temporal boundaries set the limits for selecting the actions most likely to contribute to cumulative effects (USDA-FSH 1909.15, 15.2).

Fuel treatment units or groups of units are considered the activity area and are the spatial boundary for which direct, indirect, and cumulative effects on soil productivity were analyzed. Temporary roads, skid roads, firelines and landings within unit boundaries are included in the analysis area. System roads and long-term specified roads are considered part of the Forest Transportation System and are not considered for detrimental soil damage.

Soil productivity is a site specific characteristic. Loss of soil productivity in a treatment unit alone would not lead to a loss in soil productivity in an adjacent stand or other areas across a watershed.

The analysis areas for consideration of cumulative effects are the same that are used for the existing and direct/indirect effects analysis. Assessment of cumulative effects on soil productivity at scales larger than the specific treatment unit boundary (such as the watershed scale) misrepresents the effects of management activities by diluting the site-specific effects across a larger area. In contrast to soil productivity, processes such as erosion regimes and hydrologic functions occur at a watershed scale and have been analyzed in the hydrology section of this document, and in the project Hydrology Report, located in the project record..

The temporal scale for assessing soil resource environmental effects includes both short- and long-term impacts. For the purposes of this analysis, short-term effects are defined as those that occur within about 10 years following proposed vegetation treatments. Long-term effects are defined as those that occur within about 10-20 years or more following proposed vegetation treatments.

Alternative 1 – No Action

Current management would continue, which includes continued suppression of wildfires. No adverse impacts to soils would occur. Recovery of existing impacted soils would continue through natural means (freeze/thaw cycles, root penetration into compacted soils,and burrowing animals). Litter and duff accumulations would continue to increase, unless removed by wildfire. Overall, trends towards increased soil productivity on those units with existing levels of detrimental soil disturbance would occur, but gradually. There would be no direct or indirect adverse effects to soils, and therefore no cumulative effects.

Alternative 2 (Proposed Action) and Alternative 3 (Reduce Potential Impacts to Special Areas and Wildlife Habitat)

Direct Effects and Indirect Effects

Proposed activities would have long- and short-term direct negative effects on forest soils. However, by implementing the project design features (appendix B), the project would meet the Region 4 soil quality standards, and would therefore not have a significant impact to soils.

Effects that may reduce soil productivity and lead to soil disturbance include:

- Compaction;
- Rutting and displacement;
- Severely burned soils;
- Degradation of the litter layer and soil organic matter caused by increased decomposition rates and lack of appropriate annual litter contributions;
- Lack of coarse woody debris; and
- Possible weed incursions.

Table 49 lists expected effects based on a variety of proposed treatments. The level of soil disturbance increase depends primarily on the amount or lack of existing skid trails. Activity units that have had little prior disturbance would show a greater incremental increase in potential detrimental disturbance than those units that contain a network of already existing skid trails. The resulting total disturbance within a unit is not necessarily the sum of existing disturbance and potential disturbance from proposed activities. Units with greater current disturbance would likely have less additive disturbance because disturbance caused from proposed activities would overlap existing disturbance. If there were no disturbance in a unit, it is predicted that ground based harvesting with grapple piling of slash or prescribed fire would add 13 percent disturbance to a unit and prescribed fire/hand pile and burn would add approximately 1 percent detrimental soil disturbance to a unit (Neihoff 2002; Vander Meer and Archer 2009; ground-truthing). If a unit already has existing skid trails or other disturbance, new disturbance would overlap existing disturbance in many places.

Table 49. Direct effects from proposed treatments by unit

Unit	Existing Detrimental Disturbance	Potential Disturbance following Proposed Activities			
		Alternative 2		Alternative 3	
		percent of Unit	Acres	percent of Unit	Acres
Phillips Bench Unit 1	7 percent	13 percent	8	8 percent	5
Phillips Bench Unit 5	12 percent	13 percent	25	13 percent	24
Red Top Unit 1	10 percent	13 percent	52	13 percent	52
Red Top Unit 2	4 percent	13 percent	9	13 percent	9
Phillips Bench Unit 2	NA	1 percent	2	1 percent	1
Phillips Bench Unit 7	NA	1 percent	1	1 percent	1
Phillips Bench Unit 3	23 percent	23 percent	2	23 percent	2
Phillips Bench Unit 4	11 percent	12 percent	1	12 percent	1
Phillips Bench Unit 6	NA	1 percent	1	13 percent	14
Powerline Unit 1	3 percent	4 percent	10	4 percent	6
Recreation Trail Unit 1	10 percent	11 percent	2	11 percent	2
Recreation Trail Unit 4	NA	1 percent	0	1 percent	0
Recreation Trail Unit 3	3 percent	4 percent	2	4 percent	1
Singing Trees Unit 4	10 percent	11 percent	5	11 percent	5
Red Top Unit 5	NA	1 percent	2	1 percent	1

Unit	Existing Detrimental Disturbance	Potential Disturbance following Proposed Activities			
		Alternative 2		Alternative 3	
		percent of Unit	Acres	percent of Unit	Acres
Trails End Unit	4 percent	5 percent	6	-	-
Red Top Unit 3	NA	1 percent	1	-	-
Red Top Unit 4	7 percent	8 percent	3	8 percent	1
Singing Trees Unit 1	8 percent	9 percent	10	9 percent	6
Singing Trees Unit 2	11 percent	12 percent	8	12 percent	5
Highland Hills Unit 1	NA	1 percent	1	-	-
Recreation Trail Unit 2	NA	1 percent	2	1 percent	1
Recreation Trail Unit 7	NA	1 percent	0	-	-
Recreation Trail Unit 6	NA	1 percent	0	-	-
Recreation Trail Unit 5	NA	1 percent	0	1 percent	0
Phillips Canyon BURN Unit 1	NA	1 percent	12	1 percent	6
North Fork Phillips Canyon Burn Unit 1	NA	1 percent	19	1 percent	19
Black Canyon Burn Unit 2	NA	1 percent	3	-	-
Black Canyon Burn Unit 1	NA	1 percent	6	1 percent	6
Mosquito Creek North Burn Unit	NA	1 percent	26	1 percent	23
Singing Trees Burn Unit 1	NA	1 percent	4	1 percent	4
Singing Trees Burn Unit 2	NA	1 percent	2	1 percent	2
Singing Trees Burn Unit 3	NA	1 percent	5	1 percent	3
Taylor Mountain Burn Unit 5	NA	1 percent	3	-	-
Taylor Mountain Burn Unit 3	NA	1 percent	16	1 percent	4
Taylor Mountain Burn Unit 4	NA	1 percent	4	1 percent	4
Taylor Mountain Burn Unit 2	NA	1 percent	4	1 percent	9
Highland Hills Burn	NA	1 percent	3	1 percent	4
Trails End Burn	NA	1 percent	3	1 percent	3
South Fork Fall Creek Burn	NA	1 percent	10	1 percent	10
Coburn Creek Burn Unit 3	NA	1 percent	1	-	-
Coburn Creek Burn Unit 2	NA	1 percent	10	-	-
Coburn Creek Burn Unit 1	NA	1 percent	16	-	-
Fall Creek Ranch Burn Unit 1	NA	1 percent	7	-	-
Fall Creek Ranch Burn Unit 2	NA	1 percent	3	-	-
Wilson Fall Creek Burn	NA	1 percent	4	-	-
Munger Mountain Burn Unit 1	NA	1 percent	17	1 percent	17
Munger Mountain Burn Unit 2	NA	1 percent	23	-	-
Total Acres			**354**		**251**

Mechanical Treatments

Effects from ground-based timber harvesting that may reduce soil productivity and lead to soil disturbance include:

- Compaction;
- Rutting and displacement;
- Degradation of the litter layer and soil organic matter caused by increased decomposition rates and lack of appropriate annual litter contributions;
- Lack of coarse woody debris; and
- Possible weed incursions.

Effects from past logging operations are detectable up to 80 or more years. Newer logging systems create less soil disturbance. Proposed activities use techniques that maintain or promote natural soil bio-physical resiliency. The effect of proposed activities should be relatively short compared to techniques used in the past. If all natural elements and processes remain intact, we can expect soil impacts to be nearly undetectable within 20 to 40 years based on professional judgment and experience on these soil types. Freeze-thaw cycles, soil organisms, burrowing animals, and root growth would help alleviate compaction and rutting. Soil displacement may last longer, but design features minimize soil displacement.

Phillips Bench Unit 3 currently exceeds the USDA Forest Service Intermountain Region 4 soil quality standards, but no ground-based treatment would occur in this unit, hand thinning and hand piling and burning would occur in this unit. Following implementation (including project design features) this unit would not exceed its current levels of detrimental soil disturbance. Any soil disturbance is not expected to be a substantial or permanent impairment.

Ground-based tractor harvest activities are proposed on 728 acres (222 acres in alternative 3) in Phillips Bench units 1 and 5 and Red Top units 1 and 2. Ground-based equipment would be restricted to operate only during dry or frozen soil conditions. Detrimental disturbance levels were estimated using Niehoff (2002) as well as ground-truthing, and take into account best management practices described in Niehoff (2002). Ground-based techniques are expected to create approximately 13 percent detrimental soil disturbance. This disturbance would not necessarily be additive to the current disturbance, but would overlap with existing disturbance. Reuse of existing skid trails and landings would decrease additive disturbance. None of these units would exceed Region 4 soil quality standards following implementation.

Units proposed for hand thinning are expected to have little to no detrimental soil disturbance. No ground-based equipment would be in the units; therefore, no compaction, soil displacement, rutting or erosion is expected.

Compaction can indirectly lead to decreased water infiltration rates, leading to increased overland flow and associated erosion and sediment delivery to stream. Increased overland flow also increases intensity of spring flooding, degrading stream morphological integrity and low summer flows. Compaction indirectly leads to decreased gas exchange, which in turn degrades sub surface biological activity and above-ground forest vitality.

Harvest operations remove biomass and can remove site organic matter, thus indirectly affecting nutrient cycling. Generally, nutrient losses are proportional to the volume of biomass removed from a site. Nutrients are lost during harvesting by removing the stored nutrients in trees, and additional nutrients are lost if the litter layer and woody debris are removed. Yarding unmerchantable materials, which extracts larger amounts of biomass, especially nutrient-rich foliage, compared to conventional sawlog, cut-to-

length or thinning operations, removes a larger amount of the nutrients from the site. The exact amount of nutrients lost from a particular site would vary with forest types and particular site conditions (Grier et al. 1989). The amount of nutrients present in the trees would also vary with stand age and development of the humus layer (Grier et al. 1989). Moreover, the greater the proportion of nutrients stored in trees, the greater the potential for site degradation and declines in productivity after harvesting operations. The data suggest that nutrient losses from yarding unmerchantable materials are considerably greater when compared to conventional sawlog harvesting for all nutrients. In units where nutrient loss is a concern, lop and scatter techniques would be utilized (Recreation Trail units 2, 5, 6 and 7).

Indirect effects of soil nutrient loss include reduced growth and yield and increased susceptibility to pathogens, such as root disease (Garrison and Moore 1998; Garrison-Johnston 2003) and insect infestation (Garrison-Johnston et al. 2004). Precipitation (Stark 1979) and weathering of rocks would continue to make additional nutrients available on site. Annual needle, leaf, and twig fall, forbs, and shrub mortality would continue to recycle nutrients as well.

Prescribed Fire Treatments

Effects from fuel treatments could include severely burned soil, litter loss, nutrient consumption, increased available nitrogen, erosion and possible weed incursions.

Activity-fuel treatments that may affect soils include approximately 728 acres of grapple piling in alternative 2 (658 acres in alternative 3), 1,798 acres of hand piling and burning (1,069 acres in alternative 3), and 20,244 acres of prescribed fire (11,318 acres in alternative 3). See table 49 for a list of fuel treatments by unit.

The impacts of burning depend on levels of fire severity. Slash piles would result in the highest severity from concentrated burning. Litter and duff consumption is likely to occur at high rates in pile burns. Small, spread-out piles would minimize litter loss. Prescribed underburning typically result in a positive benefit with a mosaic pattern of burned and unburned ground and predominately low severity burn. Effects are significantly reduced when soil moisture levels are above 25 percent. Prescribed fire adds about one percent detrimental soil disturbance and recovery is about 10 years (Vander Meer and Archer 2009, Niehoff 2002).

Only areas that could be reasonably accessed would be treated and no excavation would occur to facilitate entry for grapple piling. The residual logging debris that would not be grapple piled and burned would increase potential fire intensity and severity for a few years until snow could compress the material and the fine organics would decompose.

Prescribed fire can increase available nitrogen for 1 to 2 years (Choromanska and DeLuca 2002). Burning slash piles could create extremely high temperatures in concentrated areas and would lead to volatilization of nitrogen, and loss of phosphorus and potassium (DeBano 1981). If litter layers and organic matter are kept intact throughout the rest of the stand, nutrient losses would be minimal from burning slash and would be localized. Nitrogen-fixing plants can colonize sites following fire and help restore nitrogen in the ecosystem (Newland and DeLuca 2000; Jurgensen et. al. 1997). Following fire, soil erosion can increase, which could also reduce the nutrient pool (Megahan 1990). Generally, if plants colonize sites following fire, nutrient levels can reach pre-fire levels quickly (Certini 2005). Charcoal deposited following fire also adds carbon to the soil (DeLuca and Aplet 2008).

Noxious weeds following burning have the potential to impact long-term soil productivity since their presence can affect soil chemical properties. Knapweed can affect their growing environment, shifting soil properties to their favor (D'Antonio and Vitousek 1992). These changes can play out in long-term

shifts in plant composition as observed by Vinton and Burke (1995). Specific design features to limit spread and actively treat known populations is expected to minimize the potential of these effects.

Temporary Roads

Temporary road construction causes soil compaction, displacement and reduced soil hydrologic and biologic function.

Mileage of new temporary road is used as an effects indicator. Approximately 1.07 mile of new temporary road is proposed for this project and would be used to access Red Top units 1 and 2 and Phillips Bench units 1 and 5.

Newly constructed temporary road rehabilitation would be used to recover this area as soon as harvest operations finish. Recovery would likely be slower than other harvest-related disturbance given the high traffic. Current temporary road construction practices address the potential negative impacts with stringent rehabilitation efforts where temporary road templates are restored to contour. Topsoil is conserved and replaced where possible to further recovery. Road fill is covered in slash for biological and site amelioration.

Hydrological recovery is expected within the first 10 years with soil infiltration rates lower than natural forest rates (Luce 1997; Foltz and Maillard 2003). For the long term, infiltration rates improve over time as freeze/thaw and plant roots improve soil porosity though rates would remain lower than adjacent natural forest soil (Switalski et al. 2004). Soil biological function restores as forest floor and native plant communities returns.

Landings

Effects from landing construction could include soil compaction, litter loss, loss of coarse woody debris, increased potential for erosion, nutrient losses, loss of soil hydrologic and biologic function and possible weed incursions.

Log landings are expected to be 0.25 to 0.5 acres in size. Alternative 2 proposes 32 landings and alternative 3 proposes 27 landings. Existing landings sometimes receive minor blading or small tree removal in order to prepare them for use. Erosion control measures would be used if needed to avoid movement from landing sites during maintenance and construction, therefore resulting sedimentation is expected to be minimal. All landings used would be rehabilitated and returned to pre-implementation conditions. Rehabilitation measures include recontouring surfaces, ripping the surface to reduce compaction, seeding the surface where bare mineral soil is present and placing slash and other large woody debris along the surface to reduce soil erosion.

Subsoiling has been shown to be an effective tool in treating compacted soils in soil textures found in the project area that are susceptible to compaction including gravelly silt loams found in the project area (Kolka and Smidt 2004). Landing subsoiling has been shown to be effective at reducing soil bulk density as long as soil moisture levels are not high (Carr 1989).

Fire Control Line Construction (Handline)

Effects from handline construction are generally minimal and include soil displacement and loss of organic matter from hand digging. Hand lines would be dug to bare mineral soil, which could also increase erosion potential in these areas while they are in use.

Eleven miles of fire control handline may be constructed for this project under alternative 2 (6.8 miles under alternative 3) within the following units: North Fork Phillips Canyon Burn Unit 1, Black Canyon Burn Unit 2, Singing Trees Burn units 1, 2, and 3, Taylor Mountain Burn units 2, 3, and 4, Highland Hills

Burn Unit, Coburn Creek Burn units 2 and 3, and Munger Mountain Burn units 1 and 2. These hand lines would be rehabbed following treatment to avoid erosion and encourage vegetation growth. Although hand lines are disturbing soil, less than one percent of a unit would be disturbed by constructing hand lines. Existing trails, ridgelines, areas of thinner vegetation, and hose-lays would be used as control lines where possible.

Snag Removal

Snag removal is proposed on several ground-based harvest units and prescribed fire units. This would be done with ground-based equipment in Phillips Bench Unit 1, Phillips Bench Unit 5 and Red Top Unit 2. The remaining units proposed for snag removal would be done by hand. The removal of snags within the harvest or prescribed burn units would not contribute to detrimental soil disturbance. Snag removal would eliminate those snags as potential coarse woody debris in the future. Coarse woody debris requirements would still be met in each unit.

Cumulative Effects

Region 4 soil quality standards would be met when combining the existing and predicted impacts of proposed activities so that long-term cumulative soil impacts may not affect more than 15 percent of the activity areas. All proposed units would meet this standard and result in potential soil impacts that could affect up to 354 acres of the 22,519 acres proposed for treatment in the proposed action under alternative 2. About 251 acres of the 14,281 acres proposed for treatment under alternative 3 could result in potential soil impacts, but still meet the regional and Forest Plan standards. Philips Bench Unit 3 currently has higher disturbance, but disturbance is not expected to increase from 23percent and would trend towards meeting standards in the future; therefore this unit is meeting standards.

Timber Harvesting

Harvesting activities including commercial thinning and hand thinning would not overlap in time and space with ongoing or foreseeable projects except where past disturbance has occurred. Existing soil conditions are discussed above. There are no other harvesting activities proposed within the current proposed harvest units; therefore no cumulative effects from timber harvesting would occur.

Wildfire and Fire Suppression

Except when dozers were used for control lines on the Green Knoll fire, active fire suppression has protected much of the Teton to Snake Project Area over the past decades, but has resulted in increased fuel loading. The proposed harvest would reduce potential fire behavior (see Fire and Fuels Report located in the project record). The benefits of fires with lower intensity and severity would include a reduced potential of excessive soil heating and sterilization as well as hydrophobic conditions that tend to increase sediment movement, flooding, and possible slope instability (DeDios Benavides-Soloria and McDonald 2005; Neary et al. 2005).

On low intensity and smaller wildfires, disturbance from fire suppression activities is usually limited to hand tools; most hand fire-line construction has only minor (insignificant) impacts to the soil resource. During fire suppression, closed roads may be reopened for access and incorporated as fireline. As part of the post-fire work, the areas of disturbance are rehabilitated and the roads returned to their previous condition in most cases.

Road Maintenance and Decommissioning

All developed roads built in the past have a lasting effect on soil productivity due to compaction and displacement. Their maintenance for residence access, recreation, and forest management calls for ongoing use, which results in compaction and displacement through the project area.

Road maintenance includes culvert installation, blading, and brushing, and typically improves drainage and decreases erosion from water channeling down the road surface in the long run. For a detailed analysis and information on roads and related concerns, please see the project hydrology report located in the project record.

Recreation

Disturbance from general motorized use and recreational access has been occurring and would continue throughout the units indefinitely. We anticipate no changes in the existing recreation profile. Other recreational activities that occur off the developed roads, such as the gathering of miscellaneous forest products and hunting, are occurring in the project area. Closing skid trails in this area following treatment should prevent this occurrence and should not have additional effects on soils in the project area. Cumulative effects to soils from recreational vehicle use are not expected.

Trail Maintenance

Trail maintenance was completed on Philips Canyon trail in 2011, which is within two prescribed burn units: North Fork Phillips Canyon Prescribed Burn Unit and Phillips Canyon Prescribed Burn Unit 1. Maintenance included digging drain dips, installing waterbars, removing berms, and cutting back brush. No new trail construction was proposed. Maintenance improves trail conditions and decrease erosion. Prescribed fire within these units could increase erosion for a short period of time following implementation, but improved trail conditions would not lead to negative cumulative effects from prescribed burning.

Grazing

Eighteen percent of the project area falls into one active allotment: Munger Mountain. The units falling within or intersecting the Munger Mountain allotment are Red Top Units 3 and 4, Munger Mountain Rx Burn Units 1 and 2, Fall Creek Ranch Rx Burn Units 1 and 2, Highland Hills Rx Burn, Coburn Creek Rx Burn and Wilson Fall Rx Burn. These units are subject to cumulative grazing impacts. The units falling outside of the Munger Mountain allotment would not experience any cumulative grazing effects. Impacts of grazing are limited to areas where the animals bed, lounge, trail, or access water. These areas are mostly small in aerial extent. Impacts include compaction, removal of groundcover, and displacement. Grazing would continue in the foreseeable future on the Munger allotment. Generally in this area compaction is limited to the grassland portions of the project area. The harvest units in which ground based equipment would be utilized are generally located in forested areas so as there are effects of cattle in the grassland areas they generally do not overlap in space with the thinning treatment units. Grazing effects do overlap in space and time with many of the prescribed fire treatments. Assessing units following implementation would be extremely important in determining when soils are resilient enough to handle cattle grazing. This design feature would ensure that effects from prescribed fire would be negligible prior to cattle returning to the units; therefore cumulative impacts to soils from grazing are not expected.

Cumulative effects of ongoing and reasonably foreseeable activities: The other known ongoing and foreseeable activities in the area would not overlap in space with the current proposed activities and therefore would not have cumulative soil impacts.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

By implementing the resource protection measures and best management practices the proposed activities would comply with the Bridger-Teton Forest Plan as well as the Region 4 soil quality standards.

The following forest plan standards and guidelines have been reviewed for the proposed actions.

Silvicultural Restriction Standard - This standard would be met. On the soils identified as marginally unstable no logging activities are proposed on slopes greater than 55 percent.

Yarding Method Guideline - This guideline would be met. On slopes greater than 40 percent in the proposed thinning area identified, log yarding activities would use a system that suspends one end of the log (preferably the butt end).

Avoidance of Productivity Loss Standard – This standard is being met, logging operations would occur on dry soils, existing skid trails would be reused where possible, temporary roads would be rehabbed, landings would be ripped and seeded or have woody debris placed over them. .

Soil Displacement Standard - This standard is being met, Soil displacement and water runoff concentration would be minimized during yarding operations.

Soil Management Standard – This standard would be met. A slope-stability assessment or evaluation has been conducted for each analysis area.

Logging Method Guideline – This guideline would be met. Low ground disturbing equipment would be used during times of low soil moisture.

Onsite Erosion Guideline – This guideline would be met. Monitoring would be conducted after project is completed and then one year later.

Possible Conflicts with any Federal, Regional, State, and Local Land Use Plans, Policies, and Controls

There are no known possible conflicts with any Federal, Regional, State or Local Land Use Plans, Policies and Controls.

Short-term 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). Please refer to the environmental consequences for a discussion on the short term direct and indirect effects to soil productivity.

Unavoidable Adverse Effects

The proposed silvicultural and fuel treatments in each proposed alternative are not expected to adversely affect soil resources as project design criteria and best management practices would be implemented as part of each proposed alternative.

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. There are no irreversible commitments of soil-related resources for this project.

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 rights-of-way or road. There are no irretrievable commitments of soil-related resources.

Other Required Disclosures

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders."

The information presented in this soils report is concurrent with, and integrated with, other applicable review laws and environmental orders.

Summary

The Teton to Snake Project would comply with the Bridger-Teton Forest Plan and Region 4 standards for long-term soil productivity. The proposed silvicultural and fuel treatments in each alternative are not expected to adversely affect soil resources because of design criteria that would be implemented as part of each management alternative. These design criteria would help to ensure that resource safeguards would be in place that would prevent adverse effects on the soil resource from occurring.

Alternative 2: Proposed Action

Alternative 2 would have the largest effect on soil resources as measured by acres of detrimental soil disturbance, miles of new temporary road, new landings, and miles of fire control line. This alternative proposes to the treat the largest amount of acres (22,519). Soil productivity changes would be expected to be greater than under alternative 3 because of equipment disturbance to the forest floor on more acres (342 compared to 251). This disturbance is expected to be limited to skid trails, landings, hand line, and temporary roads. The activity areas would be expected to maintain forest floor across greater than 85 percent of the area and large wood, a combination of standing and down, would remain on site at levels specified by Graham et al. (1994).

Alternative 3: Reduce Potential Impacts to Special Areas and Wildlife Habitat

Alternative 3 proposes to treat fewer acres than the proposed action (14,281) and ground-based activities would be less. The type of disturbance in all units would be similar to that of alternative 2 with the exception of the units proposed for hand thinning versus ground-based thinning (Phillips Bench Unit 1). Alternative 3 would create approximately 104 acres less of detrimental soil disturbance compared to alternative 2, but would still be about 2 percent of the area proposed for treatment. Also under alternative 3, this disturbance is expected to be limited to skid trails, landings, hand line and temporary roads. The activity areas would be expected to maintain forest floor across greater than 85 percent of the area and large wood, a combination of standing and down, would remain on site at levels specified by Graham et al. (1994).

Table 50. Comparison of alternatives by environmental effect

Effects Indicator	Alternative 1	Alternative 2	Alternative 3
Detrimental soil disturbance (total acres)	0	342	251
Miles of new temporary road	0	1.1	1.1
New landings	0	32	27
Miles of fire control line	0	11.1	6.4

Fisheries

The following resource information and analysis summarizes the Fisheries Report (Fogle 2011), available on the Bridger-Teton National Forest website and in the project record.

This is an analysis of the potential impacts of the Teton to Snake Fuel Reduction Project on fish species listed as sensitive by the USDA Forest Service Intermountain Region 4, as well as management indicator species as identified in the Forest Plan.

There are no federally listed fish species or designated critical habitat in the project area, so no biological assessment is required, in accordance with the Endangered Species Act (50 CFR 402.02).

Existing Condition

Sensitive Species: The Forest Service currently lists the finespotted Snake River cutthroat trout (*Oncorhynchus clarki* ssp.) as a sensitive species in the Intermountain Region. Finespotted Snake River cutthroat trout is a subspecies of Yellowstone cutthroat (*Oncorhynchus clarki bouvieri*). For administrative purposes the Yellowstone River cutthroat trout (Yellowstone cutthroat) and finespotted Snake River cutthroat trout (Snake River cutthroat) are considered a single entity. Threats to the species include disease, habitat loss, and competition and hybridization with non-native trout.

Snake River cutthroat trout are well distributed throughout the Snake River from Palisades Reservoir to the headwaters in Yellowstone National Park and the Teton Wilderness.

Management Indicator Species: Snake River cutthroat trout and rainbow trout are designated management indicator species for the Bridger-Teton National Forest. Rainbow trout are an introduced species capable of hybridizing with cutthroat trout. The Wyoming Game and Fish Department ended stocking of rainbow trout in the late 1990s. Stream surveys conducted (USDA Forest Service 2002) in the project area did not find any rainbow trout. Wyoming Game and Fish records indicate that rainbow trout are rare in the project area (Wyoming Game and Fish Department 2004).

The analysis area for this report includes streams in the Snake River Basin below Jackson Lake Dam (6th-order Watershed) in the sub-basins of Spring Creek, Fish Creek, Mosquito Creek, and Fall Creek (5th-order Watershed). The analysis area covers 176 square miles (113,404 acres) of private and public (national forest, Bureau of Land Management, and state) land to coincide with the Wyoming Game and Fish Department Sub-basin Management Plan. The proposed project covers 79,682 acres within the 4, 5th HUC sub-basins.

Stream surveys in the project area conducted in 2002 evaluated fish distribution and habitat conditions on 20 individual streams and found major influences on fish distribution and habitat conditions to be roads and trails crossing or parallel to water, de-watering from irrigation diversions, and livestock grazing. A lack of fish passage downstream from the forest boundary on private property was noted on several streams. Damaged culverts at Rock Creek (Forest Service Road 3100) and Forest Service Road 30980 at Mill Creek have been identified in the Road and Trail Stream Crossing Inventory (USDA Forest Service 2006) as a fish barrier. Nonmotorized trails associated with the outfitter camp on Mosquito Creek (USDA Forest Service 2002) contribute to sediment into the stream at crossings. Livestock grazing on Prichard Creek, lower reaches of Fall Creek, Georges Canyon Creek, and Butler Creek contribute to streambank trampling, streambank instability and increased sediment (USDA Forest Service 2002).

Trail Creek, Black Canyon Creek, Coburn Creek, Fall Creek, North Fork Fall Creek, Mosquito Creek, North Fork Phillips Canyon Creek, Phillips Canyon Creek, South Fork of Fall Creek, and Taylor Creek, had 80 percent or better stream bank stability with 10 percent or less fines in the substrate. Pritchard

Creek, Coburn Creek, Georges Canyon Creek, Moose Gulch Creek, Butler Creek, and Cottonwood Creek had 60 to 80 percent stream bank stability with 20 to 30 percent fines in the substrate. Coles Canyon Creek, Bohnetts Canyon Creek, Jensen Canyon Creek, and Middle Fork of Phillips Canyon Creek were dry or no fish were collected.

The Jackson Region of the Wyoming Game and Fish Department Sub-basin Management Plan draws on population data from area lakes, streams, and creel surveys to assist in managing the fisheries. Information from the management plan was used to determine on a sub-basin (Spring Creek, Fish Creek, Mosquito Creek, and Fall Creek) scale for the presence and abundance of native and non-native fish in the analysis area.

Desired Condition

Direction from the Forest Plan is to provide adequate habitat for dependent fish and wildlife populations (USDA Forest Service 1990, page 123). The sensitive species management standard regarding fisheries management is to keep Intermountain Region designated sensitive species from becoming threatened under the Endangered Species Act by maintaining viable cutthroat trout populations identified in the Conservation Strategy for Yellowstone Cutthroat Trout (Range-Wide Yellowstone Cutthroat Trout Conservation Team 2008) and act cooperatively with the Wyoming Game and Fish Department in the management of fishery resources (USDA Forest Service 1990, page 126).

Environmental Consequences

Methodology and Scientific Accuracy

Wyoming Game and Fish Department, Jackson Region Sub-Basin Management Plan was used to for background information and characterize large scale (6th HUC) fish distribution. The Sub-Basin Management Plan also provides management objectives, limiting factors and management opportunities (Wyoming Game and Fish Department 2004) that are useful for effects analysis. Wyoming Game and Fish Department sub-basin Management Plans are re-evaluated at 10 year intervals. Bridger-Teton National Forest fish habitat and distribution inventory were used to determine existing conditions of fish habitat and population composition on individual streams.

Information Sources

Fisheries analysis for this project was done using the Wyoming Game and Fish Department Sub-Basin Management Plan. Bridger-Teton National Forest fish distribution and habitat surveys were conducted on individual streams using protocols from the Northern/Intermountain Regions Fish and Fish Habitat Standard Inventory Procedures handbook (Overton 1997). Forest Service crews have surveyed all of the streams in the project area for fish distribution and overall habitat condition. Habitat conditions were determined by habitat type (riffle, pool, glide, etc.) average pool/riffle ratio, bank stability, riparian vegetation type, confinement, woody debris, substrate, and percent fines. Habitat conditions were ocular estimates (USDA Forest Service 2002 Stream Description Summary). Fish species and distribution were determined using a single pass electro-fishing method using Yellowstone cutthroat and Snake River cutthroat trout presence-absence survey method (Novak 2003). Details on individual streams are discussed in the fisheries specialist report, Section B, Existing Conditions.

Incomplete and Unavailable Information

Recent survey data has not been completed for all species and survey data were not always available from past years. Presence and absence were often determined from the experience and knowledge of State and Federal Fish Biologists familiar with project area.

Spatial and Temporal Context for Effects Analysis

Effects analysis for this project considers direct, indirect and cumulative effects. Spatially, for these effects the context is the same—the boundaries of the 6th level watersheds where any treatments, roads or other project-associated activities would occur. The area of analysis for potential direct and indirect effects and the area of analysis for cumulative effects are displayed in figure 15. If too broad of a scale is used, the amount of area tends to overwhelm the ability to detect changes associated with the project and when finer scales are used the amount of area is too limited in scope

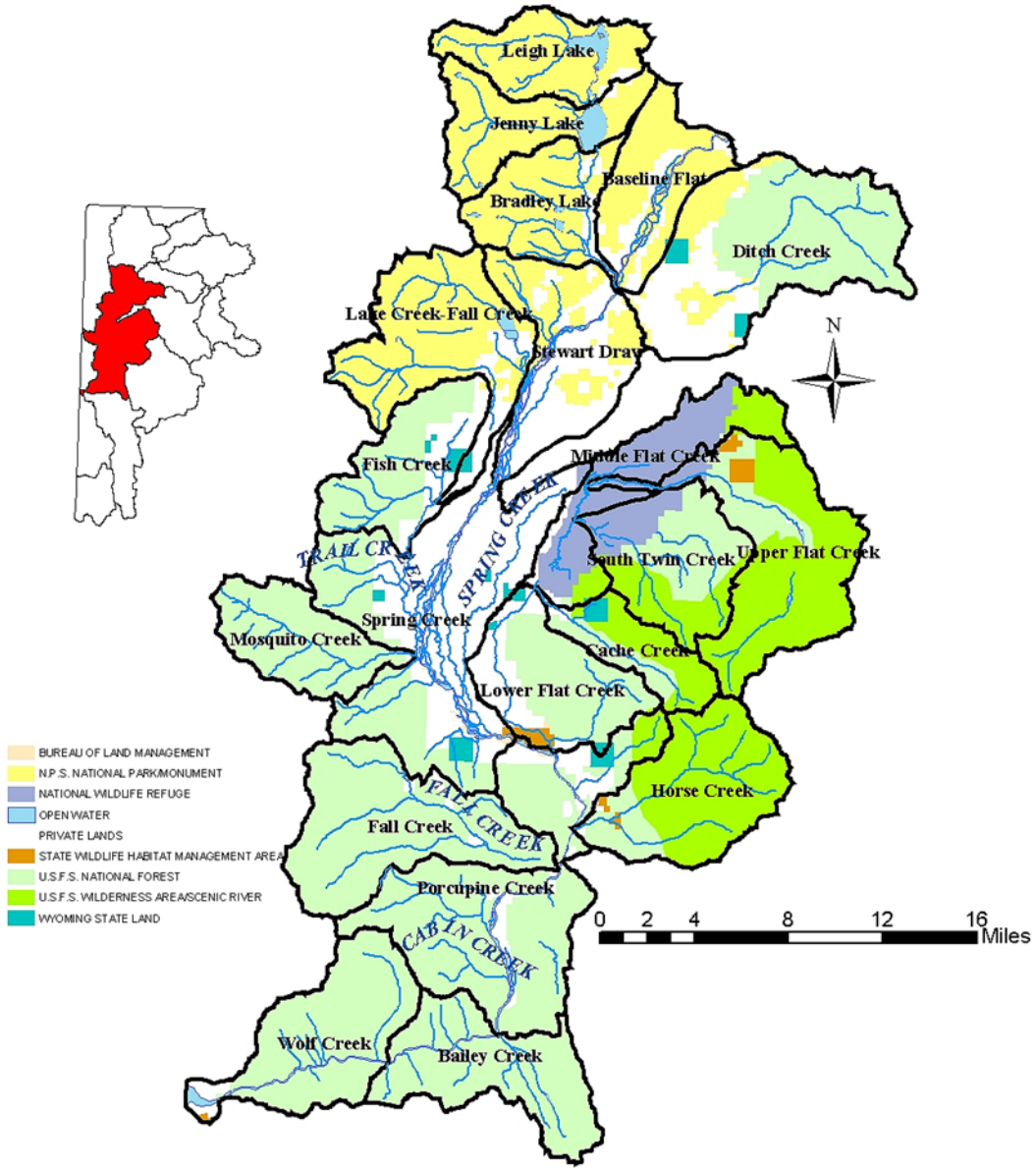


Figure 15. Snake River Basin (below Jackson Lake Dam) fifth and sixth order hydrologic unit codes (HUC)

Two levels of temporal context used in the effects analysis are short-term effects, defined as less than 10 years, and long-term effects, defined as greater than 10 years. These periods are based on professional judgment.

Alternative 1 – No action

Direct and Indirect Effects

Under the no-action alternative, no treatments would occur in the project area as proposed. The current Forest Plan would continue to guide management activities across the project area. Of note is that although the Forest Plan allows for wildfires to burn and play their natural role in the ecosystem, direction also requires protection of utilities and property; if the no-action alternative is selected, managers would continue to suppress wildfires in this project area due to the site conditions and values at risk within and near the project area.

Stream habitat in the project area is generally in good condition with impacts from roads and trails being the major contributing factor in sediment delivery with livestock grazing contributing to stream bank instability on Coburn Creek, Georges Canyon Creek, Moose Gulch Creek, Butler Creek, and Cottonwood Creek (USDA Forest Service 2002). Alternative 1 would not change stream conditions or alter fish populations.

In the event of a wildfire the effect on fish varies on the severity and extent of the fire. Wildfires can have unpredictable outcomes that change the temperature regime and physical attributes of streams that can impact fish and fish habitat (Dunham et al. 2007). Impacts to watershed on Mosquito Creek from the Green Knoll Fire were extensive, but have not physically changed the stream because the riparian vegetation remained relatively intact. Bridger-Teton National Forest crews surveyed streams in 2002 following the Green Knoll Fire in 2001. Bridger-Teton National Forest surveys indicate the fire had little or no impact to stream habitat and is also supported by Wyoming Game and Fish Department data for fish populations (Wyoming Game and Fish Department 2004). The no-action alternative would likely be similar to past fire events resulting in minor impacts to fish populations and riparian areas with short-term (under 5 year) increases in sediment delivery as vegetation recovers.

Cumulative Effects

The cumulative effect of all past wildfires, timber harvest, and prescribed fire management combination with present bridge replacement and proposed future highway projects and fuel reduction projects would not contribute to direct or indirect effects to fish or fish habitat in the project area. Road maintenance has a indirect effect of creating sediment delivery to Mosquito Creek and Fall Creek where Forest system roads encroach on the stream (USDA Forest Service 2002). An ineffective culvert on Forest Service Road 30980 at Mill Creek has been identified in the Road and Trail Stream Crossing Inventory (USDA Forest Service 2006) as a fish barrier. Nonmotorized trails associated with the outfitter camp on Mosquito Creek (USDA Forest Service 2002) contribute to sediment into the stream at crossings. Livestock grazing on Prichard Creek, lower reaches of Fall Creek, Georges Canyon Creek and Butler Creek contribute to streambank trampling, streambank instability, and increased sediment (USDA Forest Service 2002).

The combination of past, present, and future activities in the project area would not cause a decline in fish populations or habitat because of overall condition of area streams and connectivity between streams and the Snake River reduces the risk of losing fish population in a single watershed.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Prescribed fire is proposed adjacent to the North Fork, Middle Fork, and main Phillips Creek, Trail Creek, Mosquito Creek, Cottonwood Creek, Taylor Creek, Butler Creek, South Fork of Fall Creek, Coburn Creek and Prichard Creek. Non-commercial thinning is proposed on the lower reaches of Phillips Creek, Cottonwood Creek, Taylor Creek and South Fork of Fall Creek. Machine cut/machine pile and burn is not proposed adjacent to fish bearing streams and would not contribute to stream sediment.

Road maintenance and reconstruction on Red Top Meadows Unit would include a portion of Fall Creek. Phillips Bench Unit includes Phillips Creek. Road maintenance and reconstruction is also proposed for the North Fork of Fall Creek.

Target vegetation is upland lodgepole pine, subalpine fir, Douglas-fir, and sagebrush and would not extend into riparian areas or target riparian vegetation. Project design mitigates indirect effect from soil disturbance caused by wheels or tracks churning up soil that could possibly migrate into streams by utilizing stream buffers and minimum distance from streams to reduce or eliminate this effect. Project design for prescribed fire buffers streams and riparian vegetation from direct impacts from burning and provides filtering capacity of riparian vegetation to protect streams from sediment and ash from upland operations. Road maintenance and reconstruction on Red Top Meadows Unit would include a portion of Fall Creek. Phillips Bench Unit includes Phillips Creek. Road maintenance and reconstruction is also proposed for the North Fork of Fall Creek.

Alternative 2 as proposed would have positive indirect effect on fish and aquatic habitat by promoting aspen communities that reduce fire severity and promotes beaver activity that can enhance riparian and aquatic ecosystems (Olson and Hubert 1994). The proposed action as designed would have no negative long-term effect to fish or fish habitat in the project area. Short-term effects to individual fish from sediment entering streams would be reduced and possibly eliminated from the project design features for soils and hydrology which are intended to minimize or avoid potential adverse environmental effects while meeting project objectives (appendix B).

Cumulative Effects

The cumulative effects of alternative 2 are similar to alternative 1 with the exception of road maintenance that would improve roads on Phillips Bench and North Fork of Fall Creek that could reduce sediment into stream by improving drainage.

Alternative 3 – Reduced Potential Impacts to Special Areas and Wildlife Habitat

Direct and Indirect Effects

Stream habitat in the project area is generally in good condition with impacts from roads and trails being the major contributing factor in sediment delivery with livestock grazing contributing to stream bank instability (Wyoming Game and Fish Department 2004) (USDA Forest Service 2002). This alternative would not alter the impact to streams from roads and may improve water quality downstream indirectly improving fish habitat.

Cumulative Effects

The cumulative effects of alternative 3 are similar to alternative 2 with the exception of road maintenance that could reduce sediment into stream by improving drainage on 14.2 miles of road. The reduced acres treated in alternative 3 would have no impacts to Snake River cutthroat and Snake River cutthroat habitat.

Determinations

Finespotted Snake River Cutthroat Trout (Oncorhynchus clarki ssp.)

A biological evaluation was completed to assess impacts to this Forest Service sensitive species. Due to the absence of substantially additive effects, the determination of effects for Snake River cutthroat trout is **"may impact individuals but not likely to cause a trend to Federal listing or a loss of viability"** for alternatives 2 and 3, and **"no effect"** for alternative 1.

Using Forest Service standards and guidelines and following best management practices would result in no measurable long-term (greater than 1 year) direct impacts to Snake River cutthroat trout populations or habitat. Improvements to the road system would reduce sediment entering streams by using Forest Service standards and guidelines for road maintenance. Short-term direct effects (less than 1 year) may result from initial road improvements to individual fish, but is limited in time and intensity.

Management Indicator Species

Finespotted Snake River Cutthroat Trout (*Oncorhynchus clarki* ssp.)

Streams in the project area provide spawning, rearing, and adult habitat for Snake River cutthroat trout. Snake River cutthroat are well distributed in the project area and are the dominant species in the Upper Snake River. Overall health of Snake River cutthroat trout populations in the project is strong with conductivity between the Snake River and its tributaries. Rivers and streams in the project area meet the Wyoming Game and Fish Department, and Bridger-Teton National Forest management objective of maintaining viable populations of Snake River cutthroat.

Rainbow Trout (Oncorhynchus mykiss)

Rainbow trout stocking by the Wyoming Game and Fish Department has been discontinued, but the species are still present in small numbers in the Snake River. Rainbow trout have not been detected in the project area. The determination for this species is **"no effect"** for all alternatives.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Analysis of available fish distribution and population data from the Wyoming Game and Fish Department and Forest Service sources combined with data collected on the project for soils and hydrology indicate that the cumulative impact of alternative 2 and 3 would not move the status of cutthroat trout toward a need for listing under the Endangered Species Act. All alternatives meet Forest Plan standards for sensitive species management and fish passage standard as it pertains to implementation on National Forest System roads and trails.

The alternatives meet the desired condition for fisheries by providing for the conservation of the wild trout fishery and the integrity of the indigenous Snake River cutthroat trout while providing sport fishing opportunities.

Summary

Table 51. Comparison of effects to fisheries

Resource Concern	Indicator[a]	Alternative 1	Alternative 2	Alternative 3
Effect on Snake River cutthroat trout habitat and water quality	Sediment delivery from selected roads and harvest units to water bodies	No change	Improvements to Forest System roads in the project area would reduce sediment	Reducing human manipulation in wilderness study area may indirectly improve fish habitat downstream from no ground disturbance
Effects from roads and harvesting activities on sedimentation and fish passage		Roads would continue to produce sediment into streams	Project design features and best management practices on temporary roads and harvest units would reduce/eliminate sediment and improve aquatic passage	No change

a - Additional indicators regarding sedimentation and water quality are listed in the hydrology section.

Botany

The following resource information and analysis summarizes the Botany Report and Biological Evaluation (Englebert 2011) and an addendum (Johnson and Buermeyer 2011), available on the Bridger-Teton National Forest website and in the project record.

This analysis discloses the effects of the proposed activities to Bridger-Teton National Forest management indicator species, sensitive species identified in the USDA Forest Service Intermountain Region with occurrences on the Forest, and one Endangered Species Act candidate species, whitebark pine (*Pinus albicaulis).* Aspen (*Populus tremuloides*), an ecological indicator species for aspen habitat, would also be addressed.

Existing Condition

Species Evaluated

There is one known occurrence of Payson's bladderpod (*Lesquerella paysonii*) along the edge of the project area. An additional ten sensitive species and three management indicator species may have habitat in the area and would be carried forward into the effects analysis portion of this document. All other species were dropped from the analysis of effects portion of this document due to the lack of suitable habitat, and therefore, no impacts to those species. The species carried forward in the analysis are grouped according to habitat because effects would be similar. Habitat groupings are shown in table 52.

Table 52. Habitat grouping of sensitive species and management indicator species

Habitat	percent of Project Area	Species
Riparian (including high elevation riparian)	0.1 percent	Black and purple sedge Boreal draba (management indicator species only) Greenland primrose Pink agoseris
Sagebrush	14.6 percent	soft aster
Alpine and/or sparsely vegetation	Alpine: 0.3 percent Sparsely vegetation: 0.4 percent	Creeping twinpod Naked-stemmed parrya Payson's bladderpod Rockcress draba Shultz's milkvetch (management indicator species only) Seaside sedge Weber's saussurea Woolly daisy Whitebark pine
Aspen	9.2 percent	Aspen (management indicator species only)

Species Known to Occur in the Project Area

Payson's bladderpod (*Lesquerella paysonii*)

Payson's bladderpod is a regional endemic of west-central Wyoming, eastern Idaho, and southwestern Montana. There are 35 extant occurrences and 5 historical records in Wyoming. It is found primarily on windswept, gravelly, calcareous ridgecrests, semi-open slopes and rocky floodplains. It may also occur on talus slopes, disturbed roadsides, dried stream channels and rocky clearings (Heidel 2008). For this analysis Payson's bladderpod would be included in the "alpine and/or sparsely vegetation" habitat group.

There is one occurrence in the project area. It is located on the ridge and upper slopes at the east end of Powerline Unit 1 and Black Canyon Burn Unit 2.

Heidel (2008) identifies impacts from recreation, ski development, grazing and mining as potential threats to populations that occur at the lower elevations. Trend data are lacking.

Aspen (*Populus tremuloides*) – Ecological management indicator species

Aspen can be found throughout the project area especially in the eastern, lower elevation portion of the area. It occurs in pure stands, or mixed with subalpine fir, lodgepole pine, Douglas-fir, whitebark pine, or Engelmann spruce. In the lower elevations, it forms a mosaic with shrublands. Stands are typed as "aspen" forests when 60 percent or greater of the canopy cover is aspen. "Aspen/conifer mix" forests are identified where aspen accounts for 10 percent or greater of the canopy cover, and no single tree species accounts for greater than 60 percent canopy cover. Approximately 8.9 percent of the project area has been mapped as aspen, with an additional 0.3 percent identified as aspen/conifer mix.

Most of the aspen on the Bridger-Teton National Forest was established after the area was burned between 1840 and 1890 (Gruell and Loope 1974; Loope and Gruell 1973). The result of which is the current condition of mature stands with very little age and size class diversity. Seral aspen is being

replaced by conifers throughout its range. Because aspen is intolerant of shade, many well-stocked, even-aged stands have virtually no aspen regeneration beneath them. The major cause of this decline is greatly reduced fire frequency. Aspen is a disturbance-dependent species that flourished in the West when these lands burned periodically (Bartos 2007).

Whitebark Pine (*Pinus albicaulis*) – Candidate for Listing under the Endangered Species Act

Whitebark pine is known to occur in pure and mixed stands in the project area. Two proposed prescribed burn units contain whitebark pine stands that were mapped by remote sensing in 2007. The Phillips Canyon Rx Burn Unit 1 and the North Fork Phillips Canyon Rx Burn Unit 1 contain whitebark pine stands. Among the threats to the species is successional replacement by shade-tolerant conifers resulting from fire suppression, as well as an exotic fungal infection and native beetle epidemics. The trend for the species is downward at both regional and landscape scales and is predicted to continue due to compounding effects from climate change.

No Known Occurrences – Species with Possible Habitat Present in the Project Area, Grouped by Habitat for Analysis

Alpine and Sparsely Vegetated Habitats

All the species in this group occur in areas that are sparsely vegetated, generally rocky, gravely sites. All but creeping twinpod are found at alpine or subalpine elevations. In the project area these plants may have habitat in the areas mapped as “alpine vegetation”, “barren/rock” or “sparse vegetation.”

Riparian Habitat

These four species are found in wet areas. Greenland primrose and pink agoseris are found in wet meadows along waterways. Boreal draba prefers north-facing limestone, dolomite or volcanic slopes, cliffs and riparian areas. Habitat for black and purple sedge is described as subalpine moist rocky sedge or willow-dominated meadows along creek banks and ponds. While unlikely, there is a remote possibility that unknown occurrences of these four species may occur in the wet areas of the project area.

Sagebrush Habitat

Soft aster is endemic to the Bighorn Mountains and Hoback Canyon in Wyoming. It has been found in sagebrush grasslands and mountain meadows on deep, calcareous soils at the edge of aspen or pine woodlands (Fertig et al. 1994). It is unlikely that unknown occurrences of soft aster are in the project area, however, the sagebrush areas cannot be ruled out as habitat.

Environmental Consequences

The following indicators were used to measure the differences between alternatives:

- Potential for direct physical impacts to individual plants or habitat such as trampling or defoliation of individual plants and habitat.
- Potential for habitat degradation, mainly from infestation of invasive species due to ground disturbance.
- Effects to aspen were measured by number of acres of aspen treated under each alternative.
- The potential for an alteration in the competitive environment arising from the successional replacement of whitebark pine by shade-tolerant conifers.

Methodology and Scientific Accuracy

All Bridger-Teton National Forest management indicator species and all R4 sensitive species known or suspected to occur on the Bridger-Teton National Forest (USDA Forest Service 2010) were reviewed for their relevancy to the proposed action. Relevancy was determined if there is evidence of species occurrence or suitable habitat present. Local Forest Service records and GIS data, as well as occurrence data from the Wyoming Natural Diversity Database (2009) was consulted.

The Bridger-Teton National Forest has worked with the Wyoming Natural Diversity Database to assemble information on sensitive species since 1989. Multiple plant surveys have been conducted by Walter Fertig to collect data on the biology, habitat, population size, and management needs of sensitive species (Fertig 1999, Fertig 2000). Due to the very low risk associated with this project new surveys were not conducted project-wide, but a site visit was conducted on July 14, and July 16, 2010, and field checks of the areas that may be habitat were conducted by local Forest Service personnel, August 2010.

Information Sources

Plant occurrence information was obtained from the Wyoming Natural Diversity Database (2009). Most of the species information also came from authors associated with the Wyoming Natural Diversity Database. Effects are based on the best science available.

Incomplete and Unavailable Information

Comprehensive botany surveys were not completed for this project. Existing information was used and the analysis was completed with the assumption that unknown individuals could be present (presence was assumed).

Spatial and Temporal Context for Effects Analysis

The cumulative effects analysis area for the botanical resources is the areas of sparsely vegetated, alpine, riparian, sagebrush and aspen habitat within the project area. Effects outside of these areas are either minimal or cannot be tracked and defined. This analysis is bounded in time by 10 years into the past and 10 years into the future, which allows for an adequate length of time to record vegetative changes.

Alternative 1 – No action

Direct and Indirect Effects

Effects Common to all Species and Habitats Except Aspen and Whitebark Pine

There would be no direct effects to any of the plant species discussed in this analysis, since no management activities would occur. However, there is the potential for indirect effects to the habitats of the sensitive species. With large, stand-replacing fires there is the potential to burn habitats that do not typically burn. More importantly, large events are known to increase the risk of infestation by non-native invasive species (D'Antonio 2000). At one time it was believed that species found in alpine habitats were not necessarily threatened by invasive species. But Ladyman (2004) indicates that invasive species are being found in these habitats. Therefore, habitat degradation by invasive species must be considered a risk for all species in this analysis, albeit a minimal risk, including those found in alpine habitats. Invasive species cause habitat degradation because they can outcompete desired plant species for water and nutrients. Spray from herbicides used to help control weeds can also have negative effects. After habitat loss, the spread of invasive species is considered the greatest threat to imperiled species in the United States (Sieg et al. 2003).

Effects to Aspen (management indicator species)

As noted under the "Purpose and Need for Action" discussion for the project, years of fire suppression has resulted in a decline of aspen. If no management action is taken and nearly all fires continue to be suppressed, that decline is expected to continue. However, as discussed earlier, the no-action alternative could result in large, stand-replacing fires. Aspen could benefit from those fires. According to Bartos (2007) aspen is a disturbance-dependent species that is healthiest when its habitat burns periodically. Although pure stands of aspen do not burn easily, aspen is easily top-killed by fire. The root systems of top-killed stems send up a profusion of suckers which thrive in the burned areas following a fire (Howard 1996).

For more details on the effects to aspen please see the "Vegetation" section of this document, and the Silviculture Report located in the project record.

Effects to Whitebark Pine

There would be no direct effects to whitebark pine from alternative 1 since no management activities would occur. However, the indirect effects to whitebark pine from this alternative would be far-reaching and generally negative. The decline in whitebark pine is driven, in large part, by fire suppression and its knock-on effects (altered successional dynamics and hyper-dense forests with periodic outbreaks of insects). Continued fire suppression in the range of whitebark pine is predicted to maintain or even accelerate the decline of the species. The lack of fire-related disturbance in subalpine areas has led to the encroachment of shade-tolerant fire-intolerant conifer species into whitebark pine stands. These species can eventually over-top and out-compete whitebark pine leading to a loss of whitebark pine habitat. Additionally, fire suppression can lead to hyper-dense forests in areas around whitebark pine habitat. These hyper-dense forests are susceptible to episodic and epidemic outbreaks of native insects, which can spill over and cause mortality in whitebark pine. In the absence of management activities in this alternative continued fire suppression would exacerbate inter-specific competition and insect outbreaks, both of which would be negative for the species. The U.S. Fish and Wildlife Service points out that a shift from a natural fire regime to a managed one is detrimental to whitebark pine. Additionally the same analysis identified current fire management practices as a threat to the species which limits its ability recover on its own and makes it susceptible to damage from other factors (climate change, insect outbreaks, and fungal infection). As such, whitebark pine is susceptible to extinction due to changes in natural fire regimes. However, the no-action alternative would likely save individual whitebark pine trees from damage from fire. Additionally, the risk of a stand-replacing wildfire is increased with this alternative. Whitebark pine may benefit from this since the species is generally a pioneer species in some instances of stand-replacing fire. This outcome, however, is no certainty because there may be no nearby seed source to establish a pioneering cohort of whitebark pines. Seed-source losses from white pine blister rust and successional replacement make it unlikely that a ready source of whitebark pine seeds would be available. The long-distance transport of whitebark pine seeds by birds has been observed and may add some seeds to burned areas since the open spaces created by high-intensity fires are favored seed cache sites for many bird species.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Effects Common to all Species and Habitats Except Aspen and Whitebark Pine

Effects from treatments include effects from the connected management activities associated with those treatments. Roads maintained or reconstructed, temporary road construction and obliteration, landings and reducing snag density are management activities included with effects from thinning treatments. Effects from prescribed fire treatments include effects from fire control lines.

The habitats of most the plants addressed in this analysis, with the exception of aspen, are not areas where thinning treatments would occur, if thinning would occur in the area, design features are in place that would protect the habitat. Therefore no direct impacts from thinning or any of the included management activities are expected.

Whenever the ground is disturbed, by either thinning operations or prescribed burn treatments, the indirect effect of habitat degradation is possible by invasion or spread of noxious weeds resulting from adjacent or immediate disturbances. Noxious weeds may out-compete desired plant species, and spray from herbicides used to help control weeds can also have negative effects. After habitat loss, the spread of invasive species is considered the greatest threat to imperiled species in the United States (Sieg et al. 2003). Design features incorporated into the proposed action would help reduce this possible indirect effect.

Effects to Alpine and/or Sparsely Vegetated Habitats

Payson's bladderpod is known from a sparsely vegetated ridge along the west end of Powerline Unit 1. In this alternative, a noncommercial thinning treatment is proposed for Powerline Unit 1. There are no trees in the Payson's bladderpod habitat; the area is included in the unit only because it makes sense for the border of the unit to follow the ridgeline. Because there would be no treatment in the vicinity of the plants and because design features are in place that would prevent piling of fuels in the habitat, no direct effects are expected.

These habitats are inherently difficult to burn because they lack the fuel necessary to carry a fire. There are also design features that restrict direct ignition in these habitats that create additional protection for these habitats under this alternative. Additionally, none of the proposed control lines are in these habitats. Therefore, no direct impacts from prescribed burning treatments are expected.

Effects to Whitebark Pine

Effects from treatments include effects from the connected management activities associated with those treatments. Roads maintained or reconstructed, temporary road construction and obliteration, landings and reducing snag density are management activities included with effects from thinning treatments. Effects from prescribed fire treatments include effects from fire control lines as well as from fire itself.

Several possible direct effects are from thinning and burning as described in alternative 2. During the implementation of prescribed fire individual whitebark pines may be burned. While there is a design feature in place that would minimize the direct effects to whitebark pine from fire there is always the possibility that a few individual trees could be consumed. There is a much smaller chance of direct damage from thinning operations since most mechanical treatments are at a much lower elevation than whitebark pine and no planned thinning units have known whitebark pine. In addition, design features are in place that would retain individual whitebark pines while removing their competitors. The indirect effects to whitebark pine from the management described in alternative 2 generally have to do with the restoration of fire to a fire-adapted landscape.

The implementation of prescribed fire to areas with whitebark pine would likely result in a decrease in inter-specific competition and a decreased likelihood of insect outbreaks from nearby forests. The U.S. Fish and Wildlife Service points out that fire in subalpine forests creates whitebark pine habitat. Additionally fire in these areas increases the likelihood that potential habitat would become occupied due to the caching behavior of birds which, for whitebark pine seed predators at least, prefer open spaces created by fire. This alternative is also the most likely to promote a mixed-intensity burn should a large-scale wildfire occur in the project area. A mixed-intensity burn is most likely to be beneficial to whitebark pine because it would reduce inter-specific competition and create a mosaic of open and thinned patches.

Mixed-intensity fire would create habitat and increase the likelihood that it would become occupied due to caching behavior of birds. Mechanical thinning of competitors from whitebark pine stands, should whitebark pine be found in a mechanical treatment area, would result in a reduction of interspecific competition. Design features are in place that would protect whitebark pine habitat from erosion and noxious weeds as a result of mechanical disturbance and prescribed fire.

Effects to Riparian Habitats

It is highly unlikely, due to the location and type of riparian and wetlands in the project area, that any of the Region 4 sensitive species that prefer riparian habitats would be located in an area to be treated. If an unknown occurrence is in one of the treatment units it would be protect by the design features that are in place to protect the soil and water in such areas. In particular, design features would prevent mechanical treatments, decking and landings from occurring in wetlands or riparian areas. Thus no direct effects are expected.

An additional potential indirect effect to riparian species from both thinning and prescribed fire treatments may be the possible change in soil moisture and hydrologic function of the area resulting from reduced vegetation in the surrounding area. This effect is difficult to predict and quantify and could be negative or positive, depending on the magnitude and location. It is possible that an increase in available moisture could occur and that increase would improve and/or expand riparian habitat.

Riparian habitats are also inherently difficult to burn because of high moisture content, so it is unlikely that a fire under prescription would burn through them. As discussed earlier it is unlikely that any of the Region 4 sensitive species that prefer riparian habitats would occur in the project area. If an unknown occurrence is in one of the treatment units it would be protected by the design features that are in place to protect the soil and water of such areas. In particular, design features would allow back-burning into riparian areas, but burning should not exceed low-intensity and there would be no direct ignition within a buffer around the riparian areas. Thus no direct effects are expected.

Effects to Sagebrush Habitats

It is highly unlikely that soft aster, the sensitive species found in sagebrush habitats, would occur in the project area since it appears to be endemic to the Bighorn Range and Hoback Canyon, but there are areas of sagebrush in the project area, so the possibility of habitat cannot be dismissed. As discussed before under “Effects Common to All Species and Habitats Except Aspen and Whitebark Pine” there would be no thinning treatments or connected actions in the sagebrush habitats due to the lack of trees in this community type, thus no direct impacts are expected.

Many of the units proposed for prescribed fire treatments have areas of sagebrush in them. As discussed earlier, there are no known occurrences of soft aster in the project area, but there may be habitat for soft aster in the sagebrush communities. If there are unknown occurrences of soft aster in the treatment units, individual plants could suffer direct impacts from the activities associated with prescribed fire, including trampling and burning. Observations of the known occurrences of soft aster in the Bighorn Range indicate that the species persists in semi-disturbed sites (Fertig 1999) and Nature Serve (2010) reports that fire may be stimulatory for the species. So, it is unlikely that a prescribed fire would result in detrimental effects.

Effects to Aspen (management indicator species)

Aspen perpetuation is one of the objectives of the proposed action. Treatments have been designed to meet that objective. We expect aspen within the treatment units would benefit under this alternative. There are 345 acres of aspen or aspen/conifer mix mapped within units proposed for thinning treatment and 3,208 acres within units proposed for prescribed burning treatments. There are also many small

pockets of aspen scattered throughout the project area that are too small to be mapped, so a minimum of 3,553 acres of aspen are expected to benefit under this alternative.

Thinning conifers in and around the aspen stands would help regenerate the stands. According to Shepperd (2001) removing conifers is one of the tools that can be used to help a struggling clone regenerate. Removing the trees allows more sunlight to reach the forest floor, improving the growth environment for aspen. The low-level disturbance associated with the thinning may also help stimulate the sucker production that is essential for regeneration. It can be difficult to get a fire to carry through a pure aspen stand. But fire would stimulate suckering and remove competing understory vegetation, allowing sunlight to reach the forest floor which aids regeneration (Shepperd 2001). As regeneration occurs, the overall health, size, and age class diversity of aspen in the project area would improve.

The activities proposed to remove conifers and restore the size and age class diversity in the aspen stands are designed to help to move the area towards a more natural fire regime. As the natural fire regime is restored and fire is allowed to play its natural role on the landscape, aspen would continue to perpetuate.

As discussed earlier, the ground disturbance associated with the thinning and prescribed fire treatments may lead to habitat degradation from noxious weeds, but there are design features in place to limit this indirect effect.

For more details on the effects to aspen please see the “Vegetation” section of this document, and the Silviculture Report located in the project record.

Alternative 3 – Reduce Potential Impacts to Special Areas and Wildlife Habitat

Direct and Indirect Effects

Direct and indirect effects from alternative 3 are expected to be the same as for alternative 2 except:

- 769 fewer acres would be thinned, 2.44 fewer miles of roads would be maintained or reconstructed, 5 fewer landings are proposed and 10 fewer units would have snag density reduced. These reductions all result in fewer acres of disturbed ground which reduces the potential for habitat degradation from noxious weed spread.
- 7,469 fewer acres would be treated with prescribed fire and 4.3 fewer miles of fireline would be constructed; 1,093 of the acres that would not be treated are sagebrush communities. Any unknown occurrences of soft aster would be less likely to be directly impacted with fewer acres being treated. Conversely, fire may be stimulatory for soft aster, so with the reduction in acres being treated fewer acres of habitat would be enhanced.
- Under this alternative 2,211 total acres of mapped aspen or aspen/conifer communities would be within treatment areas. This is a reduction of 1,342 acres from alternative 2. With fewer acres of aspen being treated there are fewer opportunities for aspen perpetuation.

Cumulative Effects, All Alternatives

The cumulative effects analysis area for the botanical resources is the areas of sparsely vegetated, alpine, riparian, sagebrush and aspen habitat within the project area. Effects outside of these areas are either minimal or cannot be tracked and defined. This analysis is bounded in time by 10 years into the past and 10 years into the future, which allows for an adequate length of time to record vegetative changes.

Within this analysis area past, present, and reasonably foreseeable future activities that have the potential to impact the plants included in this analysis include livestock grazing, timber harvest and thinning (fuels reduction), burial of utility lines, motorized and nonmotorized recreational use, road and trail construction

and maintenance, fire suppression, prescribed fire, climate change and noxious weed infestation and treatment. A list documenting projects that could contribute to cumulative effects is in appendix E. For sensitive species there are policies in place that reduce or eliminate impacts from all 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 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 (i.e., potential for direct physical impacts of trampling and defoliation, and potential for habitat degradation due to infestation of invasive species) from the proposed activities and adding them to the following expected effects from other management activities:

- Livestock grazing can affect sensitive species directly with biomass removal and trampling; and it can cause habitat degradation with changes in species composition, compaction of soils, changes in fuel loading and the fire regime, and noxious weed invasion. Livestock grazing is limited in the analysis area. The sagebrush communities that may be habitat for soft aster are the habitats most likely to receive livestock grazing in the analysis area. Because soft aster is known to be persistent in semi-disturbed areas (Fertig 1999), the effects to the habitat from grazing are not expected to be detrimental except for the potential for habitat degradation from noxious weeds. Noxious weeds can be spread by grazing animals and weed seeds transported into new areas. Direct physical impacts are not expected as there are no known occurrences in the area. So, while the potential exists for the effects listed, the effects within the analysis area are expected to be minimal due.
- Timber harvest and thinning (fuels reduction) has led to a more open canopy with additional light reaching the forest floor (which may be beneficial or detrimental depending on the species), soil disturbance and compaction, and development of skid roads, all of which increase the risk of habitat degradation due to noxious weed invasion. Timber harvest and thinning are unlikely to have effects on most of the species discussed in this analysis as they are (as indicated under the direct and indirect effects) unlikely to occur in the same areas that timber harvest and thinning occur. The exception to this is the management indicator species aspen. The effects to aspen from other timber harvest and thinning activities are expected to be beneficial to aspen just as the direct and indirect effects from this project are (please see effects to aspen in the direct and indirect effects section).
- Motorized and nonmotorized recreational use has led to the development of non-system roads and trails, development of dispersed campsites, erosion, and the vectoring of noxious weeds in previously un-infested areas. These activities can lead to trampling of plants and their habitats as well as an increase in invasive species, leading to habitat degradation. These impacts are controllable through ongoing travel management which is expected to minimize effects in the analysis area.
- Road and trail construction and maintenance can result in direct impacts to individual plants as well as habitat degradation from soil disturbance and the resulting noxious weed invasion. It also increases the impacts from recreational activities by allowing improved access for those activities. Within this analysis area, effects to the plant species analyzed are expected to be minimal due to the habitat preferences of the plants that our outside areas impacted by roads and trails.
- 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 nonnative species

in environments where nonnatives are abundant or native species are stressed. Fire and fire suppression have the potential to affect aspen more than any of the other sensitive or management indicator species (as discussed under effects to aspen in the direct and indirect effects discussion).

- Trends in climate change indicate the future precipitation levels would be lower and temperatures would be higher than the current long-term averages. Drier conditions are expected to inhibit aspen stand health and regeneration and be detrimental to riparian species that depend on moist habitats. Warmer temperatures are expected to result in a change in the distribution of plants as the elevation at which plants are found shifts upward. This shift appears to be greater for species found in mountain habitats (Lenoir et al. 2008).

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. As stated earlier, because current management direction is designed to eliminate or reduce negative cumulative impacts by protecting sensitive plants from direct and indirect impacts, the cumulative effects to all species discussed in this analysis, under all alternatives, are expected to be minimal.

Determinations

Alternative 1

Based on the information that is available and the above analysis, a determination of **"may adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend toward Federal listing or a loss of species viability range-wide"** is made for black and purple sedge (*Carex luzulina var. atropurpurea*), creeping twinpod (*Physaria integrifolia var monticola*), Greenland primrose (*Primula egaliksensis*), naked-stemmed parrya (*Parrya nudicaulis*), Payson's bladderpod (*Lesquerella paysonii*), pink agoseris (*Agoseris lackschewitzii*), rockcress draba (*Draba globosa*), seaside sedge (*Carex incurviformis*), soft aster (*Symphyotrichum molle*), Weber's saussurea (*Saussurea weberi*), and woolly daisy (*Erigeron lanatus*) relative to implementation of the no-action alternative because no management activities would occur under alternative 1.

The determination for whitebark pine (*Pinus albicaulis*) is also **"may adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend to Federal listing or a loss of species viability range-wide"** based on the following rationale:

- Continued fire suppression and successional encroachment from shade-tolerant and fire-intolerant conifers into whitebark pine stands is likely to lead to the loss of the species in this project area. However, whitebark pine occurs across the Bridger-Teton National Forest and the loss of the 450 acres here would not result in a loss of viability in the planning area.
- Current fire management has been identified as a threat to the species which limits its ability to recover and weakens it to the effects of other factors including insect predation, fungal infection, and climate change.
- The species is at risk of extinction because of habitat loss which would be accelerated in the project area under this alternative.
- No action would maintain or accelerate the decline of whitebark pine in the project area.
- There is a possibility that a stand-replacing wildfire, which is most likely under this alternative, would create habitat for whitebark pine. However, this does not outweigh the possible loss of the species in the project area with no action.

Alternatives 2 and 3

Based on the information that is available and the above analysis, a determination of **"may adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend toward Federal listing or a loss of species viability range-wide"** is made for black and purple sedge (*Carex luzulina var. atropurpurea*), creeping twinpod (*Physaria integrifolia var monticola*), Greenland primrose (*Primula egaliksensis*), naked-stemmed parrya (*Parrya nudicaulis*), Payson's bladderpod (*Lesquerella paysonii*), pink agoseris (*Agoseris lackschewitzii*), rockcress draba (*Draba globosa*), seaside sedge (*Carex incurviformis*), soft aster (*Symphyotrichum molle*), Weber's saussurea (*Saussurea weberi*), and woolly daisy (*Erigeron lanatus*) relative to implementation of either of the action alternatives. This determination is supported by the following rationale:

- There may be habitat in the project area for all the species addressed in this analysis. When habitat is present in a project area, there is always the possibility that unknown individuals are present that management activities may directly affect. However, for this project the risk to these species is very low.
- These species are found in alpine, sparsely vegetated, riparian and sagebrush habitats. While those habitats are found within delineated treatment units, the thinning activities proposed under either alternative would not occur in those habitats because there are no trees to be removed or, in the case of the riparian habitats, there are design features that would prevent the activities from occurring in the habitat.
- The alpine, sparsely vegetated and riparian habitats are unlikely to carry a fire under a prescribed burn, and there are design features in place that would protect these habitats during a prescribed burn.
- The chance of soft aster occurring in the project area is very slight; however, if unknown individuals are present they could be directly impacted by prescribed burning activities in the sagebrush habitat. However, fire is thought to be stimulatory for soft aster, so the impacts could be beneficial.
- One known occurrence of Payson's bladderpod is in the project area. It is in an area where there are no trees to thin and there's not enough fuel to carry a prescribed burn. There are also design features built into both alternatives to protect the occurrence, therefore no direct impacts to the occurrence or individual plants are expected. None of the other occurrences of Payson's bladderpod known to occur on the Bridger-Teton National Forest are located within this project area and none would be disturbed by activities associated with this project. Therefore, while loss of unknown individuals may occur in this project area, the viable populations at the known occurrences would not be affected.
- None of the known occurrences of black and purple sedge, creeping twinpod, Greenland primrose, naked-stemmed parrya, pink agoseris, rockcress draba, seaside sedge, soft aster, Weber's saussurea, and woolly daisy known to occur on the Bridger-Teton National Forest are located within this project area and none would be disturbed by activities associated with this project. Therefore, while loss of unknown individuals may occur in this project area, the viable populations at the known occurrences would not be affected.
- With ground-disturbance activities there is a chance of invasive species infestation which can degrade sensitive species habitat.

A determination of "beneficial impacts" is made for whitebark pine, based on the following rationale:

- Several of the prescriptions for fire are specifically designed to promote the habitat of whitebark pine by restoring ecosystem function and reducing inter-specific competition.
- Whitebark pine is a species that has been given priority in this project for retention and enhancement with mechanical thinning.

- The return of fire to the ecosystem coupled with the reduction in canopy of other potentially competing conifers would benefit the species.

Summary

Table 53. Summary of risk, determinations and effects to Region 4 sensitive and management indicator species

Species	management indicator species Type	Alternative 1		Alternative 2		Alternative 3	
		Risk[a]	Determination[b]	Risk	Determination	Risk	Determination
Black and purple sedge	Sensitive	Very low	MII[3]	Very low	MII	Very low	MII
Creeping twinpod	Sensitive	Very low	MII	Very low	MII	Very low	MII
Greenland primrose	Sensitive	Very low	MII	Very low	MII	Very low	MII
Naked-stemmed parrya	Sensitive	Very low	MII	Very low	MII	Very low	MII
Payson's bladderpod	Sensitive	Very low	MII	Low	MII	Low	MII
Pink agoseris	Sensitive	Very low	MII	Very low	MII	Very low	MII
Rockcress draba	Sensitive	Very low	MI[lc]	Very low	MII	Very low	MII
Seaside sedge	Sensitive	Very low	MII	Very low	MII	Very low	MII
Soft aster	Sensitive	Very low	MII	Low	MII	Low	MII
Weber's	Sensitive	Very low	MII	Very low	MII	Very low	MII
Woolly daisy	Sensitive	Very low	MII	Very low	MII	Very low	MII
Whitebark pine	Sensitive and Endangered Species Act candidate	High	MI	Very low	BI[d]	Very low	BI
Not Region 4 Sensitive – management indicator species Only							
Aspen	Ecological	Low	Decline expected to continue without treatment	Very low	Beneficial effects expected	Very low	Beneficial effects expected, but fewer than alternative 2

a - Risk is based on species distribution and potential for detrimental effects from treatments with design features in place.
b - Determinations are made for sensitive species only.
c -May impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend toward Federal listing.
d- Beneficial impact.

Noxious Weeds

The following resource information and analysis summarizes the Noxious Weeds Report (Buermeyer 2011), available on the Bridger-Teton National Forest website and in the project record.

Existing Condition

Noxious weeds are a major concern over vast areas of the western United States, and they are continuing to spread. The region-wide trend of infestation continues to be upward, especially infestations of Canada thistle (*Cirsium arvense*), musk thistle (*Carduus nutans*), leafy spurge (*Euphorbia esula*), yellow toadflax (*Linaria vulgaris*), houndstongue (*Cynoglossum officinale*) and spotted knapweed (*Centaurea maculosa*) (USDA Forest Service, 2004). The Bridger-Teton National Forest cooperates with the Teton County Weed and Pest District through its participation in the Jackson Hole Weed Management Association, and funds the county to control weeds on the Forest. Weeds known to exist in the analysis area are shown in table 54, along with the County Weed District priorities for control of these weeds.

Table 54. Noxious weeds known to be present in the project area

Common Name	Scientific Name	Forest/County Priority[a]
Leafy spurge	*Euphorbia esula*	1
St. Johnswort	*Hypericum perforatum*	2
Sulfur cinquefoil	*Potentilla recta*	2
Absinth wormwood	*Artemesia absinthium*	3
Spotted knapweed	*Centaurea maculosa*	3
Ox-eye daisy	*Chrysanthemum leucanthemum*	3
Houndstongue	*Cynoglossum officinale*	3
Black henbane	*Hyoscyamus niger*	3
Common tansy	*Tanacetum vulgare*	3
Musk thistle	*Carduus nutans*	4
Bull thistle	*Cirsium vulgare*	4
Canada thistle	*Cirsium arvense*	4
Scentless chamomile	*Tripleurospermum inodorum*	4
Common mullein	*Verbascum thapsus*	4

a - Priority 1 = No tolerance, with a goal of eradication upon detection; Priority 2 = No tolerance, aggressive control on all known infestations; Priority 3 = No tolerance of further spread from their established locations, control and maintenance of current weed infestations and aggressive control in areas otherwise free of these weeds; Priority 4 = No tolerance of further spread, control and maintenance of current weed infestations.

Priorities for weed treatment in general are guided by the degree to which a given species is currently established in the county, and its potential to dominate a site or ecosystem should it become widely established. Higher priority is generally given to newly-discovered noxious weeds, since the likelihood of eradication is higher due to its limited distribution. Resources are not available, and likelihood of success would be minimal, to eradicate well established weeds, such as Canada thistle. Priorities for weed control outlined in the 2004 Environmental Assessment for Management of Noxious Weeds on the Bridger-Teton National Forest (USDA Forest Service 2004) in some cases differ from those in table 54. Information in

table 54 reflects more recent efforts by the Weed Management Association cooperators to prioritize weed treatment activities by weed species.

There are approximately 338 acres within the project area that are infested with noxious weeds. Most polygons are too small to show at the map scale of the project area, but are concentrated primarily along roads and near developed areas. This is not surprising as humans and ground disturbance are the major vectors for the introduction of noxious weeds. The only priority 1 weed present is leafy spurge in four spot locations, one along the powerline at the north end of the project area, and three located near each other in the Munger Mountain area at the southern end. Priority 2 weeds include St. Johns wort along Highway 22 west of Wilson, and sulfur cinquefoil just outside the project area (but within one-quarter mile of a treatment area) east of Munger Mountain.

Environmental Consequences

Methodology and Scientific Accuracy

Polygons on a Geographic Information Systems (GIS) layer developed by the Teton County Weed and Pest Division show known locations of noxious weeds infestations in the analysis area. This layer combines previously known and treated infestations with those located in surveys conducted in the fall of 2010 and spring of 2011 specifically for the Teton to Snake project. This layer was overlain with the proposed treatment units in alternatives 2 and 3, separating mechanical treatment units and prescribed burn units. This is because the prescribed burn units would be less intensively treated (not all acres would be burned), and the exact location of actual burned acres within these units is unknown. All known infestations within ¼ mile of a treatment area were identified and acres totaled, by weed treatment priority, for each of the alternatives. Control within ¼ mile was deemed to be an achievable goal, addressing risks associated with weed propagule dispersal in disturbed areas.

The following indicator was used to measure the differences between alternatives:

- Acreage of known noxious weed infestation within one-quarter mile of a planned treatment area, by the County Weed District priority category.

Information Sources

The primary source of information used in this analysis is a map of the known weed locations in the project area, created in 2010 by Teton County Weed and Pest personnel, funded as part of the development of the Teton to Snake Fuels Management Project.

Incomplete and Unavailable Information

No specific information as to the distance that weed propagules can travel was found in the literature for the following reasons:

1) Different weed species have different seed size and dispersal methods.

2) Wind dispersal distance would vary greatly depending on weather conditions, topography, and vegetative cover.

3) Seeds and other propagules transported by animals have the potential to travel greater distances than wind dispersed seeds (Sorensen 1984), but these distances would be even more difficult to predict than wind dispersal.

A ¼ mile radius of known weed infestations from treatment areas was selected for analysis because it was felt that most wind dispersed seed would fall within this radius, design features would address human-caused dispersal, and there is little control or predictability of animal dispersal.

Spatial and Temporal Context for Effects Analysis

While the spatial context for analyzing weed impacts was ¼ mile from treatment areas for the reasons described above, the spatial boundaries for analyzing the cumulative effects would be the entire project area since the other resource conditions are generally applicable on a wider scale.

Light ground disturbance in natural settings in the project area (such as harvested and burned areas), assuming no further entries, would be expected to revegetate in three years (Teton County Weed and Pest District personnel, pers. Communication; interagency fire effects monitoring). Timber sale contracts require that landings, temporary roads and skid trails be seeded with native species immediately after operations, so would be expected to recover within a year or two. The temporal context for direct, indirect and cumulative effects would be three years.

Alternative 1 – No-action

Under the no-action alternative, no treatments would occur in the project area as proposed. The current Forest Plan would continue to guide management activities across the project area, and survey and control of priority weed infestations would continue through the Participating Agreement between the Bridger-Teton National Forest and Teton County Weed and Pest Division. Of note is the fact that that although the Forest Plan allows for wildfires to burn and play their natural role in the ecosystem, direction also requires protection of utilities and property; if the no-action alternative is selected, managers would continue to suppress wildfires in this project area due to the site conditions and values at risk within and near the project area. With the continuation of current management we would continue to have a fuel complex that is more susceptible to large, stand-replacement events.

Direct and Indirect Effects

There would be no direct effects associated with the introduction or spread of noxious weeds discussed in this analysis, since no management activities would occur. However, there is the potential for indirect effects since large fire events are known to increase the risk of infestation by non-native invasive species (D'Antonio 2000).

Alternative 2 – Proposed Action

Direct and Indirect Effects

Whenever ground is disturbed or weed propagules are dispersed as a result of thinning operations, prescribed burn treatments, or connected activities, the potential exists for introduction and spread of noxious weeds. Roads maintained or reconstructed, temporary road construction and obliteration, and landings are management activities included with effects from thinning treatments. Effects from prescribed fire treatments include effects from fire control lines.

Within one-quarter mile of these treatment areas are the following acres of weed infestation:

Mechanical Treatments	Priority 1 – 0.1
	Priority 2 – 0.2
	Priority 3 – 6.6
	Priority 4 – 106.7
Prescribed Burning	Priority 1 – 0
	Priority 2 – 0.1
	Priority 3 – 25.9
	Priority 4 – 163.7

Alternative 3 – Reduce Potential Impacts to Special Areas and Wildlife Habitat

Direct and Indirect Effects

Direct and indirect effects from alternative 3 are expected to be similar to those for alternative 2 except 769 fewer acres would be thinned, 2.44 fewer miles of roads would be maintained or reconstructed, and five fewer landings are proposed. About 7,469 fewer acres would be treated with prescribed fire.

Within one-quarter mile of these treatment areas are the following acres of weed infestation:

Mechanical Treatments	Priority 1 – 0.1
	Priority 2 – 0.2
	Priority 3 – 5.9
	Priority 4 – 77.5
Prescribed Burning	Priority 1 – 0
	Priority 2 – 0.1
	Priority 3 – 1.6
	Priority 4 – 125.3

It is notable that priority 1 and 2 weeds tend to infest more acres in units that would be treated mechanically, while priority 3 and 4 weeds are more numerous (although not proportionally so) in prescribed fire areas. This is probably because more established weeds are more widely distributed over the landscape, so that larger areas would have larger populations. The mechanical units also tend to be closer to roads and private lands, both of which are vectors. Newly introduced (priority 1 and 2) species are more likely to appear in more developed areas, where the mechanically treated areas are located.

Cumulative Effects, All Alternatives

This analysis is bounded in time by 10 years into the past and into the future, which allows for an adequate length of time for most vegetative disturbances to recover.

Past, present, and reasonably foreseeable future activities within the project area include livestock grazing, timber harvest and thinning (fuels reduction), burial of utility lines, motorized and nonmotorized recreational use, road and trail construction and maintenance, insect and disease outbreaks, fire suppression, prescribed fire, urban development (sub-dividing and development of private land), climate

change and noxious weed infestation and treatment. A list documenting past and planned future activities for the project area is included in appendix E of the environmental impact statement. The acreage of disturbance represented by these activities adds up to approximately 30,250 acres. Much of this disturbance is related to fuels reduction projects similar to the Teton-to-Snake Project, so it can be assumed that the proportion of mechanically treated areas to burned areas would be similar. The incremental addition of implementing this proposal would range from 0 (no action) to 14,281 in alternative 3, to 22,510 in alternative 2.

The effects of these types of activities on the risk of the increase and expansion of noxious weed infestations are as follows:

- Livestock grazing leads to biomass removal and trampling. It can cause noxious weed invasion due to ground disturbance and removal of native vegetation. Noxious weeds can be spread by grazing animals and weed seeds are transported into new areas. It is likely that grazing impacts occurred within the project area in the past at intensities and frequencies greater than current or future levels, because the grazing permit was permanently reduced by 10 percent in 2011. Through allotment management plans, future impacts associated with the trampling or grazing by livestock can be reduced.
- Timber harvest and thinning (fuels reduction) has led to a more open canopy with additional light reaching the forest floor (most often beneficial to invasive species), soil disturbance, and development of skid roads. Changes in forest composition, structure and fire frequency have also taken place. It also increases the impacts from recreational activities by allowing improved access for those activities.
- Motorized and nonmotorized recreational use has led to the development of non-system roads and trails, development of dispersed campsites, erosion, and the vectoring of noxious weeds in previously uninfested areas. Vehicles and people help to spread noxious weeds by carrying weed seeds into new areas. These impacts are controllable through area closures and travel management.
- Road and trail construction and maintenance causes soil disturbance and erosion, which can lead to noxious weed invasion.
- Insect and disease outbreaks are natural events that occur periodically, although current levels are more intense than in recent history. Such outbreaks lead to tree mortality, creation of forest-gap habitats, opening of meadow habitats, increase of weed spread and potentially to stand-replacing fires.
- Urban development increases the risk of weed invasion and fire.
- Trends in climate change indicate that future precipitation levels would be lower and temperatures would be higher than the current long-term averages. Drier conditions are expected to affect the viability of the current suite of native plants, leading to voids in ecological niches which may create opportunities for non-native species as well as better-adapted native species to occupy those sites.

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.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

While ground disturbance and human entry increases the potential for the introduction and spread of non-native vegetation, the design features aimed at reducing these impacts would maintain the project's compliance with Forest Plan direction.

Summary

While the design features described at the beginning of the previous section are designed to prevent the introduction and spread of noxious weeds, it is likely that not all weeds would be found and controlled, and that further introductions of weed propagules would occur in the near future under circumstances beyond our control. Therefore those alternatives that cause the least disturbance (no action and then alternative 3) would have the least likelihood of introducing and spreading noxious weeds. Burn plans for the prescribed fire units could be used to prioritize weed infestations to be treated prior to burning where large acreages of noxious weeds exist.

Table 55. Acres of noxious weeds near treatment areas by priority

Forest/ County Priority	Alternative 2 Mechanical	Alternative 2 Prescribed Fire	Alternative 3 Mechanical	Alternative 3 Prescribed Fire
1	0.1	0.0	0.1	0.0
2	0.2	0.1	0.2	0.0
3	6.6	25.9	5.9	1.6
4	106.7	163.6	77.5	125.3

Cultural Resources

The following resource information and analysis summarizes the Cultural Resources Report (Schoen 2011), available on the Bridger-Teton National Forest website and in the project record.

Section 106 of the National Historic Preservation Act requires Federal agencies to take into account the effects of their undertakings on historic properties. Regulations 36 CFR 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 undertaking may have on historic properties.

A variety of vegetation management activities have the potential to affect properties either listed on or eligible for listing on the National Register of Historic Places. The analysis area for cultural resources is the project area, and the area of potential effect includes mechanical treatment units, roads, landings, burn units, and fireline construction.

Existing Condition

Mechanical treatment units, roads, and landings were surveyed for cultural resources. Surveys of burn units and fireline construction would occur as unit-specific burn plans are developed over the duration of the project. This approach is consistent with the Programmatic Agreement with the Wyoming State Historic Preservation Office (USDA 2008).

Earlier surveys conducted for previous management activities identified 26 cultural resource sites within the analysis area. The most significant of the prehistoric sites is the Teton Pass obsidian vent which is considered eligible for the national register. The remaining prehistoric sites are classified as lithic scatters indicative of lithic material procurement and processing sites as well as small temporary campsites. Two additional prehistoric sites were identified in 2010; however, neither site is within a proposed mechanical treatment unit, and both can be avoided by all project activity. Historic sites include the Teton Pass Wagon Road, the remains of the Lee Guard Station and the Munger Mountain Fire Lookout, and the remains of two separate saw mill sites. Of the historic sites, only the Teton Pass Wagon Road is considered eligible for the national register.

A cultural resource report detailing the results of the 2010 field season was submitted to the Wyoming State Historic Preservation Office on February 28, 2011, with a recommendation that all significant historic properties would be avoided by project implementation and that no historic properties would be affected by the project. The Wyoming State Historic Preservation Office concurred with this recommendation in a letter dated March 9, 2011.

Environmental Consequences

Methodology and Scientific Accuracy

This project has been analyzed at a landscape level with the analysis area defined by the project perimeter. The Bridger-Teton National Forest site and survey atlas, heritage GIS data and site databases were reviewed for the analysis area. The area of potential effect is defined as any area of potential ground disturbance or fuel load alteration. Within the area of potential effect, site forms and survey reports from previous investigations were reviewed. Site and environmental data was collected during field surveys that was based around the area of potential effect and extend into areas of the analysis area outside of the area of potential effect. The location, fire sensitivity, and fuel loading of all sites determined eligible or unevaluated for inclusion in the National Register of Historic Properties was used to determine potential effects.

In 2008 the Bridger-Teton National Forest entered into a Programmatic Agreement among the USDA Forest Service, Wyoming Forests, Wyoming State Historic Preservation Officer and Advisory Council on Historic Preservation regarding compliance with the National Historic Preservation Act (USDA 2008). Under the protocol established in this agreement for vegetation management activities, the focus of analysis in forested settings was on slopes of less than 15 percent within ¼ mile from permanent water and geological features such as saddles, terraces, benches, and high points. Areas of mechanical treatment units, road construction and maintenance, and landings were surveyed under this sampling strategy.

The strategy for those areas planned for prescribed fire and fire line construction would be to conduct limited survey through each burn unit to look for wood features, exposed archeological features, or rock art panels. The inventory would provide for a visual inspection of the open burn unit where the presence or absence of standing wood features can be confidently documented. The protocol also allows for cultural resource surveys to be completed once site-specific plans and silvicultural prescriptions are developed. This may occur after the NEPA decision is made but prior to implementation. The temporal framework for cumulative effects extends until any alterations in fuel loading may cause fire effects to cultural resources.

Information Sources

Information sources included the Bridger-Teton Project and Site Atlas, heritage GIS data, and INFRA data base. Also reviewed was the Wyoming State Historic Preservation Office Cultural Resource data base.

Incomplete and Unavailable Information

There is no incomplete or unavailable data for cultural resources.

Spatial and Temporal Context for Effects Analysis

The spatial boundaries for analyzing the cumulative effects to cultural resources are the project boundaries. The temporal boundaries are 35 years in the past and the life of the project in the future. The temporal boundary of 35 years in the past was selected because that is when cultural resource investigations and the recording of cultural resources in the project area began.

Alternative 1 – No Action

Direct and Indirect Effects

There is no potential for an absence of vegetation management activities, including prescribed fire and construction of roads, landings, and firelines, to have direct effects to any cultural resources. Indirect effects of no action could result in increased fuel loads on undetected sites. Heavier fuel loads increase the chance of high intensity fire, which has more potential to damage undetected sites. Another indirect effect of no action is a greater chance of fire suppression activity to damage cultural resources because ground-disturbing fire suppression activity may occur in unsurveyed areas. Aggressive fire suppression commonly occurs in the analysis area under the current management strategy.

Cumulative Effects

Present and reasonably foreseeable project activities would not effect, or would mitigate effects to, cultural resources, provided that regulations 36 CFR 800, which implement section 106 of the National Historic Preservation Act, are followed. Future short- and long-term effects to cultural resources from other activities (such as horseback riding, hunting, grazing, trail use, dispersed camping, and firewood gathering) may result in inadvertent damage or unauthorized artifact collecting; however, the impacts to cultural resources would be small.

Alternative 2 – Proposed Action

There is always the potential that vegetation management activities could have direct effects to previously undetected cultural resources. These effects could include the damage or destruction to standing wood features, such as cabins or prehistoric conical timber lodges. Mechanical equipment used to harvest and remove timber, or to build or maintain roads, landings, or firelines could also damage archeological sites and features. Prescribed fires across sites with only a surface scatter of artifacts generally do little if any damage. Direct effects can usually be avoided by adjusting unit boundaries so as to exclude sensitive site areas, which has been done for this alternative. There would be no direct effects to recorded eligible sites; however, there is the potential for direct and indirect effects to undetected sites. Project design features require that activities cease and evaluation occurs if any cultural resource sites discovered during implementation.

Indirect effects could result if vegetation is removed from a site leaving that site exposed to surface erosion or increased artifact collecting by the public. Indirect effects can also be mitigated by adjusting unit boundaries so as to avoid sensitive sites areas, or conducting post-harvest or post-burn surveys to identify site locations and recover additional scientific data.

The cultural resource surveys conducted to-date within the analysis area indicates that there are no significant historic or prehistoric sites within the units. Therefore, there would be no direct or indirect effects to cultural resources if the proposed action is implemented.

Cumulative Effects

The potential for cumulative effects is the same as alternative 1.

Alternative 3 – Reduce Potential Impacts to Special Areas and Wildlife Habitat

Direct and Indirect Effects

The potential for direct and indirect effects is the same as alternative 2.

Cumulative Effects

The potential for cumulative effects is the same as alternative 1.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The cultural resource survey and report to the Wyoming State Historic Preservation Office documenting the results of this survey meets the Secretary of the Interior's Standards for Archaeology and Historic Preservation (48 FR 44716-42), and complies with regulations 36 CFR800 which implements the National Historic Preservation Act.

Recreation

The following resource information and analysis is summarized from the Recreation Report (Merigliano 2012) which is available on the Bridger-Teton National Forest website and in the project record.

Recreation areas included in this analysis are the Snake River Range (Palisades Wilderness Study Area), Munger Mountain, and the Teton Pass area. Effects addressed in this analysis are:

Effect on Recreation Access and Trail Corridors: Past experience with similar projects on the Bridger-Teton National Forest suggests that recreationists are concerned about restricted access during project operations. Roads and trails could be temporarily closed during operations in the Teton Pass area and during the fall hunting season in the Snake River Range and Munger Mountain area.

A second area of concern is the effect of the proposed treatments on trail corridors, such as cutting trees within a corridor or burned trees that fall into the trail and are not removed in a timely manner.

Potential for Unauthorized Motorized Use: There is public concern about the proposed treatments opening up the forest and creating potential for motorized vehicles to create new routes off of roads and motorized trails.

Effects to recreation are measured using the following indicators:

- Miles of system trail within mechanical treatment units
- Miles of system trail within prescribed burn treatment units

The potential for unauthorized motorized use is measured using the following indicator:

- Designated motor vehicle routes (per 2011 Jackson District Motor Vehicle Use Map) within or adjacent to proposed treatment units

Existing Condition

Snake River Range

The Snake River Range contains approximately 130 miles of Bridger-Teton National Forest system trail managed for nonmotorized uses including pack and saddle use. Mountain bike use occurs on some trails. Trails are generally primitive with few signs, with primary access points within the project area at Mosquito Creek, North Fork Fall Creek, and Coburn Creek. Although the area is close to Jackson, it receives low to moderate recreation use. The highest use occurs during the fall hunting season from September 10-October 26. During the summer, nine outfitters offer stock and backpacking trips with 1,207 service days authorized. During the fall, 11 outfitters offer overnight and day hunting trips with 1,566 service days authorized.

Munger Mountain

Munger Mountain contains approximately 18 miles of system trail, 15.7 miles of which are managed for both motorcycle use and nonmotorized uses. This multi-use trail system was designated and added to the national forest system in January 2009. Since then, the Forest Service and numerous partners and volunteers have reconstructed trails to improve sustainability, added informational signing at the trailheads, and installed trail junction signing. The entire trail system is located on the west side of Munger Mountain and is accessed from the Fall Creek road. Due to the small size of the area and relatively easy access, the area receives day use; camping and multi-day trips rarely occur. The trail system receives moderate use but is increasing in popularity. Fall hunting via foot and horseback travel is also increasing. One outfitter offers guided hiking trips; no guided fall hunting is authorized.

Teton Pass Area

Teton Pass encompasses the area from the ridge south of Black Canyon to the ridge north of Phillips Canyon. State Highway 22 bisects this area. It includes 50 miles of system trail serving a mix of nonmotorized uses from hiking, cross-country mountain biking, downhill mountain biking, dog walking, trail running, and horse riding. It is one of the most popular recreation areas on the Jackson Ranger District serving local residents from both Jackson Hole, Wyoming, and Teton Valley, Idaho, and increasingly serving regional visitors from Utah, Colorado, and Montana. Bridger-Teton National Forest Visitor Use Monitoring data shows 28 percent of visitors use the national forest more than 50 times per year compared with a national average of 13 percent. Such frequent use is largely attributed to places like Teton Pass where local residents often visit favorite trails daily. Three primary trailheads serve the area: Teton Pass summit, Phillips Bench, and Trail Creek. During the summer, it is not uncommon to count 30 vehicles at the Phillips Bench trailhead. Teton Pass is considered a day-use area however backpacking trips into the adjacent Jedediah Smith Wilderness originate in the area and car camping along the Phillips Ridge road is becoming more popular as regional visitation increases. A summer trail plan for this area was developed in 2004. Since that time, the Forest Service and key partners, notably Friends of Pathways and Teton Freedom Riders have invested over $300,000 and countless volunteer hours into improving the trail system. This investment includes the 2008 ArrowCorp project with 750 Boy Scouts and the 2010 Wyoming Business Council grant which showed a clear link between the trail enhancements and improvements in the local economy. The area supports some outfitted use, primarily guided hiking in the summer and a few recreation events.

Environmental Consequences

Methodology and Scientific Accuracy

Information Sources

Information to assess effects is generated from Bridger-Teton National Forest GIS transportation data. This data contains motor vehicle route locations last updated in 2015 and nonmotorized trail data which was also updated in 2014. Use information is obtained from outfitter-guide actual use reports and daily monitoring reports completed by field personnel.

Incomplete and Unavailable Information

Recreation use numbers are estimates since generating statistically valid use numbers at a site level is difficult given the high variability in use throughout the season. This is particularly true for backcountry areas. However, the effects analysis is not dependent on precise use numbers.

Spatial and Temporal Context for Effects Analysis

The spatial context for analyzing direct and indirect effects of the proposal on recreation opportunities is the geographic boundary of the Munger Mountain area, the Teton Pass area, and the Snake River Range on the Bridger-Teton National Forest because effects to recreation users and unauthorized motorized use as a result of this project would not occur outside of these areas. The timeframe for analysis is 5-10 years. This time period is considered sufficient to fully implement the project.

Alternative 1- No Action

Direct and Indirect Effects

There would be no direct effects from this alternative. Indirect effects associated with future wildfire and suppression efforts could occur, such as temporary trail or area closures to protect fire fighter and public safety.

Cumulative Effects

No actions are proposed under this alternative, therefore there would be no direct, indirect effects, or cumulative effects. Current trends in fire suppression would continue.

Alternative 2 – Proposed Action

The proposed 2,526 acres of mechanical treatment include 1,282 acres within the Snake River Range, 0 acres within the Munger Mountain area, and 1,244 acres within the Teton Pass area.

The proposed 19,991 acres of prescribed burns include 12,147 acres in the Snake River Range, 3,919 acres within the Munger Mountain area, and 3,918 acres within the Teton Pass area.

Direct and Indirect Effects

Snake River Range

Effect on Recreation Access and Trail Corridors: The mechanical treatment in the Trails End unit (T-38) would affect approximately one mile of the South Fork of Fall Creek trail. The South Fork of Fall Creek receives low use and the drainage can be accessed via the North Fork of Fall Creek, thus the effect on recreation access and opportunities would be minimal.

Approximately 8.5 miles of system trail (Mosquito Creek – 0.5 miles, South Fork Fall Creek – 4 miles, Coburn Creek – 4 miles) pass within the burn units. The effect of prescribed burning on recreation access and opportunities would be minimal in the spring but more pronounced in the fall due to higher levels of outfitted and hunting use. Recreation effects can be reduced through coordination between recreation and fire staff on the timing of ignitions along with advance public notification as required by project design features. Since the burn units are relatively small in comparison to hunt unit boundaries, hunting opportunities would continue to be available. Coordination would be required to minimize effects in the vicinity of assigned fall outfitted hunting camps in the Mosquito Creek, North Fork of Fall Creek and South Fork of Fall Creek drainages.

Effect on Potential for Unauthorized Motorized Use: Mechanical treatment units Red Top 1 and 2 (T-33 and T-35) are near designated motor vehicle routes in the North Fork of Fall Creek drainage. Additionally, there are known user-created routes near the Singing Tree treatment units (T-23, T-25) and within the burn units in the Taylor Mountain area. Project design features would minimize the potential for unauthorized motorized use; however implementing effective motor vehicle barriers would require careful oversight.

Munger Mountain

Effect on Recreation Access and Trail Corridors: No mechanical treatment is proposed for the Munger Mountain area. The prescribed burning units include approximately three miles of the Big Munger trail from the main summit to the north summit. The trail corridor itself is unlikely to be affected by tree fall since it is dominated by open grasslands. The prescribed burns are unlikely to affect mountain bikers, horse riders, and hikers who primarily use the lower system trail loops to the west of the proposed burns. The Big Munger trail is open to motorcycle use from July 1– September 9 annually and the trail sees increased nonmotorized use (foot and horseback) during the hunting season. The timing of fall burning would need to be closely coordinated with recreation managers to minimize effects on hunters. No outfitters would be affected.

Effect on Potential for Unauthorized Motorized Use: No treatment units occur near designated motor vehicle routes. The proposed burns do encompass one significant user-created route so design features to physically block vehicle openings would be implemented.

Teton Pass

Effect on Recreation Access and Trail Corridors: Approximately 13 miles of trail could be affected by the mechanical treatments in Phillips Bench Units 1, 2, 5, 7 (T-5, 3, 6, 4); Powerline Unit 1 (T-10), and Recreation Trail Unit 2 (T-11). Affected trails include the Phillips Ridge trail, Snotel trail, and portions of the History, Crater, Big Rocks, Fuzzy Bunny, and Parallel trails. These trails receive high recreation use during the entire snow-free season.

Proposed burn units would affect 14 miles of the Phillips Canyon, Lithium, and Black Canyon trails. These trails also receive high use. Recreation activities include hiking, mountain biking, dog walking, downhill mountain biking, horse riding and hunting. Some of these trails were built or reconstructed with considerable community involvement and monetary investment, thus there is likely to be little tolerance for trail closures or trail damage.

Effect on Potential for Unauthorized Motorized Use: Phillips Bench Units 2, 7, 3, 4 (T-3, 4, 6, 7, 8) and Recreation Trail Units 4 and 3 (T-15, T-16) are near designated motor vehicle routes in the Phillips Ridge area and in the bottom of Black Canyon. Project design features would minimize the potential for unauthorized motorized use; however implementing effective motor vehicle barriers would require careful oversight.

Cumulative Effects

Considering the past, present, and reasonably foreseeable actions listed in appendix E located in the Snake River Range, Munger Mountain, or Teton Pass areas, no additional cumulative effects are anticipated. None of the projects on the list involve restrictions on recreation access nor would any projects potentially create motor vehicle openings.

Alternative 3 - Reduce Potential Impacts to Special Areas and Wildlife Habitat

Direct and Indirect Effects

The proposed 1,757 acres of mechanical treatment include 775 acres within the Snake River Range, 0 acres within the Munger Mountain area, and 982 acres within the Teton Pass area.

The proposed 12,524 acres of prescribed burns include 7,780 acres in the Snake River Range, 1,663 acres within the Munger Mountain area, and 3,081 acres within the Teton Pass area.

Alternative 3 includes the same project design features as described under alternative 2 to minimize effects on recreation.

Direct and Indirect Effects

Snake River Range

Effect on Recreation Access and Trail Corridors: No system trails would be affected by the mechanical treatments. The effects of the prescribed burns would be similar as described for alternative 2, however approximately 7 miles of system trail would be directly affected (Mosquito Creek – 0.5 miles, South Fork Fall Creek – 3.5 miles, Coburn Creek – 3 miles).

Effect on Potential for Unauthorized Motorized Use: Mechanical treatment units Red Top 1 and 2 (T-33 and T-35) are near designated motor vehicle routes in the North Fork of Fall Creek drainage. Additionally, there are known user-created routes near the Singing Tree treatment units (T-23, T-25) as well as within the burn units in the Taylor Mountain area. Project design features would minimize the potential for unauthorized motorized use; however implementing effective motor vehicle barriers would require careful oversight.

Munger Mountain

Effect on Recreation Access and Trail Corridors: No mechanical fuel treatment is proposed for the Munger Mountain area. The prescribed burning units include approximately two miles of the Big Munger trail. The trail corridor itself is unlikely to be affected by tree fall since it is dominated by open grasslands. The prescribed burns are unlikely to affect mountain bikers, horse riders, and hikers who primarily use the lower system trail loops to the west of the proposed burns. The Big Munger trail is open to motorcycle use from July 1–September 9 annually and the trail sees increased nonmotorized use (foot and horseback) during the hunting season. The timing of fall burning would need to be closely coordinated with recreation managers to minimize effects on hunters. No outfitters would be affected.

Effect on Potential for Unauthorized Motorized Use: No treatment units occur near designated motor vehicle routes, however implementing the design feature to prevent unauthorized motorized use would still be important in this area.

Teton Pass

Effect on Recreation Access and Trail Corridors: The effects of alternative 3 are the same as described under alternative 2.

Effect on Potential for Unauthorized Motorized Use: The effects of alternative 3 are the same as described under alternative 2.

Cumulative Effects

Considering the past, present, and reasonably foreseeable actions listed in appendix E located in the Snake River Range, Munger Mountain, or Teton Pass areas, no additional cumulative effects are anticipated. None of the projects on the list involve restrictions on recreation access nor would any projects potentially create motor vehicle openings.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The proposed treatments would comply with Forest Plan and other relevant laws, regulations, policies and plans as long as design features are effectively implemented and monitored.

Summary

Table 56. Comparison of alternative effects on recreation

	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Modified Proposal
Miles of system trail within mechanical fuel treatment units	0	14.0	13.0
Miles of system trail within prescribed burn units	0	8.5	7.0
Designated motor vehicle routes within fuel treatment units	0	18.0	18.0

Visual Quality

The following resource information and analysis summarizes the Visual Quality Report (Barthelenghi 2012), available on the Bridger-Teton National Forest website and in the project record.

Existing Condition

The landscape character for the project area includes high, steep, rugged mountain peaks and precipitous ridges, montane and alpine zones, and gentle sloping mountains leading to broad, lush valleys with meandering streams. Outstanding cliffs, crags, rock outcrops, talus slopes, and avalanche chutes are rich in variety of form, line, color, and texture. Elevations range from 6,200 to 11,682 feet with the varied and dramatic visual contrasts of coniferous forest, deciduous aspen forest, and grass/shrub communities. Grassy openings and or open stands of trees are dominant visual patterns on east-facing slopes and along the mountain ridgelines. The primary tree species are spruce/subalpine fir mix, lodgepole pine, Douglas-fir, aspen, and mountain big sagebrush. Aspen create an impressive scenic impact in the fall when the leaves have turned shades of golden and bright yellow.

Scenery and related aesthetic values have long been recognized in the Greater Yellowstone Area as an important resource to protect, as is evidenced by the establishment of Yellowstone and Grand Teton National Parks which are known for their high level of scenic integrity. The project area contains some of the most scenic landscapes on the Bridger-Teton National Forest, and these visual resources are important to the experiences of visitors and local residents. A variety of recreationists use the project area and view it from open roads and trails. For the most part, past timber harvesting blends well with the surrounding landscape character and has little visual effect. However, the 2001 Green Knoll Fire has had a large visual effect on the landscape and is seen from the main sensitive travel routes used by visitors to the Tetons. Visible man-made features include rural homes on adjacent lands, roads, trails, some evidence of past timber harvests, fencing, and trailhead facilities.

Visual quality objectives are defined as desired levels of scenic quality and diversity of natural features based on physical and sociological characteristics of an area. Objectives in the project area include:

1. **Foreground Retention:** For the landscape within one-half mile from the viewer, activities may only repeat form, line, color, and texture which are frequently found in the characteristic landscape, and should not be evident to casual Forest visitors.
2. **Middle Ground Partial Retention:** For the landscape located one-half mile to 4 miles from the viewer, activities may repeat form, line, color, or texture which are found infrequently or not at all in

the characteristic landscape, but remain visually subordinate to the visual strength of the characteristic landscape.

3. **Background Partial Retention:** For landscapes located more than 4 miles from the viewer, activities may repeat form, line, color, or texture which are found infrequently or not at all in the characteristic landscape, but remain visually subordinate to the visual strength of the characteristic landscape.
4. **Background Modification:** For landscapes located more than 4 miles from the viewer, activities of vegetative and landform alteration must borrow from naturally established line, form, color, and texture so that their visual characteristics are those of natural occurrences within the surrounding area when viewed as middle ground or background. Activities may visually dominate the original characteristic landscape.

All of the views from Highway 189 occur in the middle ground and background. All of the views from Highway 22 occur in the middle ground and background, except for the prescribed burn at Teton Pass which is in the foreground. Sensitive viewpoints along the Centennial Scenic Byway and Teton Pass were analyzed using visual simulations. The proposed activities cannot be viewed from the sensitive viewing areas identified in the Forest Plan.

Environmental Consequences

Sensitive viewpoints along the Centennial Scenic Byway and Teton Pass were analyzed using modeled simulations for changes to the landscape resulting from each alternative. The simulations indicate that the retention visual quality objective would be met. Simulations are located in the Visual Quality Report in the project record.

Overall, the proposed activities may affect the visual quality in the project area while still meeting Forest Plan standards and visual quality objectives. Effects would be short term (1 to 5 years) and dependent upon where on the landscape the proposed activities take place. Many of the proposed activities are not visible from main roads and trails in the project area.

Alternative 1 – No Action

Direct and Indirect Effects

Natural disturbance regimes and events such as wildfires, winds, insects, and disease would continue to shape and change the vegetation of forest landscapes.

Many dead and dying trees could remain standing for several years. As trees fall, there would be an increase in woody material on the ground and a reduction in forest canopy. The increased woody debris, along with continued spread of insect infestations, and continued fire suppression, would increase the probability for high intensity fires.

Forest Plan visual quality objectives would be met. Long-term effects may be less desirable due to increased woody debris, continued spread of beetle infestation, increased occurrence of dead and dying trees, and the potential for high-intensity fire events. This concern is amplified with dispersed recreation use and private residential developments near national forest system lands.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Table 57 displays the treatment acres proposed in each visual quality objective. Discussion of the effects follows by treatment type follows the table.

Table 57. Alternative 2 treatment acres by visual quality objectives

Treatment	Retention (acres)	Partial Retention (acres)	Modification (acres)
Hand Cut	555	838	0
Non-Commercial Thin Commercial Thin	196	527	0
Non Commercial Thin Hand Cut	74	186	0
Prescribed Fire	7,282	9,608	3,067

Commercial thin: Commercial thinning is primarily noticed as a textural change of the existing forest canopy. Treatment units are located in visual quality objectives of background maximum modification, middle ground retention, and middle ground partial retention viewpoints. This type of treatment has limited short-term visual effects and essentially no long-term effects. Once the trees are removed, slash burned, and small skid trails and roads rehabilitated, the visual effects of this treatment would greatly lessen and are considered minor. The visual quality objectives, in particular the retention objective, would be met as the treatment would likely go unnoticed within 5 years. Project design features require that temporary roads, landings, and skid trails would be rehabilitated and returned to pre-implementation conditions.

Hand cut: Trees and shrubs would be cut or pruned using chainsaws. The visual effects are minor and would meet all the assigned visual quality objectives.

Non-commercial thin: Selected trees up to 9 inches dbh would be cut and left on site, with woody debris piled and burned. These treatments are located in units which have visual quality objectives of modification, partial retention, and retention, and because effects would be limited and short term with essentially no long-term effects, retention and partial retention objectives would be met, and the objective for modification would be exceeded.

Prescribed fire: Prescribed burning units would reduce fuels and restore sagebrush and grasslands. The treatments would be noticed as blackened ground surfaces, standing and downed dead trees, and small clumps of standing red-needled trees. The visual effects of this treatment would meet the visual quality objectives of retention, partial retention, and modification.

Road work: The most noticed visual effect of the proposed road work would be the ground disturbance evidenced by the lightly colored soils and gravels on and near the main roads in the project area. This effect would recover once vegetation is established. All road work would meet the retention visual quality objective, the most restrictive.

Cumulative Effects

Projects and events which could contribute to cumulative effects include wildland fires, timber harvesting, prescribed burning, road reconstruction, recreational use, mining, private land development, special use permits, and weed spraying. These would not have cumulative visual effects either due to the nature or location of the activity.

In all alternatives changes in the form of the continuous green forest would decrease over the next decade as pockets of trees are killed from beetles and from the prescribed burning. Over time the forest cover would appear as natural and meet Forest Plan visual goals.

As mentioned in the existing conditions discussion, past timber harvesting is slightly noticeable from the main roads and trails within the project area. Most of this past harvesting activity meets the visual quality objectives established for this area by the Forest Plan. Future planned timber fuel reduction thinning would adhere to Forest Plan direction, particularly meeting visual quality objectives.

Maintenance of open Forest roads in the project area would continue, with short-term (less than 5 years) visual effects that often go unnoticed by Forest visitors.

Alternative 3 – Reduce Potential Impacts to Special Areas and Wildlife Habitat

Table 58 displays the treatment acres proposed in each visual quality objective. Discussion of the effects follows by treatment type is the same as discussed under alternative 2.

Direct and Indirect Effects

Table 58. Alternative 3 treatment acres by visual quality objectives

Treatment	Retention (acres)	Partial Retention (acres)	Modification (acres)
Hand Cut	660	838	0
Non-Commercial Thin Commercial Thin	193	386	144
Non Commercial Thin Hand Cut	72	51	0
Prescribed Fire	3,686	5,998	2,796

The visual effects are the same as those described for alternative 2. The reduced acres of prescribed fire minimize visual effects with no evident change in form, line, or texture. Prescribed fire treatments would not be noticeable to the casual visitor in the background and slightly noticeable in the middle ground viewing distances along the sensitive travel roads. Thinning treatments would not be evident because they would mimic natural openings frequently found in the landscape.

The activities planned for alternative 3 would have both short-term (less than 5 years) and long-term (greater than 5 years) visual effects; however, Forest Plan standards and visual quality objectives would be met, and project design features developed to protect visual quality would be implemented.

Cumulative Effects

The cumulative effects expected for this alternative are the same as those described under alternative 2.

Chapter 4 – Consultation and Coordination

The Forest Service consulted the following individuals, Federal, state, tribal, and local agencies during the development of this environmental impact statement:

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Consultants and Stakeholders

Federal, State, and Local Agencies

USDA Forest Service, Caribou-Targhee National Forest

USDI Fish and Wildlife Service

Wyoming State Game and Fish Department

Wyoming State Forestry Division

Wyoming State Historic Preservation Office

Bonneville Power Administration

Teton County Commissioners

Willy Watsabaugh, *Jackson Hole/Teton County Fire Chief*

Teton Conservation District

Tribes

Eastern Shoshone Tribe at Fort Washakie, Wyoming

Shoshone-Bannock Tribes at Fort Hall, Idaho

Others

Teton Area Wildfire Protection Coalition

Wyoming Wilderness Association

Homeowners Associations

Jackson Hole Conservation Alliance

Greater Yellowstone Coalition

Sierra Club

Distribution of the Draft Environmental Impact Statement

Notice of the opportunity to review and comment on this draft environmental impact statement would be provided to:

1. Federal agencies, tribes, and state and local governments listed above.
2. Individuals who specifically requested a copy of the document, submitted comments during the 2011 or 2013 scoping periods, otherwise expressed interest in this project, and the general public.

Notice would be made by email, US Post, website postings, entry in the Federal Register, and a legal ad published in the Casper Star-Tribune.

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Note: References for chapters 1 and 2 are listed by chapter; those for chapter 3 are listed by the section in which they appear.

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Chapter 3

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Appendix A: Alternative Maps

Note: The appendix A maps are in a separate folder due to file size. Please follow this link to access the alternative maps: Appendix A Maps

The map set titles are also listed below for reference.

Map 1. Alternative 2 treatment unit map, Northern Emphasis Area

Map 2. Alternative 2 treatment unit map, Midwest Emphasis Area

Map 3. Alternative 2 treatment unit map, Mideast Emphasis Area

Map 4. Alternative 2 treatment unit map, Southwest Emphasis Area

Map 5. Alternative 2 treatment unit map, South Emphasis Area

Map 6. Alternative 2 treatment unit map, Southeast Emphasis Area

Map 7. Alternative 3 treatment unit map, Northern Emphasis Area

Map 8. Alternative 3 treatment unit map, Midwest Emphasis Area

Map 9. Alternative 3 treatment unit map, Mideast Emphasis Area

Map 10. Alternative 3 treatment unit map, Southwest Emphasis Area

Map 11. Alternative 3 treatment unit map, South Emphasis Area

Map 12. Alternative 3 treatment unit map, Southeast Emphasis Area

Appendix B: Project Design Features

The project design features listed below are part of the proposed action and are intended to minimize or avoid potential adverse environmental effects while meeting project objectives. This section emphasizes standard best practices used for thinning and prescribed fire operations, thus supplementing the details about the action alternatives provided in chapter 2. Interagency fire effects and Forest Plan monitoring, which are incorporated by reference, as well as reviews of relevant literature (see list of references cited) indicate that these measures can create the desired end states and protections. As much as possible, design features are site-specific and include rationales for including them in the proposed action. Included in this list are Forest Plan standards and guidelines and additional actions to provide for safety and further protection of resources during project implementation. These measures and objectives would be written into silvicultural prescriptions, included as contract requirements, and factored into the burn window specifications documented in the burn plan.

Key to design features by resource area:

Cultural Resources (CR)

Fire Ecology (FE)

Fire Prevention (FP)

Fuels Management (FM)

Hydrology (H)

Noxious Weeds (NW)

Range (R)

Recreation (REC)

Roads and Skid Trails (ROADS)

Visual Quality (VQ)

Sensitive Plants (P)

Silviculture (SILV)

Smoke Management (SM)

Soils (SOILS)

Special Areas (SA)

Wildlife (WL)

Note: Design features apply to the particular units and locations proposed in the two action alternatives. See chapter 2 for lists of treatment units by alternative as well as units that occur in the wilderness study area, inventoried roadless areas, and defense zone.

Design Feature Identifier by Resource	Resource Objective(s)	Design Feature	Units/Location
Cultural Resources			
CR-1	Protect cultural resources.	All mechanical units have been surveyed in accordance with the Programmatic Agreement Among the U.S.D.A. Forest Service, Wyoming Forests, Wyoming State Historic Preservation Officer, and Advisory Council on Historic Preservation regarding compliance with the National Historic Preservation Act on the National Forest and Grasslands of Wyoming. All prescribed fire units would be surveyed prior to project implementation. Historic and prehistoric sites that have been determined eligible for the National Register would be avoided by all project activities.	All units
CR-2	Protect cultural resources.	If any cultural resource sites are discovered during implementation, all project activities in the vicinity of those resources would cease until evaluation occurs.	All units
Fire Regimes and Ecosystem Processes			
FE-1	Reduce the spread of noxious weeds and the possible side effect of negatively effecting the fire regime	Areas known to include invasive species and those that are discovered during implementation such as cheatgrass (*Bromus tectorum*), that have the potential to affect the fire regime, should be identified and mapped. If fire is to be applied to these areas, successful herbicide treatments should be implemented pre and post burn.	All units
Fire Prevention			
FP-1	To reduce losses on private land from future wildfire events.	The Bridger-Teton National Forest would continue to provide information and education to homeowners and community groups through the Firewise program.	NA

Design Feature Identifier by Resource	Resource Objective(s)	Design Feature	Units/Location
Fuels Management			
FM-1	Reduce fuels hazards to acceptable levels while maintaining soil productivity.	Reduce dead and down fuel loadings to 5 to 7 tons per acre, or no more than existing, within 300 feet of subdivisions. Where possible beyond the 300-foot zone, leave 5-10 tons per acre in all thinning units in the defense zone.	All mechanical defense zone units
FM-2	Manage spot fires for resource protection and to meet project objectives.	Response to spot fires and slop overs outside prescribed fire unit boundaries would be determined by the prescribed fire burn boss and agency administrator based on current and predicted fire behavior and values to be protected utilizing the risk management process. Spot fires outside of the project area would have a suppression oriented response that may include confine and contain strategies. If the spot fire creates a significant departure from the original project objectives and effects as disclosed in this Environmental Impact Statement, a supplemental report to the project file would be prepared and publicly disclosed with unimplemented future actions from Teton to Snake suspended or modified if appropriate.	All Prescribed Fire Units
FM-3	Reduce activity fuels and protect soils productivity.	Treat residual slash treated on site through pile, jackpot, or underburning. Burn piles would when snow or moisture conditions prevent fire spread between piles.	Defense zone units.
FM-4	Contain fire and protect soils and water resources.	Construct control line as needed to ensure prescribed fire stays within unit boundaries, using minimum impact tactics without compromising safety. Preference should be given to use of existing trails, roads, rock outctrops, barren or wet areas, aspen stands, and areas of low density brush and conifers as needed. All constructed fire line would be cross-drained while in use and rehabilitated when operations are complete to avoid potential for erosion and encourage revegetation.	Prescribed fire units as proposed.

Design Feature Identifier by Resource	Resource Objective(s)	Design Feature	Units/Location
Hydrology			
H-1	Minimize the effects of road building and harvesting activities on riparian areas.	WYBMP Practice 3: *Riparian Area Designation*. The objective of this BMP is to minimize the effects of road building and harvesting activities on Riparian Areas.	All units.
H-2	Maintain hydrographic characteristics to maintain water quality and soil productivity, and reduce soil erosion and sedimentation.	WYBMP Practice 6: Timber Sale Design. The objective of this BMP is to insure that timber harvest unit design would maintain hydrographic characteristics to maintain water quality and soil productivity, and reduce soil erosion and sedimentation.	All units.
H-3	Maintain soil productivity, minimize erosion, and prevent ash, sediment, nutrients, and debris from entering surface water.	WYBMP P40 The objective of WYBMP P40 *Protection of Soil and Water from Prescribed Burning* is to maintain soil productivity, minimize erosion, and prevent ash, sediment, nutrients, and debris from entering surface water.	All units with prescribed fire, underburning, and/or pile burning.
H-4	Protect water resources.	Implement no ignition\no treatment buffers as follows: 150 feet for channel side slopes less than 40 percent and 300 feet for steeper side slopes (Forest Plan Sediment Control Standard, Forest Plan Water Quality Standard, WYBMP P15, WYBMP P40, Forest Plan Streambank Vegetation Standard-Floodplains, Wetlands and Riparian Areas).	Both sides of all perennial and intermittent streams supporting riparian vegetation for all proposed units.
H-5	Protect water resources.	Use a 100-foot no-ignition\no-treatment buffer on all other channels that do not support riparian vegetation (Forest Plan Sediment Control Standard, Forest Plan Water Quality Standard, WYBMP P15, and WYBMP P40).	All channels which do not support riparian vegetation.
H-6	Protect water resources.	Back-burning is allowed into riparian areas but with the exception of occasional single or group tree torching burning should not exceed low-intensity (DeBano, 1990, WY BMP P40, Forest Plan Goal 4.3(c).	Prescribed fire units.

Design Feature Identifier by Resource	Resource Objective(s)	Design Feature	Units/Location
H-7	Protect water resources.	No mechanical treatment would occur within riparian areas. No log landings or decking areas would be located within riparian areas. Directionally fall hand cut trees away from streams in riparian areas, remove logging slash from within riparian areas. Do not skid or yard across drainages (Forest Plan Logging in Riparian Area Standard, WYBMP P3, WYBMP P2, WYBMP P6, Forest Plan Goal 4.3(c)).	All mechanical units and all commercial units.
H-8	Protect water resources.	No hand falling or hand piling would occur within 50 ft. of the North Fork of Trail Creek. Hand piling can occur beyond 50 ft. from Trail Creek to the power line, with piles spaced at least 30 ft apart. Avoid burning all the hand piles within one year to limit potential for erosion (Forest Plan Goal 1.3(b), Forest Plan Goal 4.2(d), Forest Plan Goal 4.3(c), Forest Plan Logging in Riparian Area Std, Soil, Water, and Air Water Quality Std).	Phillips Bench Unit 5
H-9	Protect water resources.	Known wetlands and ponds as well as those located during layout would be identified on maps used for project implementation. No mechanized equipment or ignition of prescribed fire should occur within these wetlands. Hand and aerial ignition should be no closer than 50 feet from delineated boundaries of wetland and ponds (Executive Order 11990, Protection of Wetlands, WY BMPs 2, 10).	Known wetlands and ponds occur in Phillips Bench Unit 6; Powerline Unit 1; Mosquito Creek North Rx Burn Unit; Singing Trees Rx Units 1, 2, 4; Taylor Mountain Rx Burn Units 3, 4; Red Top Units 1, 4; Trails End Road Rx Burn Unit; Coburn Creek Rx Burn Units 1, 2; Fall Creek Ranch Rx Burn Units 1, 2; Munger Mountain Rx Burn Units 1, 2
H-10	Protect water resources.	No hand piling and burning should occur within 50 feet of the channel (Forest Plan Goal 1.3(b), Forest Plan Goal 4.2(d), Forest Plan Goal 4.3(c), Forest Plan Logging in Riparian Area Std, SWA Water Quality Std).	Recreation Trail Unit 1
H-11	Protect water resources.	No pile burning should occur within 50 feet of the riparian zone. (Forest Plan Goal 1.3(b), Forest Plan Goal 4.2(d), Forest Plan Goal 4.3(c), Forest Plan Logging in Riparian Area Std, SWA Water Quality Std)	Recreation Trail Unit 3

Design Feature Identifier by Resource	Resource Objective(s)	Design Feature	Units/Location
H-12	Protect water resources.	No burning should occur for the entire southern boundary from the toe of slope (north/northeast side of Mosquito Creek) to the unit boundary adjacent to the road, which encompasses the entire floodplain area of Mosquito Creek. No hand or aerial ignition should occur within 100 feet of the toe of slope immediately north/northeast of Mosquito Creek	Mosquito Creek North Rx Burn Unit
H-13	Protect water resources.	Implement a 100 ft no ignition buffer surrounding the wetlands in the central portion of each unit.	Coburn Creek Rx Burn Unit 3 Munger Mountain Units 1 and 2
H-14	Protect soils on steep slopes.	Burn in spring.	Coburn Creek Rx Burn Unit 3
H-15	Prevent surface erosion into Pritchard Creek.	No hand or aerial ignition should occur on the steep southern slopes. Ignitions should occur above the break in slope. Along the eastern side of the unit, paralleling the road, implement a no-burn buffer between the road and the toe of the slope to prevent further introduction of sediment into an area with reduced ground cover and infiltration adjacent to a tributary of Pritchard Creek.	Wilson Fall Creek Rx Burn Unit
H-16	Protect riparian resources	No mechanized equipment use or ground disturbing activities within riparian areas	All units with prescribed fire, underburning, and/or pile burning
H-17	Protect riparian and water resources	No dozer line would be constructed. Rehabilitate all constructed fire line according to Forest Soil Scientist direction. When areas near fireline have been cold-trailed, soil and organic material would be pulled back onto the fireline to reduce erosion potential Fireline buffers agree with the treatment buffers along water bodies Handlines, or other constructed firelines, would be constructed according to the same buffers outlined for other activities to protect water and riparian resources.	All units with prescribed fire and underburning

Design Feature Identifier by Resource	Resource Objective(s)	Design Feature	Units/Location
H-18	Protect riparian and water resources	Construct waterbars on steep slopes where firelines have a relatively high potential for erosion. Maximum average waterbar spacing should follow these guidelines: *less than 9 percent grade; 400 ft * 10-15 percent: 200 ft * 15-25 percent: 100 ft * 25 percent+: 50 ft	All units with prescribed fire and underburning
H-19	Protect riparian and water resources	Minimize bucking of material to establish the fireline. Preferable to move material out of the line or build line around burning/burnable fuels	All units with prescribed fire and underburning
H-20	Protect riparian and water resources	Do not pile fuels if at all possible when constructing line and during mop-up. If fuels are piled, scatter them for better decomposition and dispersal of runoff	All units with prescribed fire and underburning
H-21	Protect riparian and water resources	Discourage use of newly created fireline and trails by blocking with brush, limbs, poles and logs in a naturally appearing configuration	All units with prescribed fire and underburning
Noxious Weeds			
NW-1	To reduce the risk of spreading noxious weeds.	Treat weeds within 1/4 mile of units prior to implementation, or avoid, and monitor after implementation.	All units
NW-2	To reduce the risk of spreading noxious weeds.	During the prescribed burns, avoid foot and motorized vehicle traffic through weed infestations if possible.	Prescribed fire units
NW-3	To reduce the risk of spreading noxious weeds.	All vehicles that leave established roads must be pre-washed to avoid introducing weed seeds and should be washed again before being used elsewhere.	All units
NW-4	To reduce the risk of spreading noxious weeds.	Construct burn piles at least 20 feet from roads to reduce the chance of weeds colonizing the post-burn scars.	All units

Design Feature Identifier by Resource	Resource Objective(s)	Design Feature	Units/Location
Range			
R-1	To ensure effective prescribed fire treatment.	Coordinate implementation with the District Ranger Conservationist and the Munger Allotment permittee to determine which units would need to be rested prior to burning in order to meet the burn prescription.	South Fork Fall Creek Rx Burn Unit Coburn Creek Rx Burn Units 1 and 2 Fall Creek Ranch Rx Burn Unit Wilson Creek Ranch Rx Burn Unit Munger Mountain Rx Burn Units 1 and 2
R-2	Protect soil productivity.	Post-prescribed burn, assess the need for resting pastures from livestock use, and implement as necessary to assure vegetation and soils objectives are met. The vacant Mosquito Creek allotment may be used as alternate pasture, but only temporary electric fencing would be permitted.	Same as above.
Recreation			
REC-1	Protect public safety during operations.	Develop site-specific safety plans with an eye toward minimizing restrictions on access while still promoting safety. Notify the public about any temporary closures during implementation. Notification would occur via press releases and on-site signage at trailheads at least two weeks prior to operations. On-site trail ambassadors and lookouts are highly recommended during all operations in the Teton Pass area to provide for public safety while still allowing recreation access. On-site trail ambassadors and lookouts are highly recommended during all operations in the Teton Pass area to provide for public safety while still allowing recreation access. On-site trail ambassadors and lookouts are highly recommended during all operations in the Teton Pass area to provide for public safety while still allowing recreation access.	All units
REC-2	Minimize impacts to recreationists and recreation facilities.	No piles of activity fuels would be placed in roads, trails or at trailheads.	All units

Design Feature Identifier by Resource	Resource Objective(s)	Design Feature	Units/Location
REC-3	Minimize impacts to National Forest System trails and retain the forested appearance of trail corridors.	Coordinate with the District trails manager and Outfitter and Guide permit administrators prior to and during implementation to provide real time information.	Phillips Bench and Recreation Trail mechanical treatment units
Roads and Skid Trails			
ROADS-1	Discourage unauthorized motorized use in treated areas.	Roadside openings created by treatments in the vicinity of known non-system routes would be physically blocked.	All units
ROADS-2	Protect visual quality.	Where feasible, construction of skid trails should avoid creating straight-line corridors when the skid trails connect with open system roads and trails. Temporary roads and skid trails would be held to the minimum number, width, and length.	All commercial units
ROADS-3	Protect visual quality.	Temporary roads should avoid following the fall line of the slope and should not be located in swale bottoms. The alignment should be curvilinear and cuts slopes should be less than 5 feet in height.	All temporary roads
ROADS-4	Protect soil and water resources.	Skid trails would be designated and would not exceed 15 percent of the unit. Skid trails would not be located on slopes steeper than 40 percent. Preference is to use existing skid trails (notably in Phillips Bench Unit 5 and Red Top Unit 1). On slopes greater than 40 percent, logs would be yarded by raising one end, preferably the butt end. The Forest Service administrator must approve designated skid trails and corridors before being implemented.	Phillips Bench Units 1 and 5 Red Top Units 1 and 2

Design Feature Identifier by Resource	Resource Objective(s)	Design Feature	Units/Location
ROADS-5	Protect soil and water resources, and discourage unauthorized motorized use.	All temporary roads, landings, and skid trails in would be rehabilitated and returned to pre-implementation conditions. Rehabilitation measures include re-contouring surfaces, ripping the surface to reduce compaction, seeding surface where bare mineral soil is present, placing slash and other large woody debris along surface to reduce soil erosion, assuring adequate cross-drainage, and effectively closing to OHV use. Topsoil is conserved and replaced where possible to further recovery. Road fill is covered in slash for biological and site amelioration.These measures can be obtained through Timber Sale contract provision CT5.34# - Obliteration of Temporary Roads, Skid Trails, and Landings.	Phillips Bench Units 1 and 5 Red Top Units 1 and 2
ROADS-6	Protect soil productivity.	Use ground-based logging systems only in times of low soil moisture (less than 50 percent measured using field methodology). Suspend operations if rutting exceeds four inches.	Phillips Bench Units 1 and 5 Red Top Units 1 and 2,
ROADS-7	Protect soil and water resources	Design, implement, and manage the temporary road using WYBMP P6-Timber Sale Unit Design, WYBMP P16-Erosion Control and Structure Maintenance, WYBMP P18- General Guidelines for the Location and Design of Roads and Trails, WYBMP P19- Road and Trail Erosion Control Plan, and WYBMP P34- Treatment of Temporary Roads.	Red Top Unit 2
Visual Quality			
VQ-1	Protect visual quality.	Tree stumps created during thinning operations outside of roadless areas and the wilderness study area would be a maximum height of 12 inches on flat ground or four inches on the uphill side of the stump on slopes. Stumps within roadless and the wilderness study area should be less than 6 inches in height.	All thinning units

Design Feature Identifier by Resource	Resource Objective(s)	Design Feature	Units/Location
VQ-2	To protect the scenic integrity.	In coordination with the Forest Landscape Architect, equipment shall be removed at the time of project completion and debris attributable to the fuels treatments shall be treated.	Retention and Partial Retention areas of units T-3, 4, 5, 6, 7, 8, 10, 11, 15, 16, 17, 19, 21, 23, 25, 31, 33, 35, 36, 38, 41, 43
VQ-3	To protect the scenic integrity.	In coordination with the Forest Landscape Architect, when located within 150 feet of roads or residential properties, unit boundaries and tree marking shall be painted on the side facing away from viewer or marked with flagging as appropriate.	Retention and Partial Retention areas of units T-3, 4, 5, 6, 7, 8, 10, 11, 15, 16, 17, 19, 21, 23, 25, 31, 33, 35, 36, 38, 41, 43
VQ-4	To protect the scenic integrity.	In coordination with the Forest Landscape Architect, for perimeter control in prescribed fire units, avoid long, straight lines is desirable, if situation-appropriate.	Retention and Partial Retention areas of units T-3, 4, 5, 6, 7, 8, 10, 11, 15, 16, 17, 19, 21, 23, 25, 31, 33, 35, 36, 38, 41, 43
Sensitive Plants			
P-1	Protect potential habitat for sensitive plant species.	Do not hand or aerially ignite areas of sparse or alpine vegetation.	Phillips Canyon Rx Burn Unit 1 North Fork Phillips Canyon Rx Burn Unit 1
P-2	To protect sensitive plant species.	There would be no piling on the ridgeline or the upper slopes in the sparsely vegetated Forbland.	western portion of Powerline Unit 1 northern portion of Black Canyon Rx Burn Unit 2
Silviculture			
SILV-1	Retain and promote desired 5-needled pines. Aspen supports the purpose and need, and Douglas-fir as a fire-resistant species and to increase numbers of large trees.	The species preference for retention would be whitebark and limber pine, aspen, Douglas-fir, lodgepole pine, Engelmann spruce, and subalpine fir in descending order. This order of preference may be modified for individual stands to address management objectives such as retaining species diversity, site factors, and other stand-specific factors such as relative species presence as noted in individual stand/unit prescriptions.	All thinning units
SILV-2	Reduce canopy density to modify fire behavior while retaining 5-needled pines.	Most to all younger trees in close proximity of large (greater than 20 inches dbh) and old Douglas-fir and Engelmann spruce would be removed. Retain whitebark and limber pine trees. The cutting distance would be established and defined in stand/unit prescriptions.	All thinning units

Design Feature Identifier by Resource	Resource Objective(s)	Design Feature	Units/Location
SILV-3	Retain 5-needled pines to enhance diversity.	Protection of most 5-needle pines would be built into the prescription.	All prescribed fire units
SILV-4	Perpetuate healthy aspen communities.	Conifers suppressing aspen clones would be thinned from within and around suppressed aspen. Cut tree diameter limits and cutting distance from the aspen would be established and defined in stand/unit prescriptions. In general, conifers would be cut up to 15 inches dbh in commercial units and up to 9 inches dbh in noncommercial units. Thinning would occur up to a maximum distance of two tree heights from the outside edge of the aspen clone.	All thinning units
SILV-5	Protect residual trees.	Burn piles would be located to minimize or avoid damage to residual trees.	All units
SILV-6	Protect inclusions of old growth.	Exclude old growth from treatment where it occurs in treatment units.	All mechanical units.
Smoke Management			
SM-1	Meet air quality standards.	All burning within the State of Wyoming would comply with the Wyoming DEQ Air Quality Division Standards and Regulations (WAQSR) for Smoke Management as outlined in Chapter 10, Section 4 of the WAQSR and the associated Smoke Management Program Guidance Document.	All units
SM-2	Provide timely notification of planned ignitions.	The general public, private landowners adjoining the project area, and others specified in the burn plan would be notified at least one week prior to ignitions taking place. At a minimum, this would be accomplished through press releases, and though public meetings as appropriate.	All prescribed fire units

Design Feature Identifier by Resource	Resource Objective(s)	Design Feature	Units/Location
Soils			
SOILS-1	Reduce erosion and have 60 percent or greater ground cover within one year of treatment.	Use Fire Effects Monitors (FEMOs) and/or the Fire Effects Crew to monitor the fire severity post-burn to determine areas of high burn intensity. Review burn pattern intensities with the Forest Hydrologist and Soil Scientist to determine if additional erosion control measures are necessary.	All prescribed fire units
SOILS-2	Minimize erosion potential to maintain soil productivity.	Burn piles should generally be spaced at least 30 feet apart when slopes are steeper than 40 percent.	Phillips Bench Units 1, 2, 6, 7 Recreation Trail Units 2, 5, 6, 7 Powerline Unit 1 Red Top Units 2, 3, 4, 5 Trails End Unit
SOILS-3	Minimize erosion potential to maintain soil productivity	Hand and aerial ignition in soil map unit 455 in western section of unit (limestone cliffs present) would be displayed on the implementation map and avoided.	In Black Canyon Rx Burn Unit 2
SOILS-4	Maintain soil productivity.	Soil moisture should be greater than 20 percent for treatment to occur. The same applies to units with aspects that are predominately south and/or west. East, North, and flat aspects are typically not available to burn until summer into the fall.	Mosquito Creek North Rx Burn Unit South Fork Fall Creek Rx Burn Unit Coburn Creek Rx Units 1 and 3 All prescribed fire units with predominantly south and/or west aspects.
SOILS-5	Maintain soil productivity	Avoid cutting trees or burning piles in far north section of unit (soil map unit 391).	Singing Trees Unit 1
SOILS-6	Maintain soil productivity	No landings should be located in the riparian area near the road in the southeast section of the unit. Avoid using mechanized equipment on the wet low area near the road.	Red Top Unit 1
Special Areas			
SA-1	Adhere to management direction for wilderness study area.	No permanent, temporary, or non-system roads can be constructed or reconstructed within the wilderness study area or within inventoried roadless areas.	All units within the wilderness study area and inventoried roadless areas

Design Feature Identifier by Resource	Resource Objective(s)	Design Feature	Units/Location
SA-2	Adhere to management direction for wilderness study area.	Timber and firewood cannot be sold or removed within the wilderness study area.	All units within the wilderness study area
Wildlife			
WL-1	Minimize unintentional take or disturbance effects on migratory birds, owls, goshawks, and other wildlife.	Do not allow mechanical treatments prior to July 15 of each year.	All units
WL-2	Minimize impacts to breeding and nesting migratory birds. Maintain nesting, foraging and roosting structure in vegetation.	Restrict prescribed burns during the primary portion of the nesting season. Most migratory birds nest between May 15 to July 15 (USDI, BLM 2007). Managing the scale and duration of disturbance would be considered mitigating circumstances.	All prescribed burn units
WL-3	Minimize/avoid impacts to breeding/nesting Brewer's sparrow	For prescribed fire units that overlap sagebrush patches ≥ 100 acres in size, maintain a burn mosaic pattern, as possible, that converts under 50 percent of the mature sagebrush in the unit-portion of the patch to early succession (Peterson and Best 1987).	Trails End Rd RX; Fall Creek Ranch RX Units 1 & 2; Munger Mtn Rx Units 1 & 2; South Fork Fall Creek Rx; Coburn Creek Rx Units 1, 2, & 3; Highland Hills Rx; Taylor Mtn. RX Units 2 & 3; Wilson Fall Creek Rx; Singing Trees Rx Unit 2
WL-4	Protect raptors and their nesting habitat.	Conduct seasonal field surveys for raptors (owls, bald eagles, goshawks) in suitable habitat to enable protections (see below) from disturbance and habitat loss in nesting territories.	Seasonally- accessible units; re-survey 1–2 breeding seasons prior to treatment.
WL-5	Protect nesting boreal and flammulated owls	Apply optional habitat protections and timing restrictions to nesting territories of boreal owls identified during raptor surveys. Protective measures would be developed on a case by case basis during consultation with the Wyoming Game and Fish Department.	Survey priority is breeding pairs/nests; commercial harvest/thin units, thin units, and burn units

Design Feature Identifier by Resource	Resource Objective(s)	Design Feature	Units/Location
WL-6	Protect active great gray owl nests from human disturbance.	Do not allow project activities within 0.25 miles of an active great gray owl nest stand during the nesting period (typically April 1 to July 15). The buffer distance may be reduced if a topographic feature shields the nest site from planned activities, or if actions are of limited intensity, scope, and duration (Beck and Craig 1991).	Known nest sites and new sites as discovered. See note on unit survey priority above.
WL-7	Protect the quality and quantity of great gray owl nesting habitat.	Maintain a no-treatment buffer (≥ 50 acres of high quality forest nesting habitat) around active and inactive great grey owl nests (Duncan 1997, Beck and Craig 1991). Vegetation management plans would set an objective to maintain over 50 percent canopy cover in documented activity centers (Duncan 1997, Whitfield and Gaffney 1997, Bull and Henjum 1990).	Prescribed fire and commercial units.
WL-8	Protect active bald eagle nests from human disturbance.	No project activities would occur within ½ mile of an active bald eagle nest from February 1 to August 15, including a ½ mile vertical and horizontal distance for aircraft flight paths (Greater Yellowstone Bald Eagle Working Group 1996).	Known and new sites as discovered.
WL-9	Protect the quality and quantity of bald eagle nest, roost and perch habitat.	Snags or live trees that are over 2 feet dbh and within 0.5 miles of the Snake River would be protected from burn-caused mortality.	Munger Mountain Rx 2.
WL-10	Protect active goshawk nests from human disturbance.	No ground disturbing activities from April 1 to August 15 inside occupied goshawk post-fledging areas (420–600 acres), unless site-specific monitoring supports earlier or later entry (Reynolds et al. 1992, Kennedy et al. 1994) Patla 1997).	All forested treatment units.
WL-11	Protect the quality and quantity of goshawk nesting habitat.	A no-treatment buffer of 40 acres would be applied to all active and inactive (≤ 10 years) goshawk nests (Clough 2000, Reynolds et al. 2005, Woodbridge and Hargis 2006). Project vegetation management would set an objective of retaining over 50 percent canopy cover across at least 50 percent of post-fledging areas.	All active and inactive nest sites.

Design Feature Identifier by Resource	Resource Objective(s)	Design Feature	Units/Location
WL-12	Protect active wolf den and rendezvous sites	To minimize project-related disturbance effects from personnel working afoot and in aircraft, a minimum 0.5 mile horizontal and 0.25 mile vertical no-disturbance buffer would be maintained around active wolf den/rendezvous sites from late March to July 1.	Active wolf den and rendezvous sites as documented
WL-13	Protect five-needled pines and dependent wildlife.	Whenever feasible, the mortality of 5-needled pine seedling would be minimized by protecting them from ignition and by retaining them during fire construction. Cone-bearing whitebark pines would be also protected, as possible, from fire damage or thinning.	Phillips Canyon Rx Burn Unit 1 and North Fork Phillips Canyon Rx Burn Unit 1 and other units where whitebark pine is common.
WL-14	Minimize human encounters with bears and avoid habituation of all wildlife to human food.	Enforce the Forest's food storage order during project implementation through contract clauses and on-site inspections of contract and employee crews and equipment.	All units
WL-15	Minimize disturbance to federally listed species such as grizzly bears and Canada lynx	No spring-season prescribed burn operations would occur within 1 km horizontal distance of active dens.	Active dens in all treatment units.
WL-16	Provide late-seral forest conditions in the immediate vicinity of boreal toad, Columbia spotted frog, and boreal chorus frog sites	Maintain a minimum 300–foot no treatment buffer around breeding sites (U.S. Forest Service 2013)	Mosquito North Rx; Munger Mountain Rx Unit 2; and other units with breeding sites as discovered.
WL-17	Protect elk calving areas from human disturbance.	Project operations would not occur in elk calving areas (mapped by Wyoming Game and Fish Department or identified by Forest Service biologists) from May 15 to June 30 where elk are present (USDA 1990).	All units
WL-18	Protect wintering big game from treatment disturbance.	Restrict human activity and disturbance from 11/15 to 4/30 on crucial winter range if big game animals are present (USDA 1990)	North Fork Phillips Canyon Rx Unit 2; Munger Mtn. Rx Unit 1 & 2; Singing Trees Rx Units 1, 2 & 3; Taylor Mtn. Rx Units 1 & 2; Highland Hills Rx

Design Feature Identifier by Resource	Resource Objective(s)	Design Feature	Units/Location
WL-19	Protect snags for use by wildlife	The removal of snags along fire lines in the defense zone would be limited to levels minimally necessary for firefighter protection, and to meet fuel reduction objectives (design standard). Retain a minimum of two dead or cull trees/acre (USDA 1990:244) where achievable without compromising project objectives.	All units
WL-20	Protect wolverine den and rendezvous sites from disturbance by aircraft.	To reduce disturbance to wolverine families, a minimum 0.25 vertical and 0.60 horizontal mile clearance distance operations would be maintained from active wolverine den and rendezvous sites by project aircraft (USDA 2004 from mid-February through June.	All units supporting documented wolverine den and rendezvous sties.

Appendix C: Treatment Costs and Details

Treatment costs depend upon a number of factors, many of which are at this point unknown and are unit specific. Costs differ greatly depending upon the interaction of the size and amount of material that has to be treated, terrain and access difficulty, the type of treatment and removal method, and who is doing it, e.g. the Forest Service is paying for the treatment directly or a timber purchaser is paying for the treatment as part of a timber sale package. The costs given here are meant to display the range and relative difference between treatment types and are not an accurate assessment of treatment costs for any proposed treatment unit. Table 59 displays Forest Service treatment costs from the Bridger-Teton National Forest Brush Disposal Cost Guide.

Table 59. Estimated costs of proposed treatment types

Treatment	Slash Load		
	Light	Moderate	Heavy
Hand Pile	$300/acre	$450/acre	$600/acre
Machine Pile	$50/acre	$100/acre	$200/acre
Lop and Scatter	$100/acre	$150/acre	$200/acre
Windrow	$550/acre	$750/acre	$950/acre
Fuel Break	$500/mile	$700/mile	$900/mile
Hand Fire Line	$14,000/mile	$16,000/mile	$18,000/mile
Machine Fire Line	$700/mile	$800/mile	$900/mile
Thinning (commercial or noncommercial)	$400/acre	$500/acre	$600/acre
Slash Removal	$150/acre	$200/acre	$250/acre
Burn Machine Piles	$50/acre	$75/acre	$100/acre
Burn Hand Piles	$75/acre	$100/acre	$125/acre
Burn Windrows	$75/acre	$100/acre	$125/acre
Broadcast Burn	$50/acre	$75/acre	$100/acre
Burn Landing Piles	$75/acre	$100/acre	$150/acre

Units with dense lodgepole pine and moderate to heavy mountain pine beetle activity would fall with the “heavy” slash load category shown above. There are a number of treatment options that could take place in those units1 including:

1. Hand cut commercial and precommercial thin, remove slash, burn landing piles - $1000/acre. Note that in this option we are assuming that the trees are being “whole tree yarded” so that there would be little need for additional on-site slash treatments.
2. Hand cut commercial and precommercial thin, remove large slash, hand pile, burn landing piles, burn hand piles - $1,165/acre. Note that in this option we are assuming that the large trees are being “whole tree yarded” but the smaller wouldn’t so that there would be a need for additional on-site slash treatments, but the costs of hand piling and burning piles would be ½ of those stated above.
3. Hand cut commercial and precommercial thin, hand pile, burn hand piles - $1,350/acre.

4. Hand cut commercial and precommercial thin, machine pile, burn machine piles - $900/acre.
5. Machine cut commercial and hand cut precommercial thin, remove large slash, hand pile, burn landing piles, burn hand piles - $1,105/acre. In this scenario a machine (e.g. feller buncher) would be used to fell and pile material greater than 5 inches dbh and smaller material would be hand felled. The costs are adjusted to reflect lower cost of machine cutting in larger material and that hand cutting would be less costly due to not having to cut the larger material assuming that about ½ of what would be cut would be by machine. Note, that in general one can say that the smaller the tree, the more costly it is to cut by machine up to about 5 inches dbh. From 5 inches dbh to about 8 inches the cost between machine and hand cut is about the same. Above 8 inches the machine becomes more cost effective.

In the treatment options given above, option 1, 2, and 5 would result in larger trees being removed from the site and sold for some amount of return, whereas in options 3 and 4 all material would be treated on site.

Treatment Unit Details

Table 60 displays details associated with each treatment proposed in either alternative 2 or 3.

Table 60. Treatment unit objectives

Map #	Unit Name	Treatment Objective	Treatment and Removal Options	Proximity to Values at Risk	Cover Type
PF-01	Phillips Canyon Rx Burn Unit 1	Reduce surface and ladder fuel conditions to reduce and modify fire behavior; enhance aspen.	prescribed fire	Approx. ½ mile to power line	Conifer Aspen Herbaceous
PF-02	North Fork Phillips Canyon Rx Burn Unit 1	Reduce surface and ladder fuel conditions to reduce and modify fire behavior; enhance aspen.	Prescribed Fire	Adjacent to private land	Conifer Aspen
T-03	Phillips Bench Unit 2	Reduce ground and aerial fuels adjacent to private land boundary.	Noncommercial Thin, Hand Cut, Hand-pile and Burn	Adjacent to private land and power line	Conifer Aspen
T-04	Phillips Bench Unit 7	Enhance utility of ridgeline as fuelbreak.	noncommercial thin, hand cut, hand pile and burn	Adjacent to power line	Conifer
T-05	Phillips Bench Unit 1	Enhance utility of ridgeline as fuelbreak.	Commercial Thin and noncommercial thin, Machine Cut and/or hand cut, cut-to-length or whole tree yard, Ground based yard, hand pile and burn and/or machine-pile and burn	Adjacent to power line	Conifer Aspen
T-06	Phillips Bench Unit 5	Enhance utility of ridgeline as fuelbreak.	Commercial Thin and noncommercial thin, machine cut and/or hand cut, cut-to-length or whole tree yard, ground-based yard, hand pile and burn and/or machine pile and burn	Adjacent to power line	Conifer Aspen
T-07	Phillips Bench Unit 3	Enhance utility of ridgeline as fuelbreak.	noncommercial thin, hand cut, hand pile and burn	Adjacent to power line	Conifer
T-08	Phillips Bench Unit 4	Enhance utility of ridgeline as fuelbreak.	noncommercial thin, hand cut, hand pile and burn	Adjacent to power line	Conifer
T-09	Phillips Bench Unit 6	Enhance utility of ridgeline as fuelbreak.	noncommercial thin, hand cut, hand pile and burn	Adjacent to power line	Conifer

Map #	Unit Name	Treatment Objective	Treatment and Removal Options	Proximity to Values at Risk	Cover Type
T-10	Power Line Unit 1	Reduce ground and aerial fuels.	noncommercial thin, hand cut, hand pile and burn	Adjacent to power line	Conifer Aspen Grassland Forbland
T-11	Recreation Trail Unit 2	Reduce ground and aerial fuels adjacent to private land-fuelbreak.	Lop and scatter, Prune and hand pile and burn 300 feet adjacent to private land north of highway. hand pile and burn all south of highway.	Adjacent to private residence and highway	Conifer Aspen Grassland Forbland
PF-12	Black Canyon Rx Burn Unit 2	Reduce surface and ladder fuel conditions to reduce and modify fire behavior.	prescribed fire	Adjacent to power line	Conifer Herbaceous
PF-13	Black Canyon Rx Burn Unit 1	Reduce surface and ladder fuel conditions to reduce and modify fire behavior.	prescribed fire	Approx. ½ mile to private land	Conifer Herbaceous
T-14	Recreation Trail Unit 1	Reduce ground and aerial fuels adjacent to private land and summer homes.	noncommercial thin, hand cut, hand pile and burn	Adjacent to summer homes	Conifer
T-15	Recreation Trail Unit 4	Reduce ground and aerial fuels adjacent to private land and summer homes. Enhance aspen.	noncommercial thin, hand cut, hand pile and burn	Adjacent to private residence and summer homes	Conifer
T-16	Recreation Trail Unit 3	Reduce ground and aerial fuels adjacent to private land and summer homes.	noncommercial thin, hand cut, hand pile and burn	Adjacent to private residence and summer homes	Conifer Aspen
T-17	Recreation Trail Unit 7	Reduce ground and aerial fuels adjacent to private land.	prune, noncommercial thin, hand cut, lop and scatter and/or hand pile and burn	Adjacent to private land	Conifer
T-18	Recreation Trail Unit 6	Reduce ground and aerial fuels adjacent to private land.	prune, noncommercial thin, hand cut, lop and scatter and/or hand pile and burn	Adjacent to private land	Conifer Grassland
T-19	Recreation Trail Unit 5	Reduce ground and aerial fuels adjacent to private land.	prune, noncommercial thin, hand cut, lop and scatter and/or hand pile and burn	Adjacent to private residence	Conifer Grassland

Map #	Unit Name	Treatment Objective	Treatment and Removal Options	Proximity to Values at Risk	Cover Type
PF-20	Mosquito Creek North Rx Burn Unit	Reduce surface and ladder fuel conditions to reduce and modify fire behavior. Create a buffer adjacent to Green Knoll.	prescribed fire	Approx.1 mile to private land	Conifer Aspen Shrub
T-21	Singing Trees Unit 1	Reduce ground and aerial fuels adjacent to private land; enhance aspen	noncommercial thin, hand cut, hand pile and burn, PSB PSB after HP –option to underburn the whole unit to add fire on the landscape and promote aspen.	Adjacent to private residence	Conifer Aspen
PF-22	Singing Trees Rx Burn Unit 1	Reduce surface and ladder fuel conditions to reduce and modify fire behavior; enhance aspen.	prescribed fire	Approx. 1/4 mile to private land	Conifer Aspen Shrub
T-23	Singing Trees Unit 2	Reduce ground and aerial fuels adjacent to private land; enhance aspen.	noncommercial thin, hand cut, hand pile and burn, PSB PSB after HP –option to underburn the whole unit to add fire on the landscape and promote aspen.	Adjacent to private residence	Conifer Aspen
PF-24	Singing Trees Rx Burn Unit 2	Reduce surface and ladder fuel conditions to reduce and modify fire behavior; enhance aspen.	prescribed fire	Approx.1/4 mile to private land	Aspen Shrub
T-25	Singing Trees Unit 4	Reduce ground and aerial fuels adjacent to private land; enhance aspen.	noncommercial thin, hand cut, hand pile and burn	Adjacent to private residence	Conifer Aspen
PF-26	Singing Trees Rx Burn Unit 3	Reduce surface and ladder fuel conditions to reduce and modify fire behavior; enhance aspen.	prescribed fire	Corner adjacent to private land	Conifer Aspen
PF-27	Taylor Mtn. Rx Burn Unit 5	Reduce surface and ladder fuel conditions to reduce and modify fire behavior; enhance aspen.	prescribed fire	Approx. one mile to private land	Conifer Aspen

Map #	Unit Name	Treatment Objective	Treatment and Removal Options	Proximity to Values at Risk	Cover Type
PF-28	Taylor Mtn. Rx Burn Unit 3	Reduce surface and ladder fuel conditions to reduce and modify fire behavior; enhance aspen.	prescribed fire. Unit may be divided into smaller sections to facilitate burning.	Approx. 1/2 mile to private land	Conifer Aspen Shrub
PF-29	Taylor Mtn. Rx Burn Unit 4	Reduce surface and ladder fuel conditions to reduce and modify fire behavior; enhance aspen.	prescribed fire hand cut trees and shrubs in the defense zone portion of the unit as needed prior to burning.	Adjacent to private land	Conifer Aspen
PF-30	Taylor Mtn. Rx Burn Unit 2	Reduce surface and ladder fuel conditions to reduce and modify fire behavior; enhance aspen.	hand cut trees and shrubs adjacent to structures and throughout the defense zone as needed. hand pile and burn prescribed fire	Adjacent to private land	Conifer Aspen
T-31	Highland Hills Unit 1	Reduce ground and aerial fuels adjacent to private land; enhance aspen.	noncommercial thin, hand cut, hand pile and burn, PSB; PSB after HP –prescribe burn with adjacent burn unit.	Adjacent to private residence	Conifer Aspen
PF-32	Highland Hills Rx Burn	Reduce surface and ladder fuel conditions to reduce and modify fire behavior; enhance aspen.	hand cut trees and shrubs adjacent to structures and throughout the defense zone as needed. hand pile and burn prescribed fire	Adjacent to private land	Conifer Aspen
T-33	Red Top Unit 1	Reduce ground and aerial fuels to modify fire behavior enhance aspen.	commercial thin and noncommercial thin, machine cut and/or hand cut, whole tree yard or cut-to-length, ground-based yard, hand pile and burn or machine pile and burn. The unit area bounded by Road 30997 on the west and PF-34 on the east may be underburned after thinning.	Threat zone, forest and private land access route	Conifer Aspen
PF-34	Trails End Road Rx Burn Unit	Reduce surface and ladder fuel conditions to reduce and modify fire behavior; enhance aspen.	prescribed fire	Adjacent to private land	Aspen Shrub

Map #	Unit Name	Treatment Objective	Treatment and Removal Options	Proximity to Values at Risk	Cover Type
T-35	Red Top Unit 2	Reduce ground and aerial fuels adjacent to private land; enhance aspen.	commercial thin and noncommercial thin, machine cut and/or hand cut, whole tree yard or cut-to-length, ground-based yard, hand pile and burn or machine pile and burn	Adjacent to private residence	Conifer Aspen
T-36	Red Top Unit 5	Reduce ground and aerial fuels adjacent to private; enhance aspen.	noncommercial thin, hand cut, hand pile and burn	Adjacent to private residence	Conifer Aspen
PF-37	South Fork Fall Creek Rx Burn Unit	Reduce surface and ladder fuel conditions to reduce and modify fire behavior; enhance aspen.	prescribed fire	Approx. ¼ mile to private land	Conifer Aspen Shrub
T-38	Trails End Unit	Reduce ground and aerial fuels adjacent to private; enhance aspen	noncommercial thin, hand cut, hand pile and burn	Adjacent to private land	Conifer Aspen
PF-39	Coburn Creek Rx Burn Unit 3	Reduce surface and ladder fuel conditions to reduce and modify fire behavior.	prescribed fire	Adjacent to private land	Conifer
PF-40	Coburn Creek Rx Burn Unit 2	Reduce surface and ladder fuel conditions to reduce and modify fire behavior; enhance aspen.	hand cut trees and shrubs adjacent to structures and throughout the defense zone as needed. hand pile and burn prescribed fire	Adjacent to private land	Conifer Aspen Shrub
T-41	Red Top Unit 3	Reduce ground and aerial fuels adjacent to private land; enhance aspen	noncommercial thin, hand cut, hand pile and burn	Adjacent to private land	Conifer Aspen Shrub
PF-42	Coburn Creek Rx Burn Unit 1	Reduce surface and ladder fuel conditions to reduce and modify fire behavior; enhance aspen.	prescribed fire	Approx. ½ mile to private land	Conifer Aspen Shrub
T-43	Red Top Unit 4	Reduce ground and aerial fuels adjacent to private land; enhance aspen.	noncommercial thin, hand cut, hand pile and burn	Adjacent to private land	Conifer Aspen

Map #	Unit Name	Treatment Objective	Treatment and Removal Options	Proximity to Values at Risk	Cover Type
PF-44	Fall Creek Ranch Rx Burn Unit 1	Reduce surface and ladder fuel conditions to reduce and modify fire behavior.	prescribed fire	Approx. ¼ mile to private land	Conifer Shrub
PF-45	Fall Creek Ranch Rx Burn Unit 2	Reduce surface and ladder fuel conditions to reduce and modify fire behavior.	prescribed fire	Less than ¼ mile to private land	Conifer
PF-46	Wilson Fall Creek Rx Burn	Reduce surface and ladder fuel conditions to reduce and modify fire behavior; enhance aspen.	prescribed fire	Adjacent to private land	Conifer Aspen Shrub
PF-47	Munger Mtn. Rx Burn Unit 1	Reduce surface and ladder fuel conditions to reduce and modify fire behavior; enhance aspen.	hand cut and hand pile and burn trees and shrubs adjacent to the private boundary as needed. Follow up with prescribed burning. Unit may be divided into smaller sections to facilitate burning.	Adjacent to private land and close to highway	Conifer Aspen Herbaceous
PF-48	Munger Mtn. Rx Burn Unit 2	Reduce surface and ladder fuel conditions to reduce and modify fire behavior; enhance aspen.	hand cut and hand pile and burn trees and shrubs adjacent to the private boundary as needed. Follow up with prescribed burning. Unit may be divided into smaller sections to facilitate burning.	Adjacent to private land and close to highway	Conifer Aspen Shrub

Appendix D: Monitoring

Fire Regimes and Ecosystem Processes

Monitor before and after prescribed burning according to the Bridger-Teton National Forest Fuels and Fire Effects Monitoring Handbook. Map treatment mosaics according to burn severity levels and entered into a GIS in order to update digital fuels landscape data.

Areas discovered to include invasive species such as cheatgrass (*Bromus tectorum*), that have the potential to affect the fire regime, should be identified and mapped. If fire is to be applied to these areas, successful herbicide treatments should be implemented pre- and post- burn. Both alternative 2 and alternative 3 include implementation of these mitigations.

Monitor fuels and conduct fire behavior modeling on pre- and post-treatment areas to track the effectiveness and longevity of thinning in the defense zone.

Hydrology

Forest Service personnel such as the timber sale administrator and the burn boss should complete implementation monitoring.

Noxious Weeds

North Zone vegetation management specialist would assure that weeds within 1/4 mile of units are treated prior to implementation, or avoid, and monitor after implementation.

Recreation

Forest Law Enforcement, Forest Protection Officers, and recreation staff would look for evidence of off-road vehicle impacts within treatment units particularly near existing system roads and in roadless and the wilderness study area.

Sensitive Plants

If a new sensitive plant population is located in a treatment unit prior to or during project implementation, the population should be appropriately managed by active coordination between the Forest Botanist or the North Zone sensitive species coordinator and the project administrator.

Soils

Erosion monitoring should be conducted by the Forest soils scientist in order to ensure compliance with the forest plan standards. On-site potential for soil erosion is expected to be reduce by 50 percent one year after disturbance, and 95 percent five years after disturbance.

Special Areas

The District fire and fuels program in cooperation with the wilderness and recreation program manager would monitor the following:

- Monitor the percent of wildfire starts allowed to play their natural role in the ecosystem and the amount of acres burned for each fire within the project area.

- Monitor the number of management actions taken as defined by wilderness character monitoring protocols to capture the number of actions taken by fire and fuels management within the Bridger-Teton National Forest portion of the Palisades Wilderness Study Area.
- Monitor the change in suppression tactics by tracking the following items: number of helispots, miles of fire control line constructed, and the use of mechanical equipment within the Bridger-Teton portion of the Palisades Wilderness Study Area.

Wildlife

The North Zone wildlife biologist in cooperation with the Wyoming Game and Fish Department would monitor the Coburn Creek territory, and any other goshawk nest site found during subsequent surveys, yearly for breeding success.

The implementation leader and North Zone wildlife biologist would monitor big game winter ranges for presence of animals prior to initiating work and during the project to determine if animals come onto the winter ranges after work has started. Monitor all known eagle, hawk, and owl nests to determine if any direct effects occurred during the project.

The North Zone wildlife biologist would assure that additional surveys for at-risk migratory birds are conducted as necessary, and would modify burn plans as appropriate to protect nesting.

The North Zone wildlife biologist and implementation leader would assure that great gray owl and goshawk nest surveys are conducted in the prior treatment year or prior to treatment in the same year. Surveys for nesting goshawks, as per Woodbridge and Hargis (2006), would be conducted in suitable nesting habitat in proposed treatment units during, or immediately prior to, the treatment year.

The North Zone wildlife biologist in cooperation with the Wyoming Game and Fish Department, and the implementation leader would assure that bald eagle nest site surveys are conducted prior to treatments in the Munger Mountain Burn Unit 2.

Appendix E: Projects Considered for Cumulative Effects

Table 61 displays the present and reasonably foreseeable future actions considered in the analysis of cumulative effects for this project. This list was developed using the Bridger-Teton National Forest's Schedule of Proposed Actions and knowledge of project planning by local Forest Service managers. See individual resource sections in chapter 3 for the predicted cumulative effects associated with these projects.

Table 61. Present and reasonably foreseeable future actions considered for cumulative effects in the Teton to Snake Fuels Management Project

Project Name	Unit Size	Actions	Jurisdiction	Implementation
Butler Creek Fuels Reduction	30 acres	Rx Fire and mechanical thinning	State	Completed
Crescent H Fuels Reduction	490 acres	Rx Fire	Private	Completed
Cribiore Fuels Reduction	80 acres	Rx Fire	Private	Completed
Hanson Bar BC Fuels Reduction	480 acres	Rx Fire	Private	2008
Kerr Fuels Reduction	70 acres	Rx Fire	Private	Completed
Pine Glen Reduction	30 acres	Rx Fire	Private	Completed
Hill Creek Reduction	4959 acres	Slashing and Rx fire; aspen regeneration	Caribou-Targhee National Forest	2008-2010: 3659 acres slashed and burned. 2011-2012: 1300 acres slashed and burned.
Teton Pass Fuels Reduction	14,700 acres	Rx Fire and mechanical removal of trees. EA to be completed in 2015.	Caribou-Targhee National Forest	After 2015
Snake River Ranch Fuels Reduction	294 acres	Mechanically thin 300+ acres using ground-based skidding. Chip, lops and scatter, or pile burn activity fuels. Skid trail construction.	Private	Completed 2013
HSP Fuels Reduction (Huff/Siefert/Patrick)	260 acres	Rx Fire	Private	Completed
Hoback Junction Fuels Reduction	5304 acres	93 acres of mechanical and 5211 acres of Rx fire	Bridger-Teton National Forest	Some mechanical work has been done. Slashing and piling in summer 2011 and 2012. Pile burning and Rx burning completed 2011-2014.

Project Name	Unit Size	Actions	Jurisdiction	Implementation
Bryan Flats Fuels Reduction	3750 acres	A fuels reduction project consisting of 4 different units. Two prescribed burn units and two units treated mechanically. Total acres for project are 3750. Supporting document is an EA. Mechanical treatments were planned to begin in 2011, and burning started in the spring 2011.	Bridger-Teton National Forest	One prescribed fire unit is planned for 2015 and the second would occur 2 – 3 years after that. Slashing and piling was completed in 2010. Pile burning was completed in 2011.
Badger Creek Thinning Project	1400 acres	PCT, pile and burn, masticate. Proposing to noncommercially thin dense lodgepole pine stands while emphasizing aspen species composition on approximately 1,400 acres. Supporting document 2011 CE. pre-commercial thinning, removal of conifers from aspen clumps and fuels reduction in past harvest units. In some areas cut material would be piled and burned of masticated while in other it would be scattered and left. Mike Alfieri is the project lead (malfieri@fs.fed.us).	Caribou-Targhee National Forest	DM to be signed in 2011; implement after 2012.
Indian Paintbrush Fuels Reduction	160 acres	Fuels reduction, mechanical and pile burning. Contracted out.	State	2011
Smith Canyon Fuels Reduction	283 acres	Contract with a 3 year term, contract awarded September of 2010. 108 acres of thinning, small prescribed burn and pile burning taking place after the thinning. Supporting document is an EA.	Caribou-Targhee National Forest	Completed in 2010.
Sorenson Creek (HFRA) Fuels Reduction	12,000 acres	Reduce fuels adjacent to private lands on eastern side of valley. Rx fire and mechanical. Project may drop due to portions being added to Hill Creek, Treasure Mtn, Teton Pass	Caribou-Targhee National Forest	2014-2019
Snake River Canyon Wildlife Habitat Improvement	10,000 acres	Rx Fire for wildlife benefit	On Caribou-Targhee National Forest but administered by Bridger-Teton National Forest	NEPA done in 1999, and this EIS would inform a subsequent 18.1 review.
Forest-wide Hazard Tree Assessment (recreation)	unknown	Remove hazard trees along roads and trails throughout the Bridger-Teton National Forest. Likely with protections for migratory bird nesting.	Bridger-Teton National Forest	A forest-wide hazard tree strategy is currently on hold. Projects implementing the plan have not yet been identified.
Fall Creek Bridge Replacement		Replace current with new road alignment and asphalt-surfaced bridge.	Bridger-Teton National Forest	2013
Ross Plateau Properties Road Permit	5,000 feet	No ground disturbance	Bridger-Teton National Forest	2010
Upgrade of Pow Wow Communications Site	3 acres	Upgrade and use of Pow Wow Communications Site in order to install a WyoLINK radio communication system to connect with other WyoLINK sites throughout the State of Wyoming. Construction of one building and installation of towers, etc., antennas, etc.	Bridger-Teton National Forest	NEPA completed in 2011, but may not be built do to cost of construction and maintenance of the communications site.

Project Name	Unit Size	Actions	Jurisdiction	Implementation
JHMR - Eastside Lift Relocation (recreation)	3.5 acres	Installation of a new lift as part of the master development planning process and relocation of a temporary lift to a new location providing service from the base of Thunder lift to the top of the Gondola.	Bridger-Teton National Forest	Completed in 2011
Pritchard Boat Ramp (recreation)	1.5 acres	Across the highway from Wilson-Fall Creek road at HWY 89. Some disturbance on ramp and in river during construction -- about 20 yards of stream affected about 1.5-acre parking lot. Do the project in the fall with low water and to avoid disturbing the eagles. Replacing the ramp with a hardened surface and possibly repaving the parking lot.	Bridger-Teton National Forest	2015
Livestock Area and Cultivation (permit authorization)	7 acres	pasture and hay cultivation (3 acres used for hay in the spring and pasture in the fall)	Bridger-Teton National Forest	Re-authorization is ON HOLD
Mosquito Creek Outfitter (permit authorization)	1.5 acres	Summer and fall camp. Set up May 15th/June 15th and they take down end of October. Drive to camp 1.5 acres. Summer pack trip and fall hunting. CE is in place.	Bridger-Teton National Forest	Ongoing
Phillips Canyon Trails (recreation)		Digging drain dips, installing waterbars, removing berm, cutting back brush to at least 8 ft wide, 10-ft high corridor. No new trail construction but possibly one or two very small reroutes. Any reroutes would be no more than 24 inches wide.	Bridger-Teton National Forest	2011
Fall Creek Outfitter (permit authorization)		2 acres altogether. Fall hunting outfitter, sets up around September 20th and takes down the end of October. CE is in place	Bridger-Teton National Forest	Ongoing
Relocate Avalanche Guard Mitigation System at Teton Pass (permit authorization)		Relocation of one avalanche guard station on Teton Pass from the east side to the west side of Glory Bowl.	Bridger-Teton National Forest	2011
Reconstruction of upper Coburn Creek Trail (recreation)	500 feet	Trail maintenance including digging drain dips, installing waterbars and check dams, brushing out trail corridor 10 ft high and 6 ft wide, constructing one turnpike to cross boggy area, and clearing trees. Possibly one small reroute but nothing over 500 ft in length.	Bridger-Teton National Forest	2012
Teton Pass Power Line Jumps and Candyland (recreation)	1000 feet	Realign trail for sustainability. Small sections of new tread, 24-36 inches wide, all within powerline corridor. Rehab old sections of trail and establish on remaining route. Some minor modifications to existing jumps.	Bridger-Teton National Forest	Completed in 2011
Hoback Canyon Power Line Burial (permit authorization)	3 miles	The burial of 3.95 miles of 14,400V underground three-phase powerline within Hoback Canyon along the highway ROW. Most of the line would be installed within existing conduit. Also, 25 junction vaults (24 inches x 28 inches x 22 inches) would be installed.	Bridger-Teton National Forest	Completed in 2012

Project Name	Unit Size	Actions	Jurisdiction	Implementation
Hoback Junction Bridge and Jackson South Highway Project -- Highway 89 (road permit)		Highway widening from 2 lanes up to five lanes, with 5-7 wildlife crossings and construction of a new bridge across the Snake River at Hoback Junction and removal of the old bridge.	State , Bridger-Teton National Forest, private	Bridge and junction completed in 2013, Hoback slide mitigation in 2015, Munger slide mitigation in 2016, Phase 1 of Jackson South in 2017, and Phase 2 of Jackson South in 2019.
Broadband Access Expansion (permit authorization)	35 miles	Burial of approximately 35 miles of two 1.25 inch conduits containing fiber optic broadband cable via plowing technique. Route would primarily be within existing road right-of-ways and utility right-of-ways. Low-impact trenching.	USDA Forest Service within road ROW	Completed in 2011
Ongoing activities – grazing, road and trail maintenance, and Firewise activities.		All of the subdivisions have received information on Firewise and some have worked with the County fire department on grants to help with work, in the way of limping and chipping. In 2004 the Forest Service did a community defensible space day, in partnership with the County, Forest and State, we had a truck help remove materials from private land. The USDA Forest Service also does home evaluations and has done a couple of different Firewise talks in the Wilson community in the past 8 years.	Bridger-Teton National Forest and Private	Ongoing
Wyoming Sage Grouse Habitat Conservation Strategy	Bridger-Teton National Forest	Development of Resource Management Plan and Forest Plan amendments for BLM and USDA Forest Service lands in Wyoming designed to protect sage grouse habitat. The amendments would address needed changes in the management and conservation of Greater sage-grouse habitats.	Bridger-Teton National Forest	2015
Fall Creek Ranch Fuels Reduction	37 acres	mechanical thinning	Private	Upcoming
Munger Mountain livestock allotment	14,593 acres	Manage livestock grazing	Bridger-Teton National Forest	Ongoing
Dog Creek livestock allotment	20,179 acres	Manage livestock grazing	Bridger-Teton National Forest	Ongoing
Teton Pass Trails Improvement	1000 feet	Realign, rehabilitate, and add features to trail.	Bridger-Teton National Forest	2011
Mosquito Creek Bike Trail development	12 miles	Remove primitive forest roads and develop a bike trails	Bridger-Teton National Forest	2014-2015
Coburn Cr Trail Improvements	500 feet	Trail maintenance, turnpike, short re-route	Bridger-Teton National Forest	2011
Coburn Creek Cutoff	2 miles	2 miles maintenance; 1 new turnpike	Bridger-Teton National Forest	2015
South Fork Fall Creek Trail Reconstruction	8 miles	300 feet trail reconstruction and 3 miles maintenance	Bridger-Teton National Forest	2014
Cabin Creek Trail Reconstruction	5 miles	4.9 miles reconstruction, new bridge, reroute	Bridger-Teton National Forest	2014

Project Name	Unit Size	Actions	Jurisdiction	Implementation
Station Creek Trail Re-route	2,000 feet	Re-route	Bridger-Teton National Forest	2013
Fire wise Activities	NA	Landowner and community education, home evaluations	Private	Ongoing
Teton Canyon Hazardous Fuels Reduction	2031	Prescribed burning and mechanical treatments	Caribou-Targhee National Forest	2015
Ongoing Ski Area Improvements	Variable	Facilities improvements that may include vegetation changes and ground-disturbance outside of the project area	Private	Ongoing