Utah Greater Sage-Grouse

Proposed Land Use Plan Amendment and Final Environmental Impact Statement

Volume II: Chapters 3 and 4

US Department of the Interior
Bureau of Land Management

US Department of Agriculture
Forest Service

June 2015

BLM
Forest Service

The Bureau of Land Management's multiple-use mission is to sustain the health and productivity of the public lands for the use and enjoyment of present and future generations. The Bureau accomplishes this by managing such activities as outdoor recreation, livestock grazing, mineral development, and energy production, and by conserving natural, historical, cultural, and other resources on public lands.

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DOI-BLM-UT-9100-2013-0002-EIS

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UTAH GREATER SAGE-GROUSE PROPOSED LAND USE PLAN AMENDMENT AND FINAL ENVIRONMENTAL IMPACT STATEMENT

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ACRONYMS AND ABBREVIATIONS

	Full Phrase
ACEC	area of critical environmental concern
AML	appropriate management level
APD	application for permit to drill
AUM	animal unit month
BER	Baseline Environmental Report
BLM	United States Department of the Interior, Bureau of Land Management
BMP	best management practice
BSU	biologically significant unit
°C	degrees Celsius
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
COA	condition of approval
COT report	Conservation Objectives Report
CSU	controlled surface use
DOI	United States Department of the Interior
EIS	environmental impact statement
EPA	Environmental Protection Agency
ERMA	extensive recreation management area
ESA	Endangered Species Act of 1973
ESD	ecological site description
°F	degrees Fahrenheit
FIAT	fire and invasives assessment tool
FLPMA	Federal Land Policy and Management Act of 1976
Forest Service	United States Department of Agriculture, Forest Service
FRCC	fire regime condition class
GHMA	general habitat management area
GIS	geographic information systems
GRSG	Greater Sage-Grouse
HMA	herd management area
IM	Instruction Memorandum
kV	kilovolt
LRMP	land and resource management plan
LUP	land use plan
LUPA	land use plan amendment
MZ	Management Zone
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969

NFMA	National Forest Management Act of 1976
NOI	notice of intent
NRCS	United States Department of Agriculture, Natural Resources Conservation Service
NSO	no surface occupancy
NTT	Greater Sage-Grouse National Technical Team
OHV	off-highway vehicle
PAC	priority area for conservation
PM2.5	particulate matter with a diameter less than or equal to 2.5 microns
PM10	particulate matter with a diameter less than or equal to 10 microns
PHMA	priority habitat management area
RDF	required design feature
RFD	reasonably foreseeable development
RMP	resource management plan
ROD	record of decision
ROW	right-of-way
SFA	sagebrush focal area
SGIT	Sage-Grouse Implementation Team
SGMA	Sage-Grouse Management Area
SITLA	State of Utah School and Institutional Trust Lands Administration
SRMA	special recreation management area
SRP	special recreation permit
SUA	special use authorization
SUP	special use permit
TL	timing limitation
UDWR	Utah Division of Wildlife Resources
US	United States
USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Department of the Interior, Fish and Wildlife Service
USGS	United States Geological Survey
VDDT	Vegetation Dynamics Development Tool
VRM	visual resource management
WAFWA	Western Association of Fish and Wildlife Agencies
WGFD	Wyoming Game and Fish Department
WSA	wilderness study area

Chapter 3
Affected Environment

CHAPTER 3
AFFECTED ENVIRONMENT

3.1 CHANGES BETWEEN THE DRAFT LUPA/EIS AND PROPOSED LUPA/FINAL EIS

- Calculations have been updated and new information since the Draft LUPA/EIS has been incorporated to reflect better or more current information, where available and germane to the current conditions and analysis. Most notably, such updates have been made in **Section 3.3** (Special Status Species – Greater Sage-Grouse), **Section 3.7** (Water Resources), **Section 3.9** (Other Special Status Species), **Section 3.14** (Wildland Fire Management), and **Section 3.21** (Minerals).
- Additional literature was reviewed and added to the baseline information, particularly in **Section 3.1**.

3.2 INTRODUCTION

This chapter describes the existing conditions, and trends of resources and land uses in the planning area that may be affected by implementing any of the proposed alternatives described in **Chapter 2**, Alternatives. The affected environment provides the context for assessing potential impacts as described in **Chapter 4**, Environmental Consequences.

The planning area for the Utah Greater Sage-Grouse LUPA/EIS includes all of Utah, except for Washington and San Juan Counties. The BLM St. George and Monticello Field Offices administer public lands in Washington and San Juan Counties. These offices do not manage any lands with GRSG habitat. Portions of Box Elder County that are managed by the Sawtooth National Forest are not included in the planning area, but are part of the planning area for the Idaho Sub-region. In addition, the planning area includes the portions of the Uinta-Wasatch-Cache and Ashley National Forests that extend into Wyoming. Within the planning area, the GRSG analysis area is the sum of the population areas (which overlap all the above-referenced counties), regardless of land ownership (11,386,670 acres). **Table 1.1** provides a detailed breakdown of landownership status in the planning area.

The decision area is the portions of the GRSG analysis area that are composed of BLM, Forest Service, and Bankhead Jones surface estates, as well as the mineral estates administered by the BLM. Though the planning area includes private lands, decisions are only made for BLM and

Forest Service federal surface and federal minerals in this LUPA. Management direction and actions outlined in this EIS apply only to the BLM-administered and National Forest System lands in the planning area and to federal mineral estate under BLM jurisdiction that may lie beneath other surface ownership.

The USGS produced for the BLM and Forest Service a BER for GRSG to augment this planning document at a biologically meaningful scale (Manier et al. 2013). The BER is a support document that provides information to put planning units and issues into the context of the larger WAFWA MZs. The BER examines each threat identified in USFWS' listing decision published on March 15, 2010. For each threat, the report summarizes the current understanding of various impacts on GRSG populations and habitats. When available, patterns, thresholds, indicators, metrics, and measured responses that quantify the nature of each specific threat are reported. Data from the BER are presented throughout this chapter to illuminate the context, magnitude, and extent of the threats within each WAFWA MZ that overlaps the planning area. Because the BER focuses on threats to GRSG at the WAFWA MZ (or "range-wide") scale, it provides biologically meaningful data for larger-scale analyses, such as the cumulative effects analysis for GRSG in **Chapter 5**, Cumulative Impacts. The data and information included from the BER provides the most accurate data available for analysis purposes; however, these scenarios remain based in present knowledge. Spatial data informing the existing conditions were compiled to establish a consistent information basis across the entire region, but in order to attain this consistently across the sub-region and ownership and management boundaries, some local data have been omitted; therefore, there may be inconsistencies between WAFWA-level and local planning-level data. As such, these data provide a regional baseline, suitable for guiding regional mid- to long-term analysis scenarios (Manier et al. 2013).

Chapter 3, Affected Environment, also presents data that are available at a finer scale than used in the BER's larger-scale, WAFWA MZ focus. These fine-scale, local data are incorporated into the affected environment discussion to complement the BER's biologically meaningful data, characterize the relative contributions of threats in the planning area versus the WAFWA MZs, and to set the stage for the cumulative effects analysis for GRSG (**Chapter 5**). Unless specifically described as WAFWA MZ, references to MZs throughout **Chapter 3** describe the affected environment in the portions of the WAFWA zones that overlap the Utah planning area, as described in **Chapter 1**, Introduction.

3.2.1 Organization of Chapter 3

Certain types of resources that may be present in the LUPA planning area, such as cave and karst resources, are not addressed in this LUPA because issues relating to the management of these resources were not identified during scoping by the public, or by the BLM or Forest Service, or they are not included in the planning area. Information from broad-scale assessments was used to help set the context for the decision-making process. The information and direction for BLM and Forest Service resources and resource uses has been further broken down into fine-scale assessments and information. The level of information presented in this chapter is commensurate with and sufficient to assess potential effects discussed in **Chapter 4**, based on the alternatives presented in **Chapter 2**.

The following resources are specifically addressed in **Chapters 3**, **4**, and **5**, of the Utah Greater Sage-Grouse LUPA/EIS.

- Greater Sage-Grouse
- Air Quality
- Climate Change
- Soil Resources
- Water Resources
- Vegetation (Including Noxious Weeds; Riparian and Wetlands)
- Other Special Status Species
- Fish and Wildlife
- Wild Horses and Burros
- Cultural Resources
- Visual Resources
- Wildland Fire Management
- Wilderness Characteristics[1]
  - Natural Areas
  - Inventoried Lands with Wilderness Characteristics
- Livestock Grazing/Range Management
- Recreation
- Comprehensive Travel and Transportation Management
- Lands and Realty
- Renewable Energy
- Minerals
  - Leasable Minerals
  - Locatable Minerals
  - Mineral Materials
- Special Designations
  - Areas of Critical Environmental Concern (ACEC)
  - Wilderness Study Areas (WSAs)
  - Other Special Designations

[1] Forest Service inventoried roadless areas and potential wilderness areas were not considered; see Chapter 1.

- Social and Economic Conditions (Including Environmental Justice)
- Tribal Interests

Unless specifically identified otherwise, descriptions of the decision area do not call out a distinction between BLM-administered and National Forest System lands. As the subject of analysis involves the management of, use of, and impacts on large landscapes, most resources, threats, or impacts do not change along a political boundary. As such, the resources and uses are described across the landscape of the planning, GRSG analysis, or decision areas. Distinctions between the BLM and Forest Service are only made where it involves a substantive change in resource presence, condition, or threat. Each resource section in this chapter contains a discussion of existing conditions, including trends.

- Existing conditions describe the location, extent, and current condition of the resource in the planning area, GRSG analysis area, and decision area. For each resource, a general description of the existing conditions is provided for the planning area, regardless of land status. This is done to provide a regional context for the resource. More detailed discussion of the existing conditions at various scales may be provided depending on the resource topic and availability of applicable information. This is done to provide an area-specific description of the existing conditions for the resource.
- Trends identify the degree and direction of resource change between the present and some point in the past. Not all resource topics will have trends. For example, soil resources may not undergo notable resource change. If there is change, the degree and direction of resource change is characterized as moving toward or away from the current desired conditions, and the reasons for the change are identified. Trends can also be described in quantitative or qualitative terms. Identifying the trends is done to provide an understanding of how BLM and Forest Service management influences the desired condition of the resource over time. It can be difficult to analyze trends for some resources because changes to the resource often occur due to factors beyond the control of the BLM and Forest Service. For those resource topics that can be affected by climate change, a discussion of the effects from climate change on the resource is provided.

Acreage figures and other numbers used are approximate projections; readers should not infer that they reflect exact measurements or precise calculations. Acreages were calculated using Geographic Information Systems (GIS) technology, and there may be slight variations in total acres between resources.

3.3 SPECIAL STATUS SPECIES – GREATER SAGE-GROUSE

The GRSG is a federal candidate species for listing under the ESA, and a Utah and Wyoming BLM and Forest Service sensitive species. Under Utah law, GRSG are classified as an upland game species managed by the UDWR. The GRSG is a Utah state sensitive species and a Tier II species under the Utah Comprehensive Wildlife Conservation Strategy (UDWR 2005a).

3.3.1 Life History

GRSG are considered a sagebrush ecosystem-obligate species; they rely on sagebrush on a landscape level and on a microhabitat scale. Obligate species are restricted to certain habitats or to limited conditions during one or more seasons of the year to fulfill their life requirements. GRSG require large, intact, interconnected expanses of sagebrush shrubland to exist (Connelly et al. 2004; Wisdom et al. 2011). As a landscape-scale species, GRSG move between habitats seasonally and generally require contiguous winter, breeding, nesting, and summering habitats to sustain a population (Connelly et al. 2011). These habitat requirements may increase the adverse effects of habitat loss, fragmentation, and degradation from development, infrastructure, inappropriate grazing management, and other disturbances (Connelly et al. 2011). In general, adverse impacts on wildlife and diversity are associated with declines of suitable habitat to below 30-50 percent of the landscape (Andrén 1994; Flather and Bevers 2002). Specific to GRSG, 50-70 percent of the landscape must be sagebrush to increase the likelihood of GRSG persistence (Aldridge et al. 2008; Wisdom et al. 2011).

While the largest GRSG populations generally fit this description, there are smaller populations that appear to be persisting in smaller areas, but the population dynamics and viability of these populations are not well understood at this time. In general, when existing habitat availability is reduced to the extent that a population must spend more time or energy to meet annual needs, the population becomes less resilient and more susceptible to local extirpation (Bennett and Saunders 2010). There is no information available on the minimum habitat patch size required to support viable populations. Minimum habitat patch size would likely need to be evaluated on a population-by-population basis due to the variability in habitats across the range (Connelly et al. 2011).

There are multiple spatial scales to evaluate GRSG habitat connectivity (Knick and Hanser 2011). For instance, modeling efforts have identified west-wide sagebrush connectivity (Knick and Hanser 2011). However, at the fine scale, within a seasonal habitat or between seasonal habitat areas, habitat connectivity is not clearly defined. The lack of a decisive definition is due to the variability that exists across GRSG habitats. In general, habitat connectivity within a GRSG population refers to the degree in which the landscape facilitates GRSG movements to meet their annual needs. GRSG inhabit sagebrush areas that exist within diverse landscapes. For example, GRSG occur in latitudes ranging from southern Canada down to southern Utah, and exist in precipitation zones that range between 5-10 inches annually to 35-40 inches annually.

The threats to GRSG may vary based on where that population exists (e.g., along a raptor migration corridor or near a landfill). Based on these types of variability and local topography, local populations have evolved to use their local landscape in a way to meet their needs. Due to this variability, it is not possible to make general statements about what "connectivity" within a population area is without having substantial sample sizes of movement data and associated vital rate data that spans multiple years in each area.

In Utah, occupied, winter, and breeding GRSG habitats are shown on **Map 1.1**, and breeding bird density in Utah is shown on **Map 3.3-1**. **Map 1.1** is based on the best available information on where known GRSG populations are currently distributed in Utah. While it is possible that there are birds outside of the currently mapped GRSG PPH and PGH polygons, there is a low

likelihood that there are substantial GRSG populations and quality habitats outside of PPH and PGH on BLM-administered or National Forest System lands because the base data are all known occupied habitats. Since there is a relatively small number of birds in Utah compared to other states, Utah has been able to monitor almost all the leks each year and puts efforts toward finding new leks where there are anecdotal reports of birds or perceived good habitat.

Many populations of GRSG move between seasonal ranges in response to habitat distribution and seasonal availability of resources (Connelly et al. 2004). Movement patterns differ among populations of GRSG; some are nonmigratory, while others may migrate in one or two stages, with distances up to 50 miles (Connelly et al. 2011). GRSG tend to concentrate in small areas within larger sagebrush landscapes. Percent sagebrush cover was an important predictor of winter use, and habitat selection was strongest at a scale of 1.5 square miles (Doherty et al. 2008). Conclusive data are not available regarding minimum patch size to support viable populations of GRSG; migratory populations may use areas exceeding 1,000 square miles (Schroeder et al. 1999, Connelly et al. 2011). Connectivity between populations and habitats is an important predictor of population persistence; lek activity was lower or not present in leks with smaller populations and limited connectivity to neighboring populations (Knick et al. 2013).

Sagebrush habitats vary considerably across the range of GRSG, and use of specific habitat components can vary. Tall, woody big sagebrush subspecies *(Artemisia tridentata ssp. Wyomingensis, tridentata, and vaseyana)* are used year-round, while shorter species such as black sagebrush *(A. nova)* may provide important winter, nesting, and brood-rearing habitat. Shrub species such as rabbitbrush *(Chrysothamnus spp.)* are used for nesting cover (Connelly et al. 2011). Diverse sagebrush habitats are managed by WAFWA as seven GRSG management areas on the basis of floristic characteristics (Stiver et al. 2006); Utah contains portions of four of the seven zones (MZs II, III, IV, and VII) (**Map 3.3-2**), indicating the diversity and also discontinuity of sagebrush habitats within Utah (Connelly et al. 2004; Doherty et al. 2010).

Diverse sagebrush habitats provide the majority of GRSG nesting, brooding, fall and winter cover, and forage year-round. As herbaceous vegetation desiccates during the summer, birds have also been documented using more mesic areas (e.g., small aspen stands, meadows, and agricultural lands) within or adjacent to sagebrush-dominated landscapes (Aldridge and Boyce 2007). GRSG are ground-nesters, and their key habitat components include adequate shrub size and density for nesting and understory cover of grasses for concealment, abundant forbs and insects for brood rearing, and availability of herbaceous vegetation for late summer forage (Connelly et al. 2011). Understory, height, density, cover, and patchiness of the sagebrush-dominated ecosystem are all important to GRSG.

During the spring breeding season, male GRSG congregate to perform courtship displays to attract females on areas called leks. Male GRSG begin gathering near leks in late winter and will stay on leks through spring. Leks are frequently located in open sites, surrounded by dense sagebrush cover, and the same lek sites are used year after year (Connelly et al. 2011). Leks are an indication of nearby nesting habitat (Bradbury et al. 1989; Fedy et al. 2012) and early brood-rearing habitat. Studies from Wyoming and Nevada found that 75 and 95 percent, respectively, of hens nest within 4 and 3.1 miles of a lek (Fedy et al. 2012; Coates et al. 2013). Preliminary analyses being completed using data from a number of Utah populations suggest that 3.1-mile to

4.3-mile lek buffers would include at least 90 percent of nests (Dahlgren et al. unpublished) due to strong site fidelity. Strong site fidelity means that GRSG repeatedly use the same leks, nesting areas, and brood-rearing sites, suggesting that they may have limited adaptability to habitat change (Holloran et al. 2005).

Sagebrush and associated diverse communities provide the foundation to meet GRSG annual habitat needs. Female GRSG frequently nest under shrubs and show a preference for sites under sagebrush plants that have large canopies. The canopies provide overhead cover and an herbaceous understory, thus providing lateral cover and allowing birds to be hidden from view (Bunnell 2000). Quality habitat reduces predation pressure and is essential for GRSG population stability. A large quantity of habitat can also reduce predation pressure. In Utah, nesting and early brood-rearing habitats typically include sagebrush canopy cover ranging between 10 and 50 percent (Rasmussen and Griner 1938), with herbaceous vegetation for nesting cover. In areas where understory cover is lacking, higher shrub cover has been associated with increased nest success (Kolada et al. 2009; Coates and Delehanty 2010). Chick survival is associated with higher grass and forb understory cover because chicks eat insects for their first three weeks and mostly forbs until they are three months old (Barnett and Crawford 1994; Gregg et al. 1994; Connelly et al. 2004; Casazza et al. 2011, p. 4-9). In general, GRSG have small clutch sizes and low nest success compared with other upland bird species; hence, populations may be less able to recover from population declines as quickly as those of most other game birds (Schroeder 1997).

As herbaceous understory in sagebrush habitats begin to dry out in mid-summer, GRSG move to where the herbaceous understory is green. Depending on the population, greener areas may be in higher elevations or in valleys where succulent forbs are present (Bunnell 2000). GRSG broods occupy a variety of habitats during summer, including sagebrush, relatively small burned areas within sagebrush, wet meadows, farmland, and other irrigated areas adjacent to sagebrush habitats (Connelly et al. 1988).

In winter, GRSG rely almost entirely on sagebrush for food and cover. From mid-September into November, GRSG prefer areas with relatively dense canopy cover and forbs that are still green. During winter, GRSG rely almost exclusively on sagebrush leaves and congregate where sagebrush is available above snow (Crawford et al. 2004; Schroeder et al. 1999). In Utah, females preferentially selected areas with sagebrush canopy cover of 15 to 50 percent (Rasmussen and Griner 1938). Winter habitat is used by segregated flocks of males and females (Beck 1977).

3.3.2 Conditions Range-wide

GRSG were historically found from 4,000 to over 9,000 feet in elevation in the Great Basin and Colorado Plateau regions. Early pioneer accounts mentioned that GRSG were present wherever there was sagebrush *(Artemisia tridentata)* (Beck and Mitchell 1997).

Historically, GRSG occurred in parts of 13 states within the western US and 3 Canadian provinces (Schroeder et al. 2004). GRSG populations have declined throughout much of their former range and have been extirpated from Nebraska and British Columbia (Schroeder et al. 2004). Across their range, GRSG currently occupy 670,000 square kilometers (416,309 square miles), or 56 percent of their potential range prior to Euroamerican contact, which covered approximately 1,200,000 square kilometers (745,645 square miles) (Schroeder et al. 2004).

Current distributions of "fringe" populations are fragmented and increasingly disconnected from core regions of the distribution in the Great Basin and Colorado Plateau. Approximately 11 percent of GRSG are found in Utah (Braun 1998).

Since European settlement of the West began, the amount, distribution, and quality of sagebrush habitats and the GRSG populations that depend on them have declined. The 155.5 million acres of sagebrush that existed historically were reduced to 119 million acres by 2004 (Connelly et al. 2004). The loss and degradation of habitat is attributed to altered fire frequencies, resulting in pinyon-juniper invasion at higher elevations and annual nonnative grass invasion at lower elevations; conversion to croplands or pastures; improper livestock grazing; vegetation management to remove sagebrush, such as herbicide use, chaining, and crested wheatgrass seedings; mineral and energy development; and recreational activities (USFWS 2010a; Manier et al. 2013; USFWS 2013a). Currently, sagebrush communities and GRSG continue to be at risk from multiple sources across multiple scales (Manier et al. 2013). Adding to the habitat loss and degradation, historic hunting rates severely reduced GRSG populations (Patterson 1952). GRSG were managed similar to other high reproductive output upland game birds, but GRSG have relatively low productivity and are long-lived (Wakkinen 1990 as cited by Manier et al. 2013; Zablan et al. 2003). More recently, hunting has been substantially curtailed to reflect the current science on the range of GRSG reproductive and annual survival rates. Based on current harvest rates, hunting has not been identified as a primary range-wide threat by USFWS. Further discussions on hunting is in **Chapter 1**.

GRSG Habitat Characteristics

Research provides the scientific foundation to better understand GRSG populations and the habitat characteristics that are important to inform management decisions. Due to the breadth of GRSG research information, researchers have summarized the pertinent information to aide management of GRSG habitats with general descriptions of habitat characteristics. Habitat descriptions for GRSG habitats range in spatial scales of broad landscape-level (multi-state) to the site-specific scale. **Table 3.1** shows the habitat characteristics at the site-specific level.

Connelly and others (2000) includes the most recent range-wide summary of habitat characteristics, further supported by Hagen and others' (2007) meta-analysis. These guidelines are compiled from the site-specific scale and broadened for the fine and site-specific spatial scale.

The Connelly and Hagen published guidelines are the result of a compilation of data collected from Colorado, Wyoming, Montana, Idaho, and Oregon, much of which is referred to as sagebrush-steppe and are general site-specific habitat guidelines. As such, it should be noted that habitat guidelines are based on vegetation characteristics collected at the site-specific scale of GRSG nesting, brood-rearing, or wintering locations.

McIver and others (2014) state that there is substantial spatial and temporal heterogeneity in sagebrush ecosystems. Utah encompasses diverse landscapes, as illustrated by the four floristic regions or GRSG MZs identified in the Greater Sage-Grouse Conservation Assessment and the transition zones that fall between them (Connelly et al. 2004). In addition, Utah encompasses the southernmost distribution of GRSG and nears the southernmost distribution of sagebrush.

Table 3.1
Characteristics of Sagebrush Rangeland Needed for Productive GRSG Habitat

	Breeding		Brood-rearing		Winter[e]	
	Height (cm)	Canopy (%)	Height (cm)	Canopy (%)	Height (cm)	Canopy (%)
Mesic Sites[a]						
Sagebrush	40-80	15-25	40-80	10-25	25-35	10-30
Grass-forb	>18[c]	≥25[d]	variable	>15	N/A	N/A
Arid sites[a]						
Sagebrush	30-80	15-25	40-80	10-25	25-35	10-30
Grass-forb	>18[c]	≥15	variable	>15	N/A	N/A
Area[b]	>80		>40		>80	

Source: Connelly et al. 2000
[a] Mesic and arid sites should be defined on a local basis; annual precipitation, herbaceous understory, and soils should be considered (Tisdale and Hironaka 1981; Hironaka et al. 1983).
[b] Percentage of seasonal habitat needed with indicated conditions.
[c] Measured as "droop height"; the highest naturally growing portion of the plant.
[d] Coverage should exceed 15 percent for perennial grasses and 10 percent for forbs; values should be substantially greater if most sagebrush has a growth form that provides little lateral cover (Schroeder 1995).
[e] Value for height and canopy coverage are for shrubs exposed above snow.

Consequently, sagebrush vegetation varies because of varied latitude, elevation, precipitation, and soil type.

Due to heterogeneity in Utah's sagebrush vegetation, the State of Utah has developed specific vegetation guidelines that more accurately represent the range of local sagebrush community characteristics (i.e., shrub, grass, and forb cover and heights) in Utah.

In developing these guidelines, the State gathered GRSG vegetation data (collected using Connelly et al. 2003 methods) from sites that radio-marked telemetry studies indicate are being used by GRSG throughout Utah (various graduate research projects). Based on GRSG populations and regions of similar vegetation in Utah, localized habitat characteristics were broken into seven different regions in Utah (Great Basin, Great Basin Semi-Desert, Southwest Semi-Desert, Wyoming Basin, Low-Elevation Uintah, High-Elevation Colorado Plateau, and High Elevation Semi-Desert; **Map 3.8-1**).

The Southwest Regional GAP Analysis Project (ReGAP) land cover descriptions for sagebrush habitats in Utah include Inter-Mountain Basins Montane Sagebrush Steppe, Colorado Plateau Mixed Low Sagebrush Shrubland, Great Basin Xeric Mixed Sagebrush Shrubland, and Inter-Mountain Basins Big Sagebrush Shrubland (USGS 2005) (**Map 3.8-2**).

Utah includes zones from desert to alpine and subalpine areas. Below the high mountain zone of ridge tops and plateaus, the land is characterized by lodgepole pine and spruce/fir communities. The mountain zone, from approximately 6,000 to 9,000 feet in elevation, is characterized by aspen and mountain big sagebrush vegetation. The upland or foothill zone from 5,800 to 8,000 feet, where most human development occurs, is characterized by sagebrush, pinyon pine, juniper

trees, and oaks. Sagebrush-steppe communities occur in this zone in Box Elder and Rich Counties in the northern part of Utah. The semidesert zone in Utah occupies nearly 60 percent of the land area in the Great Basin, Colorado Plateau, and Uinta Basin (USU Extension 2009).

Vegetation in semidesert areas consists primarily of shrubs and succulents, including pinyon-juniper communities and big sagebrush shrublands. Sagebrush shrublands differ from steppe habitats in their dominance of sagebrush and are generally located at lower elevations, just above salt desert scrub communities. Sagebrush-steppe, in contrast, typically contains roughly equivalent amounts of sagebrush and herbaceous species (West 1983; USU Extension 2009). GRSG are dependent upon systems with tall, woody sagebrush and a strong grass and forb component. They require mesic areas in summer, which are more limited in sagebrush shrublands (Connelly et al. 2011). Historically, GRSG were found in a wide swath of semidesert lands in Utah, from much of which they have now been extirpated (Braun et al. 2005). Sagebrush shrublands represent the southern and drier part of the species' range.

The mountain, upland, and semidesert zones each support different subspecies of big sagebrush. The three most common subspecies of big sagebrush *(Artemisia tridentata)* are basin big sagebrush *(Artemisia tridentata ssp. tridentata)*, which is predominantly found in the lower basins, Wyoming big sagebrush *(Artemisia tridentata ssp. wyomingensis)*, which is found on higher elevation foothills, and mountain big sagebrush *(Artemisia tridentata ssp. vaseyana)*, which occurs at higher elevations in the mountain zone (USU Extension 2009). Sagebrush in shrublands may have lower growth forms than in higher-elevation regions, being limited by the availability of soil moisture in spring and summer (Cook and Lewis 1963).

3.3.3 Conditions Statewide

GRSG are thought to have been historically distributed in all 29 Utah counties, based on sagebrush distribution, but are now found in 26 counties (UDWR 2009a). They are estimated to occupy only 41 percent of their historic habitats in Utah and are half as abundant as they were prior to 1850 (Beck and Mitchell 1997; **Map 3.3-3**). GRSG population declines correspond with trends of decreasing habitat quality and quantity that is common throughout the West. The reasons for declines in GRSG habitat quality and quantity vary from site to site but include wildfire, urban expansion, development, agricultural conversion, herbicide treatments, noxious weeds/invasive species expansion, conifer encroachment, drought, and improper historic livestock grazing and in some cases improper current livestock grazing (Manier et al. 2013). In western Utah, GRSG are at highest risk from habitat loss and degradation associated with nonnative annual grass invasion and conifer encroachment and related changes in fire risk, while in eastern Utah they are at highest risk from habitat loss and disturbance associated with energy development. These threats are described in greater detail in the Special Status Species – Greater Sage-Grouse section of **Chapter 4**.

Populations

Currently, the largest populations of GRSG in Utah are found in western Box Elder County, in Uintah County on Blue and Diamond Mountains, in Rich County, and in central Utah on Parker Mountain, which contains portions of Sevier, Piute, Wayne, and Garfield Counties (**Map 1.2**). Smaller populations are found scattered in the central and southern parts of the state. In Utah, GRSG leks have been counted since the 1960s, but methodologies have been inconsistent over

time, making data difficult to decipher and identification of long-term trends difficult (Knick and Connelly 2011). Populations in the early 1970s were approximately twice the size of current populations. Populations reached a low in the mid-1990s and have since increased, but not to previous levels.

The UDWR use the number of males strutting on leks as an index of GRSG population size and trends, as it is the only time these birds are highly visible. In addition, leks are often indicators of important seasonal habitats. The UDWR 2009 Greater Sage-Grouse Management Plan states that, "Utah has 429 known leks. Of the 429 known leks, 304 (71 percent) have been active in the last 5 years; 328 (76 percent) are occupied, 101 (24 percent) are unoccupied, and 29 leks are undetermined (have had less than two counts of at least two males)."

In Utah, regular lek counts began in 1967 (45 leks counted). With the exception of the occasional year's lek counts hindered by deep snow, overall, the number of leks counted each year has increased and, correspondingly, the total number of birds counted has generally increased over time. For instance, the number of leks counted between 1970 and 1995 increased to an average of 125 leks counted per year. From 1996 to 2012, the number of leks counted increased from 144 to 361. Similarly, the total number of males counted on leks between 1996 and 2006 increased from 1,555 to 5,973 males (280 percent). Since the peak lek counts of 2006, the male lek counts have oscillated down from 5,973 males to 3,284 males in 2012. While increasing numbers of males may be an indication of increasing overall Utah GRSG populations, simple conclusions are complicated by a number of factors, including, but not limited to, variable lek count methods (more standardized in the last 10 to 15 years), increasing number of leks counted, variable counting of leks that are unoccupied or vacant, discontinued counting of leks that are considered vacant, and decreasing percentage of leks that are active. Looking at average males per occupied lek, there have been regular oscillations in approximately 8- to 11-year cycles between 1969 and 2012, with average males decreasing from 1969 to 1996, and seemingly stabilizing between 1996 and 2012 (UDWR 2012a). It should also be noted that lek data for tribal lands is not complete because the UDWR currently does not have access to tribal lands to conduct lek counts or any other type of GRSG survey. In some cases, where leks are in close proximity to public access roads, the State of Utah has some lek counts (e.g., Halfway Hollow population). Though lek counts are not complete on tribal lands, these lands are still included in the total acres of GRSG habitat.

Although historic lek count data were obtained prior to the 1960s, these data are inconsistent and less reliable. In the 1960s, few leks were known, and those that were counted were generally near roads. No set protocol existed regarding timing of lek counts, suitable weather condition, and other factors known to affect lek attendance. A standard protocol was adopted beginning in the 1990s to normalize the observed level of bird activity. Furthermore, efforts to find new leks increased over time, leading to potential bias in the counts.

While lek counts are an imperfect population estimate, they provide an indicator of general trends in GRSG population. As lek counts have standardized in data collection protocol, data have become more reliable. Nonetheless, historic lek data are valuable in providing a minimum population level for GRSG, and overall estimates indicate a long-term declining trend in GRSG populations.

Due to the inherent problems of making simple conclusions about GRSG populations based on lek counts, Connelly et al. (2004) and Garton et al. (2011) have normalized and analyzed the lek data to provide less-biased population trend conclusions across the range of the species. In addition, within Utah, the BLM and Forest Service calculated Lambda (change in population from year 1 to year 2) for as many years as leks were consistently monitored within the last 20 years.

Beck and others (2003) considered 11,514 square miles (14 percent) of Utah current habitat for GRSG; UDWR, other agencies, and university researchers have identified 11,864 square miles of current GRSG habitat in Utah, 11,594 square miles of which is considered brood-rearing habitat, and 7,323 square miles of which is crucial winter habitat (UDWR 2009a). Natural fragmentation of GRSG habitat within Utah from topographic discontinuities has been exacerbated by human developments and disturbance and resulted in a highly fragmented pattern of GRSG populations.

Another means of describing population boundaries and movements of the Utah GRSG populations relative to the larger distribution of the species and within Utah is through genetic analyses (Manier et al. 2013). Oyler-McCance and others (2005) conducted coarse-level analyses on mitochondrial DNA sequence data and nuclear microsatellite data collected from 46 populations throughout the distribution of GRSG. The results showed, for both mitochondrial and nuclear datasets, that there is a gradual shift in genetic variation moving across the distribution of the species (Oyler-McCance et al. 2005). In Utah, Oyler-McCance and others (2005) sampled Box Elder County, Rich County, Strawberry, Diamond Mountain, Blue Mountain, and Parker Mountain and found that the microsatellite data (through structure analysis) clustered Strawberry and Parker Mountain populations as more similar to one another than surrounding sampled populations. Subsequently, two research projects collected additional mitochondrial samples from the Emery, Anthro Mountain, East Bench, and Deadman's Bench Population Areas (Smith 2009; Perkins 2010). As a result, Breidinger and others (2013) found that Anthro and Strawberry haplotype compositions varied from those throughout the rest of the state. Consistent with Oyler-McCance and others' (2005) conclusions, the additional Utah genetic samples suggest a shift of variation of represented haplotypes in adjacent populations or population areas, looking at samples from around the state. At this time, definitive conclusions about bird movements and genetic connectivity cannot be made with the currently available data because not all populations have been sampled in the state (especially nuclear samples) and, in some cases, sample sizes are small.

The complex mosaic of land ownership and administration of the habitat compounds the difficulty of properly managing GRSG. One population of GRSG can use land administered by several different federal and state agencies as well as private land. Currently occupied habitat of GRSG in Utah covers primarily BLM-administered and private lands. Private lands provide the greatest amount of GRSG habitat in the planning area at 38 percent, with BLM-administered lands at 35 percent. The Forest Service administers 11 percent of the current GRSG habitat in the planning area, and the SITLA administers approximately 9 percent, with 2 percent administered by other State of Utah agencies (e.g., UDWR or Division of Parks and Recreation). Tribal lands account for over 5 percent of GRSG habitat in the planning area, and other federal agencies (e.g., National Park Service, military reservations, or Bureau of Reclamation) cover less than 1 percent.

UDWR is the primary agency responsible for managing GRSG in Utah and has mapped the habitat for the species throughout the state. The mapped habitat is considered occupied based on known historic habitats, field observations, professional judgment, radio-telemetry data, and intact sagebrush areas adjacent to the previously mentioned areas. In addition to leks, nesting habitat, brood-rearing habitat, and wintering habitat, mapped habitats include other known occupied habitats that may fall between those known seasonal use areas and are considered occupied. While there may be GRSG outside current GRSG maps, the best habitat with the highest likelihood to support persisting GRSG populations are contained within the habitat maps.

Trends

GRSG have declined throughout their range and now inhabit an estimated 56 percent of their historic range, which covered nearly 500,000 square miles of habitat across 13 western states and parts of Canada (Schroeder et al. 2004). In Utah, the total number of males counted increased substantially, tracking the exponential increase in efforts to find new leks in the last 15 years. While there sometimes is a bias to count active leks, referring to the average number of males counted on active leks can be a more accurate means of determining trends. The average number of males per active lek declined between 1969 and 1996 but appears to have stabilized between 1996 and 2012 (Garton et al. 2011). Based on records of harvested birds in the past, it is clear that there were substantially more birds than there are today, even in high points of population oscillations.

It should also be noted that state trends may not reflect more localized population trends, as Utah populations are highly varied in terms of consistent lek counts, historic and current threats, topographic/geologic diversity (including natural fragmentation), and precipitation patterns.

Several factors, past and current, contribute to the changes in GRSG distribution and abundance, including habitat loss, alteration, and degradation. The negative impacts on GRSG from various types of habitat fragmentation include reductions in lek attendance and persistence, winter habitat use, recruitment, yearling annual survival, and female nest site choice (USFWS 2010a). Several of the major causes of GRSG habitat loss range-wide include energy development, infrastructure, fire, invasive plants, conifer encroachment, and improper livestock grazing. Within the planning area, the primary threats include wildfire; spread of invasive plants; conifer encroachment; improper grazing; localized predation that exceeds natural rates or species that GRSG evolved with (see **Appendix M**, Predation of Greater Sage-Grouse in the Utah Sub-regional Planning Area); localized wild horse impacts; and, in the eastern part of the planning area, infrastructure primarily associated with oil and gas development (USFWS 2013a). **Chapter 4** will discuss these important threats to GRSG and alternatives to address their impacts in the planning area.

3.3.4 Greater Sage-Grouse Population Change

All wildlife populations are in constant short-term (i.e., year to year) flux. The stability of many populations cannot be measured on an annual basis, but require decades of monitoring. Some wildlife populations exhibit cyclic trends at some frequency through time. GRSG populations across the range tend to exhibit these same characteristics, and in Utah they seem to cycle on

about a 10-year basis. The exact reason for the cycle is unknown. However, various aspects (i.e., vital rates) of the GRSG's life cycle have been linked by past research to changes in environmental and habitat conditions. Explicitly understanding population change and the direct and indirect factors requires information from the entire life-cycle (i.e., all seasonal survival and recruitment factors) over long periods (e.g., more than one decade). Such research would require significant funding and has not been conducted to date.

Population change or growth rate is influenced by multiple factors. Births and deaths are the internal factors influencing population change. Immigration and emigration are the external factors influencing population change. Biologists often understand very little about external influences on population change; however, past research on GRSG shows that immigration and emigration seem to occur at relatively low rates. Therefore, vital rates that make up birth and death rates become the factors of most interest. Death rates are often considered in terms of the inverse, survival. For GRSG this is considered female or hen survival for two age classes, namely yearling (second year) and adult (after second year), both of which are capable of breeding. Birth rate really incorporates all vital rates that influence recruitment into the breeding population. For GRSG this includes nest initiation rates, clutch size, nest survival, chick survival (up to 50 or 60 days), and juvenile survival (50 days to first breeding season the next spring). Often species are classified as either slow or fast in their life-cycle characteristics. Slow life-cycles are characterized by high survival for adult breeding stages and usually lower reproductive input. Fast life-cycles are characterized by low adult survival and high reproductive input. GRSG are likely somewhere in the middle of this slow-fast continuum for avian species.

Recent research over a 10-year period by Utah State University has shown that though GRSG are longer lived with smaller clutch sizes than most other upland game birds, combined recruitment factors (e.g., nest, chick, and juvenile survival) still have approximately twice the influence on growth rate compared to combined female survival. Therefore, reproduction remains the primary cause of population change for GRSG even though they exhibit high adult survival. Because GRSG rely on reproduction for population change, they can go from low to high population levels rather quickly, often within just a few years.

Utah's GRSG populations will likely continue to fluctuate over the short term and on their historic 10-year cycle. The general direction of the cycles, whether populations are trending up or down, is the critical conservation concern for GRSG. Connelly et al. (2004) showed that, rangewide, the trend was decreasing from the 1960s to the mid-1980s, but then seemed to stabilize to the present. Certainly, if habitat loss and degradation occur within a population's habitat base the population would likely decline in succeeding years without habitat restoration and/or other management intervention. However, if the habitat base remains intact it is likely that the population will continue to fluctuate, but remain relatively stable in the long term.

There are potentially additional factors that must be considered even if the habitat base remains in place. Disease has been shown to influence GRSG populations in the past in certain areas, and could influence population change locally despite habitat conditions. However, over multiple generations there is potential that resistance to a disease could develop in a population. Additionally, climate change may create environmental conditions that GRSG are maladapted to,

and populations could decline. These extenuating factors and their influence on population change are little understood at this time but are of notable concern.

From a management context disease, climate and other environmental factors are outside the realm of conservation impact. Therefore, preserving existing habitat and restoring degraded habitat becomes the primary focus of management actions. GRSG require large landscapes of contiguous sagebrush habitat to carry out their life-cycle. Securing these large landscapes from further degradation and adding more habitat through restoration is the primary conservation action for GRSG.

3.3.5 Conditions in Population Areas

To evaluate population trends, the BLM and the Forest Service relied on lek counts, which provides the most consistent data. Based on lek counts, average Lambda (λ) or the average change for each population was calculated from 1994 to 2013 (in some cases fewer years were available). Consecutive years of lek counts are required when calculating Lambda. If Lambda is less than 1, a population is declining; if Lambda is more than 1, a population is increasing; and, if Lambda equals 1, the population is stable. Within Utah, consistent lek counts within populations varied between 8 and 20 years. Stable to increasing population areas, based on Lambda are: Diamond Mountain (λ=1.63), Anthro Mountain (λ=1.48), Blue Mountain (λ=1.44), Emery (λ=1.35), West Tavaputs (λ=1.32), The Sheeprocks (λ=1.14), Three Corners (λ=1.11), Strawberry (λ=1.08), Bald Hills (λ=1.08), Emma Park (λ=1.07), Panguitch (λ=1.06), Hamlin (λ=1.05), Parker (λ=1.05), Rich (λ=1.02), and Box Elder (λ=1.01). The Halfway Hollow population (λ=0.97) is slightly decreasing. The Ibapah Population Area does not have consistent lek counts to determine a trend. The Box Elder, Rich, Uintah, and Parker Mountain Population Areas remain open to hunting during a limited season, with bag limits and permit numbers determined by population estimates (BLM 2004). Population area estimates and acreages are included below in **Table 3.2**.

The last 10 years of lek counts are summarized for each population below, based on data collected by the UDWR. Not all active leks are counted each year for various reasons; thus, lek counts should be referred to as an indicator of bird presence, and general trends should only be made over numerous years. UDWR estimated population size by assuming 75 percent of males were counted and a 1 male to 2 females ratio. Existing habitat refers to habitat that is associated with an existing population. Potential habitat is habitat that does not currently have documented use by GRSG. Non-habitat areas do not contribute to the annual life-cycle of GRSG and do not provide important connectivity between habitats. Within the context of the VDDT modeling effort, the term "existing habitat" is also used in the following population area descriptions (see **Appendix V**, Great Basin Vegetation Modeling Using Vegetation Dynamics Development Tool).

Rich Population Area

Based on lek counts from 2004 to 2013, the Rich population ranges between 1,800 and 6,900 birds (444 to 1,721 males counted on 63 leks). One of Utah's largest populations, the Rich Population Area is in the northeast corner of Utah that links to populations in Idaho and Wyoming, and is the westernmost part of the Wyoming Basin subpopulation (Wyoming, Utah, and Idaho) in WAFWA MZ II (Stiver et al. 2006). The Rich Population Area occupies

Table 3.2
Estimated Population and Acres of GRSG Habitat within Population Areas

Population Area	Population Estimate	Total Acres	Mapped Occupied Habitat	Mapped Brood-rearing Habitat	Mapped Winter Habitat
Bald Hills	264	557,640	347,950	308,900	105,590
Box Elder	2,171	1,437,000	1,020,980	837,360	414,020
Carbon	571	1,155,000	497,800	312,670	321,780
Emery	85	343,650	96,120	96,120	84,680
Hamlin Valley	240	371,030	143,220	143,220	58,170
Ibapah	80	112,260	85,150	85,150	85,150
Lucerne	41	43,510	37,560	37,560	9,770
Panguitch	979	703,260	343,850	272,100	93,830
Parker Mountain	2,475	1,136,900	792,450	779,510	167,800
Rich	3,928	1,728,500	1,220,780	1,153,400	972,610
Sheeprocks	309	978,880	836,280	599,430	512,660
Strawberry	261	357,130	181,340	181,340	92,910
Uintah	2,268	2,358,700	1,557,100	1,510,900	680,570
Wyoming–Blacks Fork	275	54,800	54,800	N/A	N/A
Wyoming–Uinta	87	37,600	22,000	N/A	N/A

Source: UDWR 2012b
N/A: WGFD has not mapped brood-reading or winter habitat for these areas. While these seasonal habitats may be present, the specific identification of such areas is not available at this time.

approximately 1.2 million acres and encompasses 4 subunits of diverse mid- to high-elevation sagebrush areas (6,000 to 8,500 feet). This population is composed of large, relatively contiguous habitats and is connected with large Wyoming GRSG populations. Anthropogenic disturbances are present within the population area, and GRSG winter habitat has been reduced due to mechanical vegetation treatments to thin sagebrush density in Rich County over the last 3 to 4 decades. Nonetheless, the large amount of remaining upper elevation, contiguous habitat likely makes the populations more resilient than more habitat-restricted GRSG populations in Utah.

The Rich population has eight lek complexes in four subunits (Rich County Coordinated Resource Management Sage-grouse Subcommittee 2006). Telemetry data suggest birds in Rich County are nonmigratory, one-stage migratory, and two-stage migratory and make movements crossing state boundaries (Wyoming and Idaho). Some Rich County birds are moving large distances (24 miles), while other birds stay within a relatively small area. Due to the population size and area size, the primary limiting factors for this population are still not well understood. At this time, no telemetry data have been collected for the Summit-Morgan County birds. Therefore, it is not possible to determine movements, identify important seasonal habitat uses, or identify primary limiting factors.

Garton and others (2011) group this population into the larger Wyoming Basin population, and their population reconstruction suggests the population is stable to declining. Based on

calculating Lambda for lek counts between 1994 and 2013, the years when the same leks were consistently counted, the Rich population is stable (λ = 1.02) (see **Map 3.3-1**).

Historically and currently, the area primarily supports livestock grazing, agriculture, and recreation. Grazing is the dominant land use in this area. Unlike other arid areas in Utah, this area historically supported bison and may be more resilient to domestic livestock grazing (Rich County Coordinated Resource Management Sage-grouse Subcommittee 2006). GRSG hunting still occurs in Rich County but at reduced levels since 2000. Range management activities are common (including sagebrush treatments, water developments, and fencing), and agriculture occurs in the valleys on approximately 50,000 acres adjacent to the Bear River and some benches in the Summit-Morgan County area (Rich County Coordinated Resource Management Sage-grouse Subcommittee 2006). In the northern portion of Rich County, Bear Lake is the center of recreational activities during the summer months. Roads and power lines bisect the area but are relatively low in density and are frequently co-located. Low levels of oil and gas development and hunting exist (Rich County Coordinated Resource Management Sage-grouse Subcommittee 2006). GRSG habitat in Summit and Morgan Counties has been impacted by expanding human populations, particularly in the greater Park City area.

In the lower elevations, dominant vegetation is Wyoming sagebrush, rabbitbrush, black sagebrush, and low sagebrush (*A. arbuscula*), with patches of basin big sagebrush. Due to the history of grazing, patches of crested wheatgrass plantings remain. Moving up in elevation, the dominant vegetation changes to mountain big sagebrush mixed with aspen, mountain mahogany with a diversity of other shrubs, up to mixed conifers. Dense sagebrush gives way to mesic areas with abundant herbaceous vegetation that are used as late brood-rearing GRSG habitat (Hunnicutt 1993). Because of the historic and current grazing occurring in the area, sagebrush condition may pose the largest threat to these birds. In particular, winter habitat may be the primary limiting factor for these birds, and sagebrush treatments could reduce available habitat during heavy snow winters. The COT report (USFWS 2013a) considers this population "low risk."

Based on vegetation maps using regional-scale remote sensing (e.g., reGAP and LANDFIRE), approximately 63 percent of the mapped occupied habitat in the population area is covered by sagebrush, with an additional 3 percent covered by pinyon-juniper. Of the 63 percent of sagebrush, remote sensing indicates that approximately 80 percent is in mid- to late-seral classes, which are usually reflective of between 10 and 30 percent sagebrush cover that provides habitat that best meets GRSG habitat guidelines. Modeling of the existing habitat trends indicates that over the next 10 to 50 years, the percent of the area providing 10 to 30 percent sagebrush cover will decrease to 76 percent in 10 years, and continue to decrease to around 67 percent at 50 years due to increases in annual grasses and conifer encroachment. Current percent disturbance in GRSG habitat in the Rich Population Area is 0.6 percent, or 0.8 percent if fire history is included.

Strawberry Population Area

Based on the last 10 years of lek counts (2004 to 2013), the Strawberry Population Area is estimated to range between 220 and 630 birds (55 to 158 males counted on 8 leks). This population area occurs in central Utah in Wasatch and Duchesne Counties, and is in the

WAFWA Southern Great Basin MZ III (Stiver et al. 2006). The population area encompasses 180,000 acres in Strawberry Valley down to the Fruitland area and ranges in elevation between 6,500 and 10,000 feet. The population area has a history of human-related impacts, decreasing the habitat quantity and quality and altering the native wildlife populations. Current percent disturbance in GRSG habitat in the Strawberry Population Area is 0.4 percent. There is no history of fire in GRSG habitat in this population area.

The area has a diverse history of use, including grazing, agriculture, reservoir-related activities, and transportation and power line corridors. Highway 40 was reported as a known source of bird mortality in 1937 and 1938 (Griner 1939). Strawberry Reservoir was completed in 1922 and expanded in 1974, inundating over 17,000 acres of GRSG habitat (SVARM 2007). In association with the reservoir, recreation in the area has increased, including fishing, boating, hiking, camping, biking, OHV use, and snowmobile use. In the 1930s, GRSG populations were estimated to range between 3,000 and 4,000 birds (Griner 1939). With focused livestock production, large expanses of sagebrush were removed with herbicides and smooth brome was planted (Messmer et al. 2008, p. 126), but livestock grazing has decreased over the years and was removed from the Strawberry area in the early 1990s. In 1970, when regular lek counts began, the population was estimated to be 600 birds, and by 1999 the estimates were 150 to 200 birds. From 1939 to 1999, the population is estimated to have decreased 95 percent (Bunnell 2000). The decline has been primarily attributed to reservoir expansion, cultivation, sagebrush removal, road and cabin construction, human-associated facilities, and resulting high native and nonnative predation. Garton and others (2011) group this population with the larger Northeast Interior Utah population, and their population reconstruction for the larger population suggests a general decline from 1975 to 1995 but a slight increasing trend from 1995 to 2007. Based on calculating Lambda for lek counts between 1996 and 2013, the only years when the same leks were consistently counted, the Strawberry population is stable to slightly increasing (λ = 1.08) (see **Map 3.3-1**).

The upper elevation vegetation is primarily mountain big sagebrush and grasses with patches of silver sagebrush in the moister areas. Some patches are dominated by smooth brome and lack the preferred sagebrush cover, forb diversity, and forb abundance as GRSG use sites in the area (Bunnell 2000). In Fruitland, the habitat is largely Wyoming big sagebrush with intact understories with traces of cheatgrass and knapweeds (B. Maxfield, personal communication with Renee Chi, BLM, April 19 and April 23, 2013). Some birds in the population area are a one-stage migratory population moving from Strawberry to the Fruitland area during winter months and some birds stay in the Fruitland area year around. Since 2003, 336 females from other populations in the state have been translocated to the Strawberry Population Area, increasing local lek counts and expanding habitat use (Baxter et al. 2013). Due to the small amount of habitat in Strawberry Valley, predation rates from nonnative red fox and unnaturally high raven numbers were identified as the primary issue driving declining population. From 2000 to 2010, targeted predator control was conducted to increase GRSG annual survival and reproductive success, especially for translocated birds.

Based on vegetation maps using regional-scale remote sensing (e.g., reGAP and LANDFIRE), approximately 59 percent of the mapped occupied habitat in the population area is covered by sagebrush, with an additional 14 percent covered by pinyon-juniper. Of the 59 percent of

sagebrush, remote sensing indicates that approximately 76 percent is in mid- to late-seral classes, which are usually reflective of between 10 and 30 percent sagebrush cover that provides habitat that best meets GRSG habitat guidelines. Modeling of the existing habitat trends indicates that over the next 10 to 50 years, the percent of the area providing 10 to 30 percent sagebrush cover will be maintained at 76 percent over 10 years, and then increase slightly to 78 percent at 50 years, reflecting a stable to improving habitat trend.

The Strawberry GRSG population is a small population in an area with a long history of human impacts that continue today. Due to this population's small size, habitat quality and quantity, and existing threats, the COT report (USFWS 2013a) considers this population "at risk."

Uintah Population Area

Across the population area, vegetation maps using regional-scale remote sensing (e.g., reGAP and LANDFIRE) reflect that approximately 52 percent of the mapped occupied habitat is covered by sagebrush, with an additional 22 percent covered by pinyon-juniper. Of the 52 percent of sagebrush, remote sensing indicates that approximately 80 percent is in mid- to late-seral classes, which are usually reflective of between 10 and 30 percent sagebrush cover that provides habitat that best meets GRSG habitat guidelines. Modeling of the existing habitat trends indicates that over the next 10 to 50 years, the percent of the area providing 10 to 30 percent sagebrush cover will decrease to 76 percent in 10 years, and continue to decrease to around 67 percent at 50 years due to increases in annual grasses and conifer encroachment.

Within the Uintah Population Area, there are seven areas with separate habitat and distinct populations. The seven areas include the GRSG populations in Duchesne and Uintah Counties.

South Slope Uinta

Based on 8 years of lek counts (2006 to 2013), the South Slope Uinta population is estimated to range between 256 and 364 birds (63 to 91 males counted on 9 leks). The majority of the leks occur on tribal lands where access is limited. Therefore, these counts represent only the leks that were counted and likely are a low estimate for the number of birds in the population. This population area occurs in the northeastern portion of Utah in Duchesne County and is part of the Northeast Interior Utah population of WAFWA MZ III (Stiver et al. 2006). The 270,000-acre population area is located on the northwestern portion of the Uinta Basin (south-to-southeast facing) bounded by the Uinta Mountains on the north (8,000 feet elevation) sloping down to the Duchesne River (5,600 feet elevation). This southern half of the population area (primary private lands) is fragmented and degraded habitat from anthropogenic activities (Ellis 1985). The majority of the birds are found in the northern half of the area, on upper elevation tribal lands where little is known about the habitat use but oil development and pinyon-juniper encroachment are present. Current percent disturbance in GRSG habitat in South Slope Uintah area is 0.9 percent, or 3.4 percent if fire history is included.

The band crossing the middle (west to east) of the South Slope Uinta Population Area continues to be developed for oil resources, with increasing well density. Currently 30 percent (82,560 acres) of this area has development levels that exceed 1 well per section, which research has indicated disturbs GRSG within 2 miles (Naugle et al. 2011). The three southern leks have been vacant for over 10 years, but the area has some documented recent winter use. Telemetry data have not been collected for this population recently; therefore, little can be stated about

movements, important seasonal habitat areas, and limiting factors. Ellis' research (1985) documented abandonment of Blue Bench lek after a 345 kV transmission line was erected next to the lek. Garton and others (2011) group this population with the larger Northeast Interior Utah population, and their population reconstruction for the larger population suggests a general decline from 1975 to 1995 but a slight increasing trend from 1995 to 2007. Based on Lambda calculations of lek counts for this population where at least three leks were counted (between 2004-2013) and the years when the same leks were consistently counted, the South Slope population is stable to increasing (λ = 1.25) (see **Map 3.3-1**). However, ten years of lek counts are not enough years to establish a trend with substantial confidence, and the number of leks counted ranged between 3 and 13 in a single year.

The South Slope Uinta population is a small-to-medium-sized GRSG population in a moderately sized area with anthropogenic and natural fragmentation. The population is not well understood, but it appears that the lower two-thirds of the population area has been directly and indirectly impacted by various natural and anthropogenic disturbances, and birds are congregating on less-disturbed, high-elevation tribal lands. This population is not included in the COT report (USFWS 2013a).

Halfway Hollow

Based on the last 10 years of lek counts (2004 to 2013), the Halfway Hollow population is estimated to range between 120 and 332 birds (30 to 83 males counted on 10 leks). This population occurs west of Vernal in northeastern Utah and is part of the WAFWA MZ II (Wyoming Basin) (Stiver et al. 2006). This 263,000-acre area ranges in elevation from the Duchesne River (5,000 feet elevation) sloping up to the edge of the Uinta Mountains (8,500 feet elevation). The population area is characterized by relatively contiguous habitat in the northern portion, with on-going energy and human-related fragmentation in the southern portion. Current percent disturbance in GRSG habitat in the Halfway Hollow area is 1.0 percent, or 5.3 percent if fire history is included.

While anthropogenic habitat disturbances in this area have increased at a relatively slow rate, future interest in the area is growing. The western half of the area is dominated by private and tribal lands that are fragmented by agricultural fields and rural human developments. The largest lek also exists on private lands, near more mesic areas. Primarily in the southern half of the area are roads, power lines, oil development (290 wells), and proposed oil sands development. Oil development has been occurring at low levels with varying densities. Approximately 14 percent of the area has 1 well per section, and 18 percent of the area exceeds 1 well per section. On the eastern half of the area, on SITLA lands, the nation's first oil sands mining operation is proposed (with potential of over 200 new exploratory wells). Garton and others (2011) group this population into the larger Wyoming Basin population, and their population reconstruction suggests the larger population is stable to declining. Based on Lambda calculations of lek counts for this population where at least 6 leks were counted (between 1996 and 2013) and the years when the same leks were consistently counted, the Halfway Hollow population is slightly decreasing (λ = 0.97) (see **Map 3.3-1**).

The area is characterized by Wyoming sagebrush in the low elevations and mountain sagebrush in the upper elevations. Pinyon-juniper encroachment is particularly problematic in the mid-

section of the area. The area has contiguous habitat that ranges in condition from degraded understory vegetation with some cheatgrass at lower elevations, increasing understory diversity at mid-elevations, and intact, diverse understory vegetation at the upper elevations. Limited telemetry monitoring has been initiated on birds in the Little Mountain area, and to date, those birds have remained in the upper-elevation areas. Unmarked birds have been observed in the lower-elevation areas, but their origin is unknown. Telemetry research on Diamond Mountain birds documented a long bird movement (more than 20 miles straight line) to the southern portion of Halfway Hollow's Population Area.

The Halfway Hollow area supports a small-to-medium-sized GRSG population in a moderately sized and impacted landscape. The population has been directly and indirectly impacted by various anthropogenic disturbances but is contiguous with other medium to large populations in the region. This population is relatively more resilient to threats due to its proximity and potential connectivity with the adjacent populations. While limiting factors are not well understood, energy development and other anthropogenic impacts may be the primary factors, along with loss of habitat value due to juniper encroachment. The COT report (USFWS 2013a) considers these populations "low risk."

Diamond Mountain

Based on the last 10 years of lek counts (2004 to 2013), the Diamond Mountain population is estimated to range between 670 and 1,700 birds (168 to 437 males counted on 22 leks). However, there are also eight areas where birds have been observed strutting but the areas are not yet designated as "occupied" leks. This area is northeast of Vernal in northeastern Uintah County, part of WAFWA MZ II (Wyoming Basin) (Stiver et al. 2006). The 300,000-acre Diamond Mountain area is a relatively contiguous sagebrush plateau (7,300 feet elevation) with patches of pinyon-juniper at upper elevations and eroding away down toward the Green River (5,200 feet elevation) with naturally fragmented sagebrush areas. The area has various anthropogenic influences, but efforts are focused on reclaiming habitat by removing encroaching pinyon-juniper and Douglas fir. Current percent disturbance in GRSG habitat in the Diamond Mountain area is 2.4 percent, or 3.3 percent if fire history is included.

While there are roads (mostly small gravel roads), two pipelines, power lines (transmission and distribution), and a pipeline compressor station spread across this area, disturbances to this population are relatively minimal. One paved road crosses Diamond Mountain. Primary uses of the area include historic and current grazing, cultivation, and associated management practices; some ranches and residences (less than 70); and recreational activities (camping, fishing, and hunting). GRSG hunting still occurs on Diamond Mountain but at reduced levels since 2000. Garton and others (2011) group this population into the larger Wyoming Basin population, and population reconstruction suggests the larger population is stable to declining. Diamond Mountain's specific lek counts suggest a more stable trend than Garton's assessment. Based on calculating Lambda for lek counts between 1996 and 2013, the only years when the same leks were consistently counted, the Diamond population is increasing ($\lambda = 1.63$) (see **Map 3.3-1**).

The majority of the area is on the Diamond Mountain Plateau, a contiguous, undulating high-elevation (8,000 feet) mountain big sagebrush bench with fingers of habitat going north up five drainages and mixing with aspens, Douglas-fir, Ponderosa pine, and pinyon-juniper. Upper

elevation areas have a mostly intact understory. Off the bench, the slope down to the Green River is Shiner Basin. Shiner Basin is a slope that is incised by numerous drainages; it has patches of bare soil and varying densities of pinyon-juniper, Wyoming big sagebrush, black sagebrush, and salt desert shrubs. Shiner Basin is an important wintering area and serves as nesting and brood-rearing habitat for some birds, but the understory is less abundant and less diverse.

The Diamond Mountain GRSG population is relatively large in a moderately sized area, and is part of a cluster of GRSG populations that are characteristic of Wyoming populations. The area has had low levels of anthropogenic disturbances. Due to the size of the population, the quantity and quality of the habitat, and proximity to other GRSG populations, this population is likely very resilient to current threats. The COT report (USFWS 2013a) considers these populations "low risk."

Three Corners-Browns Park

Based on the last 10 years of lek counts (2004 to 2013), the Three Corners-Browns Park population is estimated to range between 156 and 968 birds (39 to 242 males counted on 7 leks). The two leks in the Browns Park area have not documented birds since the 1970s. This population is part of larger populations and lek complexes that cross state borders into Wyoming and Colorado, within WAFWA MZ II (Wyoming Basin) (Stiver et al. 2006). The Utah portion of this population is found in Daggett County in northeastern Utah. This population is bounded by Flaming Gorge and the Uinta Mountains on the west and southwest and is a series of shallow basins (5,500 feet elevation) with some rolling mountains (8,200 feet elevation). Less than 3 miles south is the Diamond Mountain area. In this region, the GRSG populations are in close proximity to other populations, only separated by geographic features (2 to 3 miles). This population is not well understood, but pinyon-juniper is an identified issue (UBARM 2006).

In 1964, Flaming Gorge Dam was completed and flooded GRSG habitat. While Flaming Gorge Dam represents a significant anthropogenic alteration of the area, a diversity of other uses or impacts also exists. Livestock grazing is the most widespread use in the area. Other small, localized anthropogenic activities are agricultural crops, two small communities, natural gas production, and human-caused fire. In the central portion of the Three Corners area, in Clay Basin, a natural gas field has been operating since the mid-1980s. The 5,500-acre development field's natural gas wells and associated infrastructure have a development density that exceeds 1 well per square mile, a density observed to disturb GRSG with 2 miles (Naugle et al. 2011). The largest recent impact in the area was the 2002 Mustang fire that burned 22,000 acres within mapped GRSG habitat dominated by pinyon-juniper. Garton and others (2011) group this population into the larger Wyoming Basin population, and their population reconstruction suggests the larger population is stable to declining. It is difficult to evaluate a population trend specifically for the Three Corners-Brown Park population since it extends into Wyoming and Colorado, but based on calculating Lambda for lek counts between 1996 and 2013, the only years when the same leks were consistently counted, the Three Corners-Browns Park population is stable ($\lambda = 1.11$) (see **Map 3.3-1**). Current percent disturbance in GRSG habitat in the Three Corners area is 1.0 percent, or 1.4 percent if fire history is included.

Aside from pinyon-juniper encroachment, the habitats are intact with diverse, abundant understory vegetation and traces of nonnative species. The sagebrush flats are dominantly

Wyoming big sagebrush interspersed with black sagebrush and salt desert shrubs. There is some mountain big sagebrush in the upper elevation areas of Goslin Mountain and Bender Mountain. Due to the lack of telemetry data for this area, it is not possible to determine movements, identify important seasonal habitat uses, or identify primary limiting factors. Brown's Park Valley has observed birds during the nesting, brood-rearing, and wintering seasons. For much of the area, pinyon-juniper is encroaching into sagebrush areas, and such areas are a primary focus for conservation efforts.

The Three Corners and Browns Park areas are part of larger GRSG populations for which the dynamics and status are not well understood. The Three Corners-Browns Park GRSG population in Utah is a medium-sized GRSG population in a geologically diverse landscape. The Utah portion of this area has been directly and indirectly impacted by various anthropogenic disturbances. Limiting factors are not well understood, but removing pinyon-juniper in areas where it is encroaching is the local working group's current focus. The COT report (USFWS 2013a) considers these populations "low risk."

Blue Mountain

Based on the last 10 years of lek counts (2004 to 2013), the Blue Mountain population is estimated to range between 40 and 600 birds (10 to 151 males counted on 8 leks). This area occurs in northeastern Utah, south of Dinosaur National Monument in eastern Uintah County, and it extends into Moffat County in Colorado. This population is part of WAFWA MZ II (Wyoming Basin) (Stiver et al. 2006). The Utah portion of this area encompasses approximately 59,000 acres, ranging from the Green River Valley (5,000 feet elevation) up to the high-elevation Yampa and Blue Mountain Plateaus (8,000 feet elevation). This population is a largely undisturbed area with minimal threats relative to other populations in the region. Current percent disturbance in GRSG habitat in the Blue Mountain area is 0.8 percent, or 1.0 percent if fire history is included.

Historically, ranching and grazing were the primary uses in the area. Grazing (cattle and sheep) remains one of the primary uses in the area but has declined. Aside from grazing and related management activities, the area has some recreational use. Dinosaur National Monument is adjacent to Blue Mountain, and there is one paved road on the plateau that is used to access a lookout spot in the monument. Other than those uses, there are minimal uses or disturbances in the area, though there have been some vegetation treatments. Garton and others (2011) group Blue Mountain into the larger Wyoming Basin subpopulation, and their population reconstruction suggests the larger population is stable to declining. It is difficult to evaluate a population trend for the Utah Blue Mountain population since the majority of the birds are in Colorado, but based on calculating Lambda from 1999-2013, the only years when the same leks were consistently counted on the Utah side, the Utah Blue Mountain population is increasing (λ = 1.44) (see **Map 3.3-1**).

The vegetation communities in this population area are intact, with diverse shrub and understory vegetation and traces of cheatgrass on the western, drier portions of the population area. The majority of the birds are found on the plateau where the habitats are contiguous and dominant with mountain big sagebrush, limited black sagebrush on shallow soils, some pinyon-juniper encroachment, and patches of pinyon-juniper. Douglas fir, ponderosa pine, and aspen are

found in isolated small patches. The lower-elevation areas are a mix of Wyoming sagebrush, black sagebrush, and salt desert shrubs. The lower areas provide wintering areas and may be important in heavy winters. Otherwise, birds have been observed on the plateau during the winter (B. Maxfield, personal communication with Renee Chi, BLM, April 19 and April 23, 2013). Cheatgrass abundance is not currently considered a fire risk but is a management consideration when conducting vegetation projects in the area. The limited telemetry information (six birds) indicates birds primarily stay on the plateau in both Utah and Colorado.

The Blue Mountain GRSG population in Utah is in a small area with a small number of birds but is a shared population with Colorado. Limiting factors are not well understood, but there are no substantial threats other than being a small area. The COT report (USFWS 2013a) considers these populations "low risk."

Deadman's Bench

The Deadman's Bench Population Area has 2 leks that have had less than 10 birds since 1989. While the last 10 years of lek counts estimate a population ranging between 0 and 28 birds (0 to 7 males), the low number of birds suggest this population is connected to other populations, because such a low population cannot persist for over 20 years at this level. This area occurs in eastern Utah in Uintah County, south of the Blue Mountain area, and is part of WAFWA MZ II (Wyoming Basin) (Stiver et al. 2006). The area encompasses 134,650 acres of dry, low-elevation areas (5,400 to 5,700 feet). This area has a history of anthropogenic disturbances, including oil development and associated infrastructure. While Wyoming big sagebrush is present, the degraded understory does not provide good nesting and brood-rearing habitat but does provide adequate winter habitat.

Historically, grazing was the primary use in the area. While sheep grazing still occurs, use has declined. More recently, natural gas development occurred throughout 60 percent of the area and exceeds 1 well per section on 45 percent of the area. Other disturbances include a 500 kV transmission line through Coyote Basin and some pipelines through the area. Garton and others (2011) group this population into the larger Wyoming Basin population, and their population reconstruction suggests the larger population is stable to declining. It is difficult to evaluate a population trend for this local population since it extends into Colorado and the lek counts have been consistently low for 25 years, suggesting bird movements extend outside the area.

Deadman's Bench is a dry, low-elevation area with even-aged Wyoming big sagebrush and low understory vegetation cover but diverse forbs. Nonnative weeds are common; in particular, cheatgrass is abundant and is a management concern. Limited telemetry monitoring indicates some Deadman's Bench birds stayed in the area year-round. Other birds moved north of Deadman's Bench into Snake John Reef and Thunder Ranch (10 to 13 miles north of Highway 40). During recent sagebrush removal projects, winter bird use in the area has been verified, but the origin of the birds is unknown.

The Deadman's Bench area is arid with anthropogenic disturbances and degraded habitat. These factors likely decrease the resiliency of the habitat and the GRSG population. Current percent disturbance in GRSG habitat in the Deadman's Bench area is 2.5 percent, or 2.6 percent if fire history is included.

Due to the limited data for this area, other important factors driving the population are not well understood. The COT report does not include this area in its assessment.

East Bench and Books Cliffs

In the last 10 years (2004 to 2013), the East Bench and Books Cliffs lek counts steadily declined from 34 males (2005) to 1 male (2013) counted on 4 leks. Based on this, the population is estimated to range between 4 and 36 birds. East Bench leks are the only known active leks in the last 10 years. However, it is unknown if there are leks on tribal lands in the western portion of this area because UDWR does not have access. The East Bench and Books Cliffs area is in eastern Utah in Uintah and Grand Counties and is part of WAFWA MZ VII (Colorado Plateau) (Stiver et al. 2006). The area ranges in elevation between 5,200 and 7,800 feet and is on the southern edge of the Uinta Basin, encompassing the naturally fragmented East Tavaputs Plateau. While there is substantial gas development in the northern portion of the population area, other influential factors are not well understood.

Historically and currently, livestock grazing occurs on the plateau but is now at low levels. While there are no wild horse HMAs, trespass wild horses that have eluded capture are still present in the upper-elevation GRSG habitats and are adversely impacting herbaceous understory growth in various vegetation projects (B. Maxfield, personal communication with Renee Chi, BLM, April 19, April 23, 2013). Past and current gas development exists on approximately 38 percent of the area, with development exceeding 1 well per section on 21 percent of the area; the majority of the concentrated development is in the northern portion of the area. Aside from gas interest in the northern area, there is interest in oil shale deposits in the southern portion of the area. Other disturbances on the landscape include power lines, a newly paved road, and recreation. Garton and others (2011) were not able to conduct an analysis on the East Bench (also known as White River) or the Book Cliffs (also known as East Tavaputs) areas because the lek data were insufficient. Based on Colorado data, population modeling for the Colorado Plateau WAFWA MZ suggests the population is stable. The localized lek counts do not agree with Garton and suggest that the East Bench and Book Cliffs GRSG population has been in consistent decline down to 1 male counted on the one known remaining active lek from 2011 to 2012. The status of the birds and habitat on adjacent tribal lands is unknown. Current percent disturbance in GRSG habitat in the East Bench area is 2.5 percent. There is no history of fire in GRSG habitat in this area.

The primary vegetation in the area is Wyoming big sagebrush with some black sagebrush in the lower elevations; greasewood, tamarisk, and cultivated alfalfa in riparian areas; and pinyon-juniper woodlands with small pockets of mountain sagebrush areas in the upper elevations. Dry, lower-elevation areas are dominated by even-aged sagebrush stands with low abundance but diverse forb understory vegetation. Cheatgrass and halogeton are common, particularly in areas where there has been disturbance. Limited telemetry data on East Bench birds suggest nearby riparian areas are an important brood-rearing area and that there is habitat in the western portions of the area on tribal lands. Biologists for the adjacent tribal lands have indicated birds are doing better on tribal lands than on East Bench. In addition, telemetry data from West Tavaputs showed a bird moving to the tribal lands from the west side. In the upper elevations on the plateau, birds are still occasionally observed during the summer months but the origin of those birds is unknown.

The East Bench and Book Cliffs GRSG population has steadily declined in the last 30 years. While one of the primary threats in the low elevations may be gas development, the decline of the upper-elevation leks is not well understood. The COT report does not include this population in their assessment.

Carbon Population Area

Based on vegetation maps using regional-scale remote sensing (e.g., reGAP and LANDFIRE), approximately 45 percent of the mapped occupied habitat in the population area is covered by sagebrush, with an additional 21 percent covered by pinyon-juniper. Of the 45 percent of sagebrush, remote sensing indicates that approximately 66 percent is in mid- to late-seral classes, which are usually reflective of between 10 and 30 percent sagebrush cover that provides habitat that best meets GRSG habitat guidelines. Modeling of the existing habitat trends indicates that over the next 10 to 50 years, the percent of the area providing 10 to 30 percent sagebrush cover will decrease to 57 percent over 10 years, and then hold steady to 58 percent at 50 years, reflecting a decreasing, but stabilizing trend. The model indicates that the decreases in habitat are due to continued conifer encroachment.

Anthro Mountain

From the last 10 years of lek counts (2004 to 2013), the Anthro Mountain GRSG population is estimated to be about 150 birds (ranging between 16 and 176 birds and based on lek counts ranging between 4 and 44 males on 5 leks). Recently, concerted efforts have been made to count the leks in this population area even when accessibility is poor due to snow. The area is part of the southwestern portion of the Uinta Basin but is part of WAFWA's Utah Northeast Interior population in MZ III (Stiver et al. 2006). This population area falls between Argyle Ridge to the south and the Duchesne River to the north. The area is composed of naturally fragmented sagebrush areas spread out over a large northeast-tilting plateau dissected with a series of drainages leading to Green River Basin. Despite the area boundaries described, some birds from the Anthro Mountain area are moving up to 25 miles outside of the Anthro Mountain area (Christensen 2009, unpublished report). Anthropogenic influences, particularly energy development, have decreased the amount of habitat available in some of the lower-elevation, less-productive areas.

The area has a history of grazing and energy development. While grazing has existed in the area, levels have declined. Additionally, a number of vegetation treatments have been conducted in sagebrush and pinyon-juniper in the area. Energy development is common and is increasing, especially in the eastern low-elevation areas (Sand Wash, Big Wash, Wrinkles, and Cowboy Bench areas; 28 percent of the area), where there are 38 existing wells. In 8 sections, densities exceed 1 well per section, a level which research has found to disturb GRSG within 2 miles (Naugle et al. 2011). Additional development of leased areas will result in approximately 141 wells (based on the conceptual well design). This eastern area is primarily used as winter habitat, and future development may decrease use in areas where development exceeds 1 well per section (potentially 80 percent of the area). In addition, 45 new wells are proposed on the western, higher-elevation portion of the primary Anthro Mountain area but is planned to minimize impacts on the existing GRSG population by drilling multiple wells from one pad and keeping surface disturbance less than 5 percent. The eastern developments, in particular, will increase the disturbance and associated fragmentation of wintering GRSG habitat. It is unknown

how much development in this area will impact the population. Garton and others (2011) group this population with the larger Northeast Interior Utah population, and their population reconstruction for the larger population suggests a general decline from 1975 to 1995 but a slight increasing trend from 1995 to 2007. Based on calculating Lambda for lek counts between 2003 and 2013, the only years when the same leks were consistently counted, the Anthro population is stable to increasing (λ = 1.12) (see **Map 3.3-1**). However, 10 years of lek counts are not many years to establish a trend with substantial confidence, and efforts to count leks each year has increased. It is also important to note that although efforts to count leks each year has increased, access to count leks during peak lek attendance may be limited in high snow years, and counting the leks during off-peak male lek attendance can skew lek counts to look like a decline.

This area ranges broadly from high-elevation sagebrush areas (9,000 feet elevation) to drier sagebrush areas (5,600 feet elevation). The high-elevation areas on Anthro Mountain fall in a higher precipitation zone and are more productive, with primarily mountain big sagebrush interspersed with pockets of aspen, Douglas-fir stands, and pinyon-juniper into the drainages. While the higher-elevation habitat is characterized by abundant and diverse shrub and intact understory vegetation, the habitat area is small and is not connected to other habitat areas. Precipitation levels decrease as elevation decreases, and pinyon-juniper dominates the landscape until giving way to sagebrush again. These lower-elevation areas are dominantly Wyoming big sagebrush, but there is some black sagebrush with pinyon-juniper encroachment and less understory vegetation, and some cheatgrass present. Telemetry data suggest some birds are moving large distances to separated areas of seasonal habitats, including movements off the plateau. These seasonal movements include Emma Park, West Tavaputs, Fruitland, and Blue Bench and can range between 14 and 33 miles. While many movements have been documented, not all wintering habitats are currently known. In addition, a recent translocation research project resulted in the translocation of 60 hens to this population in 2009 and 2010. Current percent disturbance in GRSG habitat in the Anthro Mountain area is 1.2 percent. There is no history of fire in GRSG habitat in this area.

This area is a small collection of separate blocks of habitat. While upper elevation habitat has intact sagebrush cover and herbaceous understory, lower-elevation habitat blocks are degraded and more fragmented. This population encompasses bird home ranges that span separate seasonal habitats, sometimes extending to the adjacent populations. Energy development is expected to continue, notably at the Gasco energy development to the east, which will impact wintering habitat in general habitat. Not all seasonal habitats and movement corridors are well understood. Due to this population's small size and noncontiguous habitats, this population is likely more susceptible to stochastic events. This population is not included in the COT report (USFWS 2013a).

Emma Park

Based on the last 10 years of lek counts (2004 to 2013), the Emma Park population is estimated to range between 288 and 640 birds (72 to 160 males counted on 13 leks). This area occurs in central Utah in the eastern portions of Utah and Wasatch Counties and the northwestern portion of Carbon County (Crompton and Mitchell 2005), on the eastern edge of WAFWA MZ III (Stiver et al. 2006). The greater Emma Park area is a series of high-elevation areas (7,000 to

8,500 feet) primarily influenced by precipitation, limited sagebrush habitat, and anthropogenic disturbances.

Coalbed methane development is occurring at low levels in localized areas, and there has been interest in additional leasing in this area. The area has a history of sheep grazing but has been grazed by cattle since the 1980s (B. Crompton, personal communication with Renee Chi, BLM, April 3 and April 23, 2013). In the last 10 years, coalbed methane development and associated infrastructure has been concentrated in the area with the primary population. Noise associated with active pumpjacks near active leks has displaced strutting males from preferred leks (Crompton and Mitchell 2005). These developments contribute to fragmentation from the existing highway and power lines. Mortality rates and eagle occurrence were higher in close proximity to the development. Future wind development has been proposed for the Scofield Junction, and additional coalbed methane development is anticipated east of the existing development. Current percent disturbance in GRSG habitat in the Emma Park area is 1.4 percent, or 1.6 percent if fire history is included.

The primary Emma Park habitat is a northerly sloping plateau dissected by a number of drainages. Four other small habitat areas are south and southwest of the primary Emma Park area. Gordon Creek is a plateau of habitat west of Price and has 325 gas wells concentrated on the eastern half; birds have not been confirmed in the developed area. There are three small, historically occupied habitat areas west of Scofield Reservoir, but there is no recently documented bird presence. Current percent disturbance in GRSG habitat in the Gordon Creek area is 3.7 percent. There is no history of fire in GRSG habitat in this area.

The primary area is dominantly mountain big sagebrush, with patches of black sagebrush on shallow, rocky slopes and basin big sagebrush along the major drainages (B. Crompton, personal communication with Renee Chi, BLM, April 3 and April 23, 2013). Upper elevations have mixed stands of aspen and Douglas fir interspersed with mountain shrub communities. The birds are considered nonmigratory, but birds collared on the adjacent Anthro Mountain area have moved to this area during winter and summer seasons (Christensen 2009, unpublished report). Garton and others (2011) group this population with the larger Northeast Interior Utah population, and their population reconstruction for the larger population suggests a general decline from 1975 to 1995 but a slight increase from 1995 to 2007. Based on calculating Lambda for lek counts between 1997-2013, the only years when the same leks were consistently counted, the Emma Park population is stable to slightly increasing (λ = 1.07) (see **Map 3.3-1**). It is also important to note, in general, though efforts to count leks each year has increased, access to count leks during peak lek attendance may be limited in high snow years and counting the leks during off-peak male lek attendance can skew lek counts to look like a decline.

The Emma Park area supports a medium-sized GRSG population in a relatively small, geologically and vegetationally diverse landscape. The population has been directly and indirectly impacted by various anthropogenic disturbances. The size of the population area combined with the nonmigratory behavior of the birds may make this population more susceptible to stochastic events. Limiting factors are not well understood, but precipitation and limited habitat quantity and quality may be driving this population. The COT report (USFWS 2013a) considers this population "at-risk."

West Tavaputs

From the last 10 years of lek counts (2004 to 2013), the West Tavaputs Plateau population is estimated to range between 56 and 308 birds (14 to 77 males counted on six leks). There are seven known leks in the area, of which three are active each year (B. Crompton, personal communication with Renee Chi, BLM, April 3 and April 23, 2013). The population is found on a rugged plateau northeast of Price, Utah and is the easternmost population in WAFWA MZ III (Stiver et al. 2006). West Tavaputs is a series of broad, discontinuous plateaus incised by deep drainages. The plateau drains north and east to Nine Mile Canyon and the Green River, respectively.

Historically, there have been low levels of anthropogenic disturbances in the area, with minimal oil and gas development. However, recent development is concentrated in the limited GRSG wintering habitats and exceeds densities of 1 well per section on approximately 11 percent of the population. Additional future well development will occur in winter habitat over the next two decades with mitigation emphasis on maintaining GRSG on the landscape. Roads are common on most ridges but receive low levels of use. Historically and currently, limited livestock grazing and wild horse presence occurs on the plateau. Garton and others (2011) group this population with the larger Northeast Interior Utah population, and their population reconstruction for the larger population suggests a general decline from 1975 to 1995 but a slight increasing trend from 1995 to 2007. Based on calculating Lambda for lek counts between 2006 and 2013, the only years when the same leks were consistently counted and the same number of leks were counted, the West Tavaputs population is increasing (λ = 1.21) (see **Map 3.3-1**). However, 7 years of lek counts are not enough years to establish a trend with substantial confidence. It is also important to note that although efforts to count leks each year has increased, access to count leks during peak lek attendance may be limited in high snow years, and counting the leks during off-peak male lek attendance can skew lek counts to look like a decline. Current percent disturbance in GRSG habitat in the West Tavaputs area is 0.7 percent, or 0.8 percent if fire history is included.

The West Tavaputs GRSG habitat is characterized by sagebrush stands interspersed with aspen and spruce-fir communities at high elevations, and pinyon-juniper communities at low elevations. The vegetation is generally diverse, with mountain big sagebrush dominant in the upper elevations and Wyoming big sagebrush and black sagebrush occurring at mid-elevations and winter habitats. Generally, the understory vegetation is diverse, with a variety of grasses and forbs. Telemetry data suggest the birds are using most of the mid- to high-elevation sagebrush areas on the plateau to meet breeding, nesting, and brood-rearing habitat needs. During winters, birds are moving to three primary locations lower on the plateau. There is evidence that GRSG sometimes winter north of Nine Mile Canyon (Cowboy Bench and Wrinkles areas) and mix with wintering Anthro Mountain birds. These long movements (up to 11 miles) are associated with heavy snow years (Castle Country Adaptive Resource Management Local Working Group 2006; Crompton 2012). Additionally, telemetry data documented a bird from the West Tavaputs area crossing east over the Green River onto tribal lands.

The West Tavaputs area maintains a small population in a naturally fragmented landscape. Due to the natural habitat fragmentation and limited wintering habitat, reclaiming sagebrush areas from encroaching pinyon-juniper is a primary management goal, with particular emphasis in

lower-elevation wintering areas. The COT report does not include this population in their assessment.

Emery Population Area

Composed of the Horn Mountain and Wildcat Knolls populations, the last 10 years of lek counts (2004-2013) for the Emery Population Area estimate a population ranging between 36 and 248 birds (average 128 birds) (9 to 62 males counted on 3 leks). Lek counts over the last 10 years have indicated that the number of birds in these small complexes have appeared to increase. Both populations are found on the southeast end of the Wasatch Plateau and fall within WAFWA MZ III (Stiver et al. 2006). The habitat in these areas is limited to small, high-elevation sagebrush areas bordered by large canyons, cliffs, and mountains (Perkins 2010). The Horn Mountain and Wildcat Knolls populations occupy relatively small sagebrush areas, approximately 16,817 acres and 10,245 acres, respectively, while mapped occupied habitat that includes other potential habitat area is approximately 96,000 acres. While the Horn Mountain and Wildcat Knolls populations are relatively close (less than 15 miles apart), no movement was documented in recent research (Perkins 2010).

Based on vegetation maps using regional-scale remote sensing (e.g., reGAP and LANDFIRE), approximately 58 percent of the mapped occupied habitat in the population area is covered by sagebrush, with an additional 15 percent covered by pinyon-juniper. Of the 58 percent of sagebrush, remote sensing indicates that approximately 77 percent is in mid- to late-seral classes, which are usually reflective of between 10 and 30 percent sagebrush cover that provides habitat that best meets GRSG habitat guidelines. Modeling of the existing habitat condition trends and levels of vegetation treatments indicates that over the next 10 to 50 years, the percent of the area providing 10 to 30 percent sagebrush cover will increase to 83 percent over 10 years, and continue to increase slowly to 85 percent at 50 years. Current percent disturbance in GRSG habitat in the Emery Population Area is 0.5 percent, or 0.8 percent if fire history is included.

Since the 1940s, underground coal mining has been active under the Wildcat Knolls area and there is concern that mining, grazing, recreation, or other activities may be influencing habitat quality. From 1987 to 1990, 53 birds (35 hens and 18 males) were translocated to the Wildcat Knolls population from other Utah GRSG populations. During the same period, the state initiated lek counts for these populations. In 1991, GRSG hunting seasons on these populations were closed because of observed declines (Perkins 2010). Garton and others (2011) evaluated these populations grouped together in one population, and their population reconstruction suggests a stable to increasing trend. Based on calculating Lambda for lek counts between 2005 and 2013, years when the same leks (3-4 leks) were consistently counted, the Emery population is increasing (λ = 1.35) (see **Map 3.3-1**). It is also important to note, in general, though efforts to count leks each year has increased, access to count leks during peak lek attendance may be limited in high snow years, and counting the leks during off-peak male lek attendance can skew lek counts to look like a decline.

The birds in the Horn Mountain and Wildcat Knolls areas appear to move on the landscape differently (Perkins 2010). The Horn Mountain birds are considered one-stage migratory, moving more than 6 miles between late-summer and wintering habitat (Perkins 2010). While

there are leks in the north and south ends of the Horn Mountain Population Area, the majority of the birds attend the southern lek. Wintering habitat is also in the southern portion of the Horn Mountain area. In contrast, the Wildcat Knolls population is nonmigratory and stays in the same area year-round (Perkins 2010). The Wildcat Knolls area is smaller than Horn Mountain, and nest success appears to be influenced by habitat fragmentation and surrounding conifers that provide increased perching opportunities for avian predators (Perkins 2010).

Due to the small habitat areas, geographic isolation, small population size, and potentially low genetic diversity (especially Horn Mountain), these populations are more susceptible to stochastic events and lack general resiliency. Therefore, small impacts may have proportionately large or amplified impacts on these populations. The COT report (USFWS 2013a) considers these populations "at-risk."

Parker Mountain Population Area

Based on the last 10 years of lek counts (2004 to 2013), the greater Parker Mountain population is estimated to range between 2,344 and 5,556 birds (586 to 1,389 males counted on 45 leks). This population area occurs in southcentral Utah (Sevier, Piute, Wayne, and Garfield Counties) and is part of WAFWA Southern Great Basin MZ III (Stiver et al. 2006). This large area is relatively unfragmented. This area includes the Parker Mountain population on the Awapa and Aquarius Plateau, as well as pockets of habitat on Monroe Mountain and Sevier Plateau, Grass Valley, and John's Valley. This population area occupies a large, diverse habitat ranging from valley Wyoming big sagebrush (6,000 feet elevation) up to mountain shrub/aspen habitat (10,000 feet elevation). While the area has various anthropogenic disturbances on the landscape, the low human populations and lack of economically developable resources has kept disturbances low.

Historically, ranching and grazing were the primary use in the area. Livestock grazing remains one of the primary uses in the area, especially on the plateau, but has generally declined. Due to the history of grazing, predator management of primarily native predators has been consistent on Parker Mountain. Agricultural development occurs in the valleys on either side of the plateau, with alfalfa comprising the primary crop. In correlation with the human populations, there are landfills on the edge of Parker Mountain (near Loa) and the Garfield County landfill in the middle of John's Valley; increased raven abundance has been reported for the John's Valley area, assumed to be associated with the landfill. While hunting still occurs on Parker Mountain, harvest rates have declined substantially since 2000. Other anthropogenic influences in the area include some two-lane highways with low levels of traffic, a few distribution power lines and one transmission line in Grass Valley, ranches, and two small reservoirs. Garton and others (2011) groups this population with the larger South Central population (and includes the Panguitch population and Bald Hills), and their population reconstruction suggests the larger population is stable. Based on calculating Lambda for lek counts between 1994 and 2013, years when the same leks were consistently counted, the Parker population is stable to slightly increasing (λ = 1.05) (see **Map 3.3-1**). Current percent disturbance in GRSG habitat in the Parker Mountain Population Area is 0.8 percent. There is no history of fire in GRSG habitat in this population area.

The majority of the birds are on Parker Mountain, a northeast-facing, high-elevation, undulating plateau. At the low elevations, black sagebrush dominates the rolling ridges, with Wyoming big

sagebrush in the swales and patches of pinyon-juniper. At higher elevations, black sagebrush is found on ridges, with mountain big sagebrush in the swales and patches of silver sagebrush and aspens groves. Although the understory is diverse throughout the plateau, abundance increases with elevation. The valleys are dominated with Wyoming big sagebrush and encroaching pinyon-juniper around the edges, with low understory abundance of grasses or forbs in the lower elevations. Rabbitbrush abundance has been increasing in John's Valley. Due to the condition of the understory in the valleys, cheatgrass is a concern. Much telemetry data exists for Parker Mountain, but data are limited for Grass Valley and John's Valley. Parker Mountain nesting and brood-rearing vegetation data show that percent herbaceous vegetation cover is the lowest in the state despite one of the most stable populations (with an average combined grass and forb cover of 5 percent, in contrast to Connelly et al. 2000 guidelines. Parker Mountain birds make large movements throughout the year, spending winters primarily on the lower-elevation portions of the plateau. On the plateau, diversifying shrub structure in the mountain big sagebrush stands and changing grazing management are the primary management priorities. In the valleys, pinyon-juniper encroachment and grazing management in riparian areas is a management focus.

Based on vegetation maps using regional-scale remote sensing (e.g., reGAP and LANDFIRE), approximately 67 percent of the mapped occupied habitat in the population area is covered by sagebrush, with an additional 11 percent covered by pinyon-juniper. Of the 67 percent of sagebrush, remote sensing indicates that approximately 70 percent is in mid- to late-seral classes, which are usually reflective of between 10 and 30 percent sagebrush cover that provides habitat that best meets GRSG habitat guidelines. Modeling of the existing habitat condition trends and levels of vegetation treatments indicates that over the next 10 to 50 years, the percent of the area providing 10 to 30 percent sagebrush cover will decrease slightly to 67 percent over 10 years, and then increase slightly to 68 percent at 50 years, reflecting a generally stable trend in habitat condition.

The greater Parker Mountain GRSG population is a large GRSG population in a large, diverse landscape. While the valley has been directly and indirectly impacted by various anthropogenic disturbances, the majority of the area only has dirt roads with low human presence. The quantity, quality, and general lack of disturbances make this population more resilient than other Utah populations. The COT report (USFWS 2013a) considers this population "low risk."

Panguitch Population Area

Based on the last 10 years of lek counts (2004 to 2013), the Panguitch population is estimated to range between 648 and 1,960 birds (162 to 490 males counted on 17 leks). This population area occurs in southwestern Utah in Garfield, Iron, and Kane Counties, and is in WAFWA Southern Great Basin MZ III (Stiver et al. 2006). The Panguitch Population Area includes portions of the Markagunt Plateau, Panguitch Valley, and down through Long Valley (from 6,000 up to 8,500 feet in elevation). This population has localized threats of habitat loss from pinyon-juniper encroachment and increasing human-related development.

Since first European settlement in the 1850s, grazing and agriculture has remained this area's primary land use. While grazing has decreased, cattle are the primary agricultural commodity produced in the area (Frey et al. 2006a). The moist valleys have been converted to agricultural

uses. Until recently, development of Kane County's coal resources occurred prior to 1971 (Frey et al. 2006a). In 2010, surface coal mining in the Alton coalfield (3 miles south of Alton) began near the Sink Valley lek site. Development of the mine has resulted in increased traffic levels due to haul trucks on Highway 89. Expansion of the Alton mining operation has been proposed, which could affect adjacent nesting and brood-rearing habitat. Garton and others (2011) group this population with the larger South Central Utah population (and includes Parker Mountain and Bald Hills), and their population reconstruction suggests the larger population is stable. Based on calculating Lambda for lek counts between 1994 and 2013, the Panguitch population is stable to slightly increasing (λ = 1.06) (see **Map 3.3-1**). It is also important to note, in general, though efforts to count leks each year has increased, access to count leks during peak lek attendance may be limited in high snow years, and counting the leks during off-peak male lek attendance can skew lek counts to look like a decline. Current percent disturbance in GRSG habitat in the Panguitch Population Area is 1.2 percent. At this time, fire is not a primary threat in the Panguitch GRSG Population Area.

The habitat on the plateau is characterized by high-elevation mountain big sagebrush openings with intact understories, surrounded by pinyon-juniper, aspens, and Douglas fir. The valleys are largely Wyoming big and black sagebrush, giving way to pinyon-juniper as elevation increases. The largest valleys are on the eastern and southern portions of the population area (Panguitch Valley down to the Long Valley Junction) and have the most human-related development (towns and agriculture). There are small communities in the Kanab Creek and Sink Valleys. There are higher-elevation valleys that have little to no development and contain half the leks and 68 percent of the males (based on 10-year average lek counts) within the Panguitch Population Area. Valley understory vegetation is variable, ranging from low abundance and diversity to moderate abundance with low diversity of grasses and forbs. Some areas have traces of crested wheatgrass. The largest leks are found in the northern portion of the population area, where the habitat areas are the largest and most contiguous. Little is known about the bird movements in the northern portion of the population area, especially relative to the brood-rearing and wintering habitat areas and movement corridors. Recent data indicates that there is some level of connectivity within the southern two-thirds of the population area (Frey 2014). Though the southernmost sagebrush area (Ford Pasture) no longer supports active leks, it provides winter habitat for birds from further north. In addition, recent projects to remove pinyon-juniper where it had encroached into sagebrush areas have resulted in immediate use of habitat and establishment of a lek. Much of the pinyon-juniper expansion into sagebrush areas has been identified for similar projects throughout the Panguitch Population Area. Since the entire population has not been researched extensively, to date, not all seasonal habitats have been identified and it is not possible to determine vital rates, movements, or primary limiting factors.

Based on vegetation maps using regional-scale remote sensing (e.g., reGAP and LANDFIRE), approximately 51 percent of the mapped occupied habitat in the population area is covered by sagebrush, with an additional 32 percent covered by pinyon-juniper. Of the 51 percent of sagebrush, remote sensing indicates that approximately 70 percent is in mid- to late-seral classes, which are usually reflective of between 10 and 30 percent sagebrush cover that provides habitat that best meets GRSG habitat guidelines. Modeling of the existing habitat condition trends and levels of vegetation treatments indicates that over the next 10 to 50 years, the percent of the area providing 10 to 30 percent sagebrush cover will decrease slightly to 67

percent over 10 years, and then increase slightly to 68 percent at 50 years, reflecting a generally stable trend in habitat condition.

The Panguitch GRSG population is a large GRSG population in a medium-sized area spread across populated and unpopulated valleys and upper-elevation, patchy sagebrush benches. While the limiting factors are not well understood, the local working group identifies widespread pinyon-juniper encroachment, localized anthropogenic development, and increased raven abundance as primary threats to the population. The COT report (USFWS 2013a) considers these populations "low risk."

Bald Hills Population Area

The last 10 years of lek counts (2004-2013) of the Bald Hills population estimates it to range between 144 and 576 birds (36 to 144 males counted on 12 leks). The Bald Hills Population Area is in southwestern Utah, in Beaver and Iron Counties, and is part of WAFWA Southern Great Basin MZ III (Stiver et al. 2006). Due to limited telemetry data, it is unknown if the Bald Hills population is connected to the Panguitch population. Habitats within the area are characterized by salt desert shrub and Wyoming big sagebrush at the lower elevations (5,200 feet elevation), ranging up to patches of Wyoming and mountain big sagebrush, pinyon-juniper, aspen, and white fir between 6,500 and 8,000 feet elevation. Precipitation in the area ranges from 8 inches in the valleys to 16 inches in the upper elevations (Frey et al. 2006b). Vegetation within this area has been impacted by wildfire, which has resulted in some loss of sagebrush in portions of the population area. In contrast, wildfire has reduced the pinyon-juniper density within portions of the population area.

Historically, this area's primary land use was and remains grazing, with agriculture to a lesser degree. Grazing has decreased from historic levels (Frey et al. 2006b). Because of increasing cheatgrass presence and pinyon-juniper encroachment, fire frequency has been increasing. After the 2007 Milford Flat fire, this population's northern extensions of GRSG habitat were eliminated from the occupied GRSG habitat map. While the leks had been unoccupied within the burn area for more than 20 years, birds were occasionally observed using the area during other seasons prior to the fire. Within the current population area, approximately 48,150 acres (14 percent) has burned in the last 15 years. Residential development and agriculture occur in the north and to the east (Beaver, Minersville, Parowan, and Cedar City). The West Wide Energy Corridor is on the western edge of the population area, which is where the majority of infrastructure is located for major pipelines and transmission lines. Utah Highway 130 bisects the population area. Several roads through the population area provide access for a variety of purposes. Geothermal development is on the northwest portion of the population area at Thermo, and potential for expansion may exist. The population area has been of interest for wind energy development potential (Burnett and Frey 2012). Garton and others (2011) group this population with the larger South Central Utah population (and includes Parker Mountain and Panguitch populations), and their population reconstruction suggests the larger population is stable. Based on calculating Lambda for lek counts between 1994 and 2013, years when the same leks were consistently counted, the Bald Hills population is stable to slightly increasing (λ = 1.08) (see **Map 3.3-1**). However, from 1995 to 2003, only 3 leks were counted and by 2013, 12 leks were being counted. It is unknown if these are newly established leks or newly discovered

leks. Current percent disturbance in GRSG habitat in the Bald Hills Population Area is 1.2 percent, or 12.8 percent if fire history is included.

Habitats in the lower elevations (5,200 feet elevation) are characterized by salt desert shrub, black sagebrush, and Wyoming big sagebrush. There are dense stands of pinyon-juniper that separate the low-elevation shrublands from the high-elevation big sagebrush areas (Wyoming big sagebrush and mountain big sagebrush) at 7,900 feet. Higher elevations are characterized as large, rolling hills of Wyoming and mountain big sagebrush, with isolated stands of aspen and white fir and wet meadows that provide valuable summer habitat for GRSG. Based on a few years of telemetry data, the majority of this population is one-stage migratory. Birds seasonally use the north end of the population area near the agriculture fields, west of Minersville, and use higher-elevation sagebrush habitats on the Bald Hills during the summer season for brood rearing. During the winter, birds use the lower-elevation habitats at the southwest portion of the population area. Birds were using pinyon-juniper stands to some extent, hypothesized to help regulate high temperatures in mid-summer (Burnett and Frey 2012). High-quality brood-rearing habitat is a limiting factor for the GRSG within this population area due to limited mesic habitats. In addition, the lower-elevation winter habitats may be at risk because of increased fire frequency within the population area.

Based on vegetation maps using regional-scale remote sensing (e.g., reGAP and LANDFIRE), approximately 57 percent of the mapped occupied habitat in the population area is covered by sagebrush, with an additional 24 percent covered by pinyon-juniper. Of the 57 percent of sagebrush, remote sensing indicates that approximately 70 percent is in mid- to late-seral classes, which are usually reflective of between 10 and 30 percent sagebrush cover that provides habitat that best meets GRSG habitat guidelines. Modeling of the existing habitat condition trends and levels of vegetation treatments indicates that over the next 10 to 50 years, the percent of the area providing 10 to 30 percent sagebrush cover will decrease slightly to 67 percent over 10 years, and then increase slightly to 68 percent at 50 years, reflecting a generally stable trend in habitat condition.

The risk of fire within the population area is high, and that risk increases during dry years. The primary threats within the Bald Hills Population Area are the risk of fire within low-elevation sagebrush habitats and pinyon-juniper expansion into sagebrush habitat. There is a lot of opportunity to improve and restore GRSG habitats within this population area. The COT report (USFWS 2013a) identifies the Bald Hills Population Area as showing resiliency. Due to the size and trends of this population, the COT report (USFWS 2013a) considers this population "low risk."

Hamlin Valley Population Area

The Hamlin Valley population is estimated, based on the last 10 years of lek counts (2004-2013), to range between 192 and 516 birds (48 to 129 males counted on 6 leks). The Hamlin Valley area is in southwestern Utah, on the western side of Beaver and Iron Counties, and is in the Southern Great Basin WAFWA MZ III (Frey et al. 2006b). This area is part of the basin and range landscape, ranging between 5,000 and 9,000 feet in elevation, and is relatively isolated from other Utah GRSG populations but is a continuation of a population in Nevada. The

143,200-acre population area includes Hamlin and Pine Valleys, with high-elevation sagebrush flats in the Indian Peak Range between the valleys.

The primary past and present land use in this area is grazing. In addition to livestock grazing, wild horses are managed in the area. Water is piped to support livestock grazing. Other uses in the area include some recreation and big game hunting. Due to low precipitation levels ranging from 8 inches in the valleys up to 16 inches in the upper elevations, loss of sagebrush cover to fire is a concern during the summer (Frey et al. 2006b). In 2012, 936 acres burned in the population area. Garton and others (2011) group this population with the much larger Southern Great Basin subpopulation (includes central Nevada), and their population reconstruction suggests the larger population is stable. Based on calculating Lambda for lek counts between 1994 and 2013, years when the same leks were consistently counted, the Hamlin Valley population is stable to slightly increasing (λ = 1.05) (see **Map 3.3-1**). However, it is difficult to determine a population trend for Hamlin since it is part of a larger Nevada population that extends into Utah. Current percent disturbance in GRSG habitat in the Hamlin Valley Population Area is 0.8 percent, or 2.7 percent if fire history is included.

Hamlin and Pine Valleys are dominated by Wyoming big sagebrush communities, including winterfat. Historically, portions of the population area were converted to crested wheatgrass seedings, which is still evident throughout the population area. Big basin sagebrush is present throughout the washes, and black sagebrush occurs on the benches. Pinyon-juniper encroachment is expanding into sagebrush habitats at 6,200 feet throughout much of the population area and dominates the higher elevations.

Based on vegetation maps using regional-scale remote sensing (e.g., reGAP and LANDFIRE), approximately 69 percent of the mapped occupied habitat in the population area is covered by sagebrush, with an additional 21 percent covered by pinyon-juniper. Of the 69 percent of sagebrush, remote sensing indicates that approximately 36 percent is in mid- to late-seral classes regionally, which are usually reflective of between 10 and 30 percent sagebrush cover that provides habitat that best meets GRSG habitat guidelines. It is important to note that the modeled portion of GRSG habitat is mostly composed of habitat on the eastern end of the Great Basin in Nevada, with small portions extending into Utah, including the Hamlin Valley Population Area. Modeling of the existing habitat condition trends and levels of vegetation treatments indicates that over the next 10 to 50 years, the percent of the area providing 10 to 30 percent sagebrush cover will increase to 45 percent over 10 years and will continue to increase to 54 percent at 50 years, resulting in an improving trend.

Two years of telemetry research data on the birds in the southern portion of Hamlin Valley suggest the birds stay in that portion of the valley, while birds in the northern portion of the Hamlin Valley are using habitats in Nevada during the summer. Low nest success is attributed to high avian predation, particularly unusually high raven populations (McPherron 2013). During research in 2011 to 2012, the southern Hamlin Valley GRSG summer habitat use patterns appeared to follow water availability at livestock developments. The Pine Valley birds have very low lek attendance. No telemetry data exist for birds in the Pine Valley or Indian Peak areas, but birds have been observed in Pine Valley year-round and birds have been observed in the Indian

Peak area during winter. Due to the high precipitation levels, birds may be using the area during the summer as well.

The Hamlin Valley GRSG population appears small in comparison to larger populations within the state; however, it is a shared population with Nevada. Primary threats to the Hamlin Valley Population Area include pinyon-juniper expansion into sagebrush habitats. While there are not many threats to the population, sagebrush habitat is limited to the long, narrow valleys, and pinyon-juniper is expanding into the sagebrush at the lower elevations. In portions of the Population Area, understory vegetation diversity is lacking (in some cases, a result of old crested wheatgrass seedings). Limiting factors are still not well understood, but high-quality brood-rearing habitat is considered a limiting factor within the population due to the scarcity of natural riparian habitats (the springs have been piped). The COT report (USFWS 2013a) considers the Southern Great Basin population "at-risk."

Sheeprocks Population Area

From lek counts conducted the last 10 years (2004 to 2013) on both North (7 leks) and South Sheeprocks (3 leks; also known as the Tintic area) GRSG populations, the estimated population ranges between 200 and 760 birds (50 to 190 males). This population area is on the eastern edge of Tooele and Juab Counties and falls within WAFWA MZ III (Stiver et al. 2006). The Sheeprocks (North and South) Population Area (835,000 acres) is a relatively isolated population and may encompass two lek complexes that have distinct home ranges (Robinson 2007). This population's primary threats are cheatgrass invasion and associated fire intervals that threaten wintering habitat, pinyon-juniper encroachment, localized recreational impacts, predation, and localized wild horse impacts.

Historically, grazing was the primary use in the area and continues to occur throughout the population area from spring to fall. GRSG hunting was discontinued in the early 1990s due to decreasing lek counts. Wild horses use portions of the northwest portion of the area. Increasing human populations in Utah Valley and adjacent areas contribute to increasing recreational use of the miles of roads that go through GRSG habitats (including the Pony Express Trail). Due to the prevalence of cheatgrass at lower elevations, fire has impacted the area and is a future concern. Other disturbances include various ROWs with train tracks, power lines, roads, and pipelines. The majority of those exist in the southern portion of the population area. Garton and others (2011) evaluate this population individually, and their population reconstruction suggests the population is generally increasing. Based on calculating Lambda for lek counts between 1996 and 2013, years when the same leks were consistently counted, the Sheeprocks population is increasing (λ = 1.14) (see **Map 3.3-1**). Current percent disturbance in GRSG habitat in the Sheeprocks Population Area is 0.8 percent, or 1.9 percent if fire history is included.

Within the GRSG habitats, vegetation ranges from high-elevation (8,000 feet), diverse mountain big sagebrush communities to low-elevation (5,200 feet), converted agricultural areas, or Wyoming big sagebrush stands dominated with an understory of cheatgrass. While the habitat is continuous between the North and South Sheeprocks areas, there are no documented bird movements between them. The North Sheeprocks birds move over 8.5 miles between mid- to high-elevation nesting and late brood-rearing habitats down to low-elevation areas in the winter (Robinson 2007). Important breeding through late brood-rearing areas are found in mid to high

elevations. In the winter, most birds concentrate in a small, low-elevation area on the southern portion of the population area. Biologists have observed unusually high raven populations and increasing nonnative red fox in the area.

Based on vegetation maps using regional-scale remote sensing (e.g., reGAP and LANDFIRE), approximately 43 percent of the mapped occupied habitat in the population area is covered by sagebrush, with an additional 29 percent covered by pinyon-juniper. Of the 43 percent of sagebrush, remote sensing indicates that approximately 53 percent is in mid- to late-seral classes, which are usually reflective of between 10 and 30 percent sagebrush cover that provides habitat that best meets GRSG habitat guidelines. Modeling of the existing habitat trends indicates that over the next 10 to 50 years, the percent of the area providing 10 to 30 percent sagebrush cover will decrease to 46 percent over 10 years and to 38 percent at 50 years, reflecting a downward trend due to increasing acreage affected by annual grass and conifer encroachment.

The Sheeprocks Population Area is a small, isolated area with natural and anthropogenic fragmentation. Upper elevation habitats are small but currently intact, and lower-elevation wintering habitats are small and degraded areas that are susceptible to fire. The primary threats to this population are fire in wintering habitat, corvid predation, pinyon-juniper encroachment, and localized recreational impacts. The COT report (USFWS 2013a) considers the northern portion of this population "at-risk," but does not include the southern portion.

Ibapah Population Area

The Ibapah Population Area is a population shared with Nevada, with four known leks in Utah. While the last 10 years of lek counts (2004 to 2013) estimate a population ranging between 0 and 336 birds (0 to 84 males), the low number of birds suggests this population is connected to other populations. The southernmost lek is in tribal lands. This nonmigratory population is on the western edge of the Utah/Nevada state line in Tooele and Juab Counties and is part of Southern Great Basin GRSG population in Nevada, in WAFWA MZ III (Robinson 2007; Stiver et al. 2006). The GRSG habitats are primarily low-elevation (5,200 feet), low-precipitation Wyoming big sagebrush sites lacking a diverse, native understory and dominated by cheatgrass (Robinson 2007). Connectivity with other populations is unknown, and most birds inhabit small, low-elevation areas where cheatgrass and associated fire risk are the primary threats.

The area has livestock grazing, historic hunting, and some agriculture. Livestock grazing (cattle and sheep) remains the primary land use throughout the area and occurs year-round (Robinson 2007). On the tribal lands, wild horses are common, an unknown level of hunting still occurs, and OHV use is common. Outside the reservation, GRSG hunting discontinued in 1990 due to decreasing lek counts. Some sagebrush treatments intended to increase understory abundance and diversity have been conducted but have generally resulted in areas dominated by cheatgrass. Garton and others (2011) group this population with the larger Southern Great Basin population (including central Nevada), and their population reconstruction suggests the larger population is stable. Based on calculating Lambda for lek counts between 2005 and 2013, years when the same leks (3-4 leks) were consistently counted, the Ibapah population is decreasing ($\lambda = 0.82$) (see **Map 3.3-1**). However, eight years of lek counts are not enough years to establish a trend with substantial confidence, and it is difficult to determine a population trend for Ibapah since it is part of a larger Nevada population that extends into Utah.

The Ibapah Population Area is in an arid, remote area in the Deep Creek watershed. The population area encompasses a patchwork of vegetation types within approximately 85,200 acres. Low-elevation areas (5,200 feet) are commonly Wyoming sagebrush with a cheatgrass understory and some crested wheatgrass. There is very little diversity until elevation increases. The high-elevation habitat areas (7,000 feet) have mountain big sagebrush intermixed with aspens (Robinson 2007). Telemetry data suggest the majority of the birds spend the entire year (breeding, nesting, brood-rearing, and wintering) within 6 miles of the leks. As the vegetation desiccates, some birds move towards permanent water sources near nest sites. The wintering areas are northwest of the leks in Nevada. Since these birds have concentrated year-round habitat use, they are highly susceptible to stochastic events. In particular, fire is a substantial threat because of the prevalence of cheatgrass in these primary habitat areas. For this population, the local working group has prioritized maintenance of current sagebrush habitats, removing dispersed or encroaching trees to expand functional sagebrush habitats, and creating mesic brood-rearing habitats. Without long-term telemetry data on both the Nevada and Utah birds, it is not possible to determine interconnectedness, movements, or primary limiting factors.

Based on vegetation maps using regional-scale remote sensing (e.g., reGAP and LANDFIRE), approximately 72 percent of the mapped occupied habitat in the population area is covered by sagebrush, with an additional 4 percent covered by pinyon-juniper. Of the 72 percent of sagebrush, remote sensing indicates that approximately 36 percent is in mid- to late-seral classes regionally, which are usually reflective of between 10 and 30 percent sagebrush cover that provides habitat that best meets GRSG habitat guidelines. It is important to note that the modeled portion of GRSG habitat is mostly composed of habitat on the eastern end of the Great Basin in Nevada, with small portions extending into Utah, including the Ibapah population area. Modeling of the existing habitat condition trends and levels of vegetation treatments indicates that over the next 10 to 50 years, the percent of the area providing 10 to 30 percent sagebrush cover will increase to 45 percent over 10 years, and continue to increase to 54 percent at 50 years, resulting in an improving trend. Current percent disturbance in GRSG habitat in the Ibapah Population Area is 0.6 percent. There is no history of fire in GRSG habitat in this area.

The Ibapah GRSG Population Area in Utah is small but connected to GRSG in Nevada. Fragmentation (natural and anthropogenic) and the prevalence of nonnative vegetation make this population very susceptible to stochastic events. While the population is not well understood, the local working group has identified primary threats as fire in wintering habitat, corvid predation, pinyon-juniper encroachment, and localized recreational impacts. The COT report (USFWS 2013a) considers this population "at-risk."

Box Elder Population Area

Based on lek counts from 2004 to 2013, the Box Elder population is estimated to range between 1,316 and 4,652 birds (329 to 1,163 males counted on 68 leks). Because of recent research efforts, birds have also been strutting in areas that are currently not designated as leks, and new leks are identified each year. This population is one of the largest in Utah. It is in the northwest corner of the state and is part of the Northern Great Basin sub-population (Utah, Idaho, and Nevada) in WAFWA Snake River Plain MZ IV (Stiver et al. 2006). The Box Elder

populations occupy a large, diverse area (1,020,900 acres) ranging from salt desert shrub (4,250 feet elevation) to mountain shrub/aspen habitat (8,200 feet elevation). The Box Elder Population Area supports the southeastern extent of a larger population that extends beyond state boundaries into Nevada and Idaho and is primarily influenced by fire risk, especially in dry, dense juniper areas or in areas dominated by nonnatives.

The history of use in the area is diverse but centered around grazing, ranching, and agriculture. Grazing still occurs in most GRSG habitat from spring through fall. In association with grazing activities, cultivated crops, primarily hay and alfalfa, are prevalent in the valleys. Ranching communities are primarily on the north and east sides of the population area. In association with the communities, there are roads (dirt to two-lane highway), power lines, and houses, as well as railroads and pipelines. A small number of rock quarries exist within late brood-rearing GRSG habitats (Knerr 2007). Though this population is hunted, harvest rates have declined substantially in the last 10 years. In this subpopulation, fire is the primary threat, especially in relation to the amount of juniper in the area. In the Utah portion of the Box Elder Population Area, almost 100,000 acres (10 percent) have burned in the last 15 years. While consistent lek counts did not occur until recently, lek counts of the Utah portion of the population suggest the population is stable (West Box Elder Coordinated Resource Management Sage-grouse Subcommittee 2007, p. 24). Garton and others (2011) grouped this population with the larger Northern Great Basin subpopulation (includes Nevada and Idaho), and their population reconstruction suggests this larger population is in a slow decline. Based on calculating Lambda for lek counts between 1994 and 2013, years when the same leks were consistently counted, the Box Elder population is stable ($\lambda = 1.01$) (see **Map 3.3-1**).

The Box Elder GRSG Population Area is divided into three subunits, Grouse Creek, Raft River, and Pilot Mountain (Rich County Coordinated Resource Management Sage-grouse Subcommittee 2007, p. 19). This area encompasses a diversity of vegetation from low-elevation salt desert shrub and moving up in elevation through agricultural areas, sagebrush flats, grassy meadows, juniper, and finally mountain shrub/aspen habitat. The population area is naturally fragmented by the upper elevations of Grouse Creek and Raft River Mountains and juniper-dominated areas. Upper elevation habitat areas are characterized as dominantly mountain big sagebrush in a mixed mountain shrub and aspen vegetation community. Mid-elevation areas are dominated by Wyoming big sagebrush and juniper woodlands. Basin big, Wyoming big, and black sagebrush are found in the lower elevations, with localized cheatgrass presence (ranging from traces to dominant). The Pilot Mountain area has a band of Wyoming sagebrush wrapping around the base of the mountain with salt desert shrub below and pinyon-juniper above. The understory vegetation in this area has abundant invasive plant species.

Based on vegetation maps using regional-scale remote sensing (e.g., reGAP and LANDFIRE), approximately 57 percent of the mapped occupied habitat in the population area is covered by sagebrush, with an additional 19 percent covered by pinyon-juniper. Of the 57 percent of sagebrush, remote sensing indicates that approximately 55 percent is in mid- to late-seral classes, which are usually reflective of between 10 and 30 percent sagebrush cover that provides habitat that best meets GRSG habitat guidelines. Modeling of the existing habitat trends and vegetation treatment levels indicates that over the next 10 to 50 years, the percent of the area providing 10 to 30 percent sagebrush cover will increase to 61 percent over 10 years and to 70

percent at 50 years, reflecting an improving habitat trend. Current percent disturbance in GRSG habitat in the Box Elder Population Area is 0.4 percent, or 5.9 percent if fire history is included.

Based on telemetry data, birds are both nonmigratory and migratory. Birds demonstrate a variety of home ranges, with some centered in the low elevations, some centered in upper elevations, and some with movements from lower elevations to upper elevations. Birds can travel over 25 miles to seasonal habitats, including movements into Idaho (Knerr 2007). Some birds move down to agricultural fields during summer, and some are moving to upper elevation habitats. Wintering habitats are the low- to mid-elevation areas and are at a higher risk of fire than any other habitat type. In particular, the Pilot Mountain area is a low-lying, dry area that has high fire risk. Birds have been observed in the area year-round, but no leks have been identified in the area. On the edges of the area, birds have been observed in the limited agricultural fields near springs.

The Box Elder GRSG population is a large population encompassing many lek complexes and is part of a larger population that extends beyond the Utah state boundaries. While the habitat has natural and anthropogenic fragmentation, the size of the area and the varied home ranges make this population more resilient than small populations. In this dry region, some areas are particularly susceptible to fire because of nonnative invasive weed presence or juniper density. The local working group has identified the need to focus resources on conifer removal, fire prevention planning, and raven control. The COT report (USFWS 2013a) considers this population "potentially at risk."

Lucerne

Lucerne is north of the Uinta Mountains, near the Wyoming border. Lucerne has no known leks, but GRSG using the area are coming from Wyoming GRSG populations. There are approximately 37,550 acres of mapped GRSG habitat in the area ranging between 7,200 and 9,000 feet in elevation. This area is the southern part of habitat for a population that is primarily in Wyoming. Most of the birds observed in this part of Daggett County are found west of Manila, especially around Phil Pico Mountain. This area is largely privately and SITLA-owned property with a few agricultural areas. Garton and others (2011) group this population with the larger Wyoming Basin population, and their population reconstruction suggests the larger population is stable to declining. Current percent disturbance in GRSG habitat in the Lucerne Population Area is 0.5 percent. There is no history of fire in GRSG habitat in this area. Habitat trends would be the same as those noted for the Rich and Uintah Population Areas, with long-term downward trends due to annual grasses and conifer encroachment.

Wyoming – Uinta

The Uinta County, Wyoming portion of the Uinta-Wasatch-Cache National Forest is composed of approximately 22,000 acres that have been designated to be within the GRSG range and are part of the State of Wyoming's Uinta Core Area. Nearly all the suitable GRSG habitat within this area is considered brood-rearing habitat. There are 7 known historic leks within 4.5 miles of the forest's brood-rearing habitat. Of these known leks, six are considered occupied by the WGFD. All seven of the leks are on adjacent BLM-administered or private land. The lek count data are incomplete, as some leks were not counted some years or counts were incomplete, making a trend or status determination difficult. Due to the incomplete data, it is difficult to

determine the trend of these individual lek populations. It does appear, however, that there are fewer birds now than what has historically been documented. Garton and others (2011) group this population with the larger Wyoming Basin population, and their population reconstruction suggests the larger population is stable to declining.

Based on vegetation maps using regional-scale remote sensing (e.g., reGAP and LANDFIRE), approximately 7 percent of the mapped occupied habitat is covered by sagebrush. Of the 7 percent of sagebrush, remote sensing indicates that in general, approximately 80 percent is in mid- to late-seral classes, which are usually reflective of between 10 and 30 percent sagebrush cover that provides habitat that best meets GRSG habitat guidelines. Modeling of the existing habitat trends indicates that over the next 10 to 50 years, the percent of the area providing 10 to 30 percent sagebrush cover will decrease to 76 percent in 10 years, and continue to decrease to around 67 percent at 50 years due to increases in annual grasses and conifer encroachment.

Wyoming – Blacks Fork

The Flaming Gorge National Recreation Area of the Ashley National Forest currently has only one known lek location within its boundary and is part of Wyoming's Blacks Fork Core Area. However, there are several others within the drainage basin and the larger Southwest Wyoming Sage-Grouse Conservation Area. In 2006, there were 232 occupied leks and 102 unoccupied leks in the area (WGFD 2011b). Eighty-eight of the 102 unoccupied leks have been abandoned and 14 others destroyed. The management plan for this area of Wyoming cites the early pioneering GRSG work of Robert Patterson as another example of this decline. Forty-two leks were counted in that study area. In 1949, there were 3,118 males attending and in 1950, there were 3,199. This is an average of 74 and 79 males per lek, respectively. In 2003, the same study area averaged 35 males per lek and a maximum of 318 males were counted on 9 active leks. Forty of the original 42 leks are now deemed historical.

Garton and others (2011) group this population with the larger Wyoming Basin population, and their population reconstruction suggests the larger population is stable to declining. Current lek count information is consistent only since 1995, when males counted on leks reached an all-time low. Since that time, populations are thought to have recovered to levels common in the 1980 decade. The one known lek on the Ashley National Forest National Recreation Area of Wyoming has declined from 36 males counted in 2007 to 17 males in 2012 (WGFD 2011b).

Based on vegetation maps using regional-scale remote sensing (e.g., reGAP and LANDFIRE), approximately 51 percent of the mapped occupied habitat is covered by sagebrush. Of the 51 percent of sagebrush, remote sensing indicates that in general, approximately 80 percent is in mid- to late-seral classes, which are usually reflective of between 10 and 30 percent sagebrush cover that provides habitat that best meets GRSG habitat guidelines. Modeling of the existing habitat trends indicates that over the next 10 to 50 years, the percent of the area providing 10 to 30 percent sagebrush cover will decrease to 76 percent in 10 years and will continue to decrease to around 67 percent at 50 years due to increases in annual grasses and conifer encroachment.

3.3.6 Regional Context

The WAFWA used floristic characteristics to organize the diverse sagebrush habitat areas into 7 GRSG MZs within the species' distribution (Stiver et al. 2006); Utah contains portions of 4 of

the 7 zones (MZs II, III, IV, and VII) (**Table 3.3** and **Map 3.3-2**). MZs II and VII are considered together because both contain parts of the Uintah Population Area. Outside Uintah, most GRSG in MZ VII are Gunnison Sage-Grouse (*Centrocercus minimus*).

Table 3.3
Summary of GRSG Habitat in WAFWA Management Zones within the Planning Area

Surface Management Agency	WAFWA Management Zone	Acres of Mapped Occupied Habitat		Percent of Mapped Occupied Habitat in Planning Area
		Management Zone	Planning Area	
BLM	II & VII	18,033,700	721,500	4%
	III	9,509,200	1,364,500	14%
	IV	18,638,900	413,000	2%
Forest Service	II & VII	614,500	217,800	35%
	III	1,592,400	639,600	40%
	IV	2,727,300	400	<1%
Tribal and Other Federal	II & VII	2,138,600	177,200	1%
	III	289,900	195,500	67%
	IV	1,156,100	0	0%
Private	II & VII	13,628,700	817,800	6%
	III	2,221,000	1,262,200	57%
	IV	8,406,900	553,600	7%
State	II & VII	2,224,600	203,700	9%
	III	386,100	376,900	98%
	IV	1,865,600	56,000	3%
Other	II & VII	36,100	0	0%
	III	100	0	0%
	IV	94,300	0	0%

Source: Manier et al. 2013

Management Zone II (Wyoming Basin Management Zone) and VII (Colorado Plateau Management Zone)

MZ II in Utah is in the northeastern part of the state and includes the majority of the Rich Population Area as well as the northern Uintah Population Area and smaller populations on National Forest System lands stretching into Wyoming. MZ VII is in southeast Utah and includes the southern Uintah population of GRSG as well as the San Juan population of Gunnison Sage-Grouse. The two MZs are considered together because they both cover the Uintah Population Area.

Northern portions of these MZs contain stable populations of GRSG, which are abundant relative to other parts of the range (USFWS 2013a). Populations in the southern part (Colorado Plateau) are less robust and less connected (Garton et al. 2011). The major threat to GRSG in this region is energy development, primarily oil and gas (USFWS 2013a). Infrastructure development, fire, and wild horse and improper livestock grazing impacts also pose threats in this region (Manier et al. 2013).

Management Zone III (Southern Great Basin Management Zone)

This zone comprises the majority of Utah and includes the Sheeprocks, Strawberry, Ibapah, Emery, Carbon, Bald Hills, Parker Mountain, Panguitch, and Hamlin Valley GRSG populations, as well as part of the Rich population.

Overall, populations within this MZ are relatively stable (Garton et al. 2011). Federal land comprises 82 percent of sagebrush, including much of the Southern Great Basin. Sagebrush cover is naturally limited in this region due to microclimates, leading to a lack of connectivity between habitats (Knick and Hanser 2011). Energy development, including coal, poses a threat in Utah, and geothermal development may increase in the future (Manier et al. 2013).

Management Zone IV (Snake River Plain Management Zone)

MZ IV is in the northwest corner of Utah and covers the Box Elder GRSG population, as well as the Northern Great Basin and Snake River Plain populations in Idaho. The area has a long history of agricultural land use, which has left the residual sagebrush ecosystem drier than the historical conditions (Manier et al. 2013). Populations in this MZ are considered in decline and moderately vulnerable (Garton et al. 2011). Primary threats include habitat loss from wildfire, infrastructure development, and potential geothermal energy development (USFWS 2013a).

3.4 AIR QUALITY

The US Environmental Protection Agency (EPA) has the primary responsibility for regulating air quality, including seven criteria air pollutants subject to National Ambient Air Quality Standards (NAAQS). Pollutants regulated under NAAQS include carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter with a diameter less than or equal to 10 microns (PM_{10}), particulate matter with a diameter less than or equal to 2.5 microns ($PM_{2.5}$), and sulfur dioxide. Two additional pollutants, nitrogen oxides and volatile organic compounds, are regulated because they form ozone in the atmosphere. Air quality is determined by pollutant emissions and emission characteristics, atmospheric chemistry, dispersion meteorology, and terrain. Air quality related values include effects on soil and water, such as sulfur and nitrogen deposition and lake acidification, and aesthetic effects, such as visibility.

In addition to EPA federal regulations, air quality is also regulated by the Division of Air Quality within the Utah Department of Environmental Quality. This agency develops state-specific regulations and issues air quality permits for emission sources.

3.4.1 Conditions Statewide

Several areas of Utah are nonattainment for various pollutants. Salt Lake County and a portion of Tooele County are nonattainment for sulfur dioxide. Portions of Cache, Box Elder, Weber, Tooele, and Utah Counties are nonattainment for fine particulate matter ($PM_{2.5}$). All of Davis and Salt Lake Counties are nonattainment for fine particulate matter ($PM_{2.5}$). All of Salt Lake and Utah Counties are nonattainment for particulate matter (PM_{10}). Portions of central Weber County and northern Salt Lake County are maintenance areas for carbon monoxide, and Salt Lake and Davis Counties are maintenance areas for ozone (Utah Department of Environmental Quality 2013).

Three years of Air Quality Index data applicable to the planning area are displayed in **Table 3.4**. Davis County, San Juan County, Salt Lake County, and Washington County do not have mapped occupied GRSG habitat and are italicized in **Table 3.4** for this reason.

Ozone and particulate matter present the most common air quality problems in most regions of the Rocky Mountain west. Ozone can cause asthma, irritated eyes, stuffy noses, and reduced resistance to colds and other infections. It can also damage plants and trees (Utah Department of Environmental Quality 2012). Particulate matter can cause nose and throat irritation, lung damage, and bronchitis and is the main source of haze that reduces visibility (Utah Department of Environmental Quality 2012). Major sources of volatile organic compounds and nitrogen oxides in Utah are vehicle engine exhaust, emissions from industrial facilities (including oil and gas development), gasoline vapors, chemical solvents, and biogenic emissions from natural sources such as vegetative growth (Utah Department of Environmental Quality 2012). Sources of particulate matter include directly emitted PM_{10} from fugitive dust generation and wildfire, and $PM_{2.5}$ formed when gasses such as sulfur dioxide and nitrogen oxides react with other gasses in the atmosphere to form tiny particles (Utah Department of Environmental Quality 2012).

Table 3.5 displays data from air monitoring sites located in mapped occupied GRSG habitat. The two monitoring sites from Uintah County are included not only because they are located in occupied habitat, but also because these sites are within the Uinta Basin, which repeatedly exceeds ozone concentrations during winter months. The Uinta Basin in eastern Utah has reported ozone concentrations above the 75 parts per million ozone NAAQS were recorded for 2 of the 3 years displayed in **Table 3.5**. It is the current scientific consensus that the photochemical processes that form ozone are heightened by increased concentrations of nitrogen oxides and volatile organic compounds from stagnant winter atmospheric conditions and by increased solar radiation reflected off winter snow cover (Schnell et al. 2009).

The reflection of sunlight off winter snow cover also keeps the earth's surface cool, which contributes to the formation of temperature inversions. Temperature inversions occur when cold air is trapped near the ground under a layer of warmer air, limiting circulation (National Oceanic and Atmospheric Administration 2009). The accumulation of pollutants such as volatile organic compounds and nitrogen oxides, along with an increase in solar radiation due to high snow cover albedo, enable ozone formation to occur at a higher rate during the winter than during the summer (Stoeckenius et al. 2013). Inversions and the presence of snow cover substantially contribute to the high ozone concentrations seen in **Table 3.5**. Data on particulate matter are not included in **Table 3.5** because particulate matter is not monitored at the three sites listed in the table.

Based on quantitative data provided by the three monitors listed in **Table 3.5** and based on data from the Air Quality Index, it is reasonable to assume the air quality in the planning area will continue to be primarily good. It is also reasonable to assume that high winter ozone levels in the Uinta Basin will continue to be linked to snow cover. During winter months with high snow cover, high ozone levels in the Uinta Basin are likely to persist, and during months with no snow cover there are likely to be ozone levels that are consistent with the rest of the planning area.

Table 3.4
Utah Air Quality Index, 2011-2013

County	# Days with Air Quality Index	# Days Good	# Days Moderate	# Days USG[1]	# Days Unhealthy	# Days Very Unhealthy	Percent of Days Good or Moderate
				2011			
Box Elder	365	288	69	4	4	-	98%
Cache	365	251	104	5	5	-	97%
Carbon	275	219	56	-	-	-	100%
Daggett	135	131	4	-	-	-	100%
Davis	*365*	*323*	*39*	*2*	*1*	-	*99%*
Duchesne	365	285	61	14	2	3	95%
Garfield	121	120	1	-	-	-	100%
Salt Lake	*365*	*232*	*111*	*19*	*3*	-	*94%*
San Juan	*356*	*306*	*50*	-	-	-	*100%*
Tooele	365	293	68	4	-	-	99%
Uintah	365	261	80	15	5	4	93%
Utah	365	243	113	9	-	-	98%
Washington	*364*	*301*	*63*	-	-	-	*100%*
Wayne	*109*	*109*	-	-	-	-	*100%*
Weber	365	239	114	8	4	-	97%
				2012			
Box Elder	366	264	100	2	-	-	99%
Cache	366	253	110	3	-	-	99%
Carbon	364	278	84	2	-	-	99%
Daggett	191	146	45	-	-	-	100%
Davis	*366*	*324*	*42*	-	-	-	*100%*
Duchesne	366	271	92	3	-	-	99%
Garfield	366	346	20	-	-	-	100%
Salt Lake	*366*	*207*	*148*	*11*	-	-	*97%*
San Juan	*345*	*279*	*64*	*2*	-	-	*99%*
Tooele	366	296	69	1	-	-	99%
Uintah	366	224	133	8	1	-	98%
Utah	366	221	140	5	-	-	99%
Washington	*365*	*281*	*72*	*3*	-	-	*97%*

Table 3.4
Utah Air Quality Index, 2011-2013

County	# Days with Air Quality Index	# Days Good	# Days Moderate	# Days USG[1]	# Days Unhealthy	# Days Very Unhealthy	Percent of Days Good or Moderate
Wayne	120	118	2	-	-	-	100%
Weber	366	225	135	5	1	-	98%
2013							
Box Elder	365	256	89	18	2	-	95%
Cache	365	198	124	27	16	-	88%
Carbon	365	320	45	-	-	-	100%
Daggett	175	154	21	-	-	-	100%
Davis	*365*	*300*	*53*	*12*	-	-	*97%*
Duchesne	365	252	80	21	11	1	91%
Garfield	348	330	18	-	-	-	100%
Salt Lake	*365*	*223*	*97*	*36*	*9*	-	*88%*
San Juan	*350*	*320*	*30*	-	-	-	*100%*
Tooele	343	271	60	12	-	-	100%
Uintah	365	201	110	26	17	11	85%
Utah	365	219	109	21	16	-	90%
Washington	*365*	*320*	*45*	-	-	-	*100%*
Wayne	119	119	-	-	-	-	100%
Weber	365	200	127	34	4	-	90%

Source: EPA 2015a
[1] USG = Unhealthy for sensitive groups

Table 3.5
Air Quality Monitoring Values in Utah

Pollutant	Averaging Time	2011	2012	2013	3-Year Average	NAAQS	Percent of NAAQS
8600 West 24000 North Portage Monitor Site, Box Elder County							
Ozone	8-hour	0.066 ppm	0.069 ppm	0.065 ppm	0.067 ppm	0.075 ppm	89%
Monitor Site 2 Miles South of Ouray and South of the White and Green River Confluence, Uintah County							
Ozone	8-hour	0.116 ppm	0.07 ppm	0.133 ppm	0.106 ppm	0.075 ppm	141%
Nitrogen Dioxide	1-hour	31 ppb	26 ppb	46 ppb	34 ppb	100 ppb	34%
Monitor Site 2 Miles West of Redwash Atop Deadman's Bench, Uintah County							
Ozone	8-hour	0.1 ppm	0.067 ppm	0.112 ppm	0.093 ppm	0.075 ppm	124%
Nitrogen Dioxide	1-hour	34 ppb	25 ppb	46 ppb	35 ppb	100 ppb	35%

Source: EPA 2015b
*Exceptional events have been excluded
ppb: parts per billion
ppm: parts per million

3.5 CLIMATE CHANGE

Climate represents the long-term statistical characterization of daily, seasonal, and annual weather conditions such as temperature, relative humidity, precipitation, cloud cover, solar radiation, and wind speed and direction. Climate is the composite of generally prevailing weather conditions of a particular region throughout the year, averaged over a series of years. A region's climate is affected by its latitude, terrain, and altitude, as well as nearby water bodies and their currents. Climate is both a driving force and a limiting factor for biological, ecological, and hydrologic processes, as well as for resource management activities such as disturbed site reclamation, wildland fire management, drought management, rangeland and watershed management, and wildlife habitat administration. Climate also influences renewable and nonrenewable resource management, affecting the productivity and success of many management activities on BLM-administered and National Forest System lands. Incorporating effective application of climate information into BLM-administered and National Forest System lands programs, projects, activities, and decisions authorizing use of the BLM-administered and National Forest System lands is critical for effective management.

All federal agencies are mandated under Executive Order 13514 to "evaluate agency climate-change risks and vulnerabilities to manage the effects of climate change on the agency's operations and mission in both the short and long term."

In January 2009, the DOI issued Amendment 1 to Secretarial Order 3226 to provide guidance on how bureaus and offices can respond to emerging climate change issues. One of the tasks within the order requires each bureau and office within the department to consider and analyze the potential climate change impacts in planning exercises and when making decisions affecting department resources (Kempthorne 2009).

The BLM developed a climate change adaptation strategy to provide guidance on how to fulfill the mandate of the amendment. This strategy was due to the DOI in 2013. The DOI published a Climate Change Adaptation Plan in 2014. In addition to the DOI's climate adaptation priorities, which include actions like investing in research and working with communities to prepare for future climate change impacts and risks, the BLM will prioritize conducting vulnerability assessments and strengthening existing landscape level planning efforts (DOI 2014).

In 2008, the Forest Service introduced a "Strategic Framework for Responding to Climate Change" (Forest Service 2008) and in 2010, the USDA released the *USDA Strategic Plan FY 2010-2015* (USDA 2010). This latter document guides agencies to achieve Strategic Goal 2 of ensuring that national forests and private working lands are conserved, restored, and made more resilient to climate change, while enhancing our water resources. The Forest Service response to this goal includes the National Roadmap for Responding to Climate Change (Forest Service 2011) and a Performance Scorecard. The roadmap builds on the Strategic Framework and, through 2015, via the Climate Change Scorecard, the Forest Service is mandated to report annually on their activities.

USDA Regulation 1070-001 establishes a department-wide policy to integrate climate change adaptation planning and actions into USDA programs, polices, and operations. The Forest Service has established a national strategy for dealing with climate change. The strategy has two components: 1) Facilitated Adaptation, which refers to actions to adjust to and reduce the

negative impacts of climate change on ecological, economic, and social systems; and 2) Mitigation, which refers to actions to reduce emissions and enhance sinks of greenhouse gases so as to decrease inputs to climate warming in the short term and reduce the effects of climate change in the long term.

To implement this strategy, the Forest Service integrated these two components into all its programs. The Forest Service has established a Climate Change Resource Center to assist Forest Service resource managers and decision makers who need information and tools to address climate change in planning and project implementation on national forests.

3.5.1 Conditions Statewide

There are portions of six ecoregions within the planning area—the Colorado Plateau, Central Basin and Range, Northern Great Basin, Wyoming Basin, Mojave Basin and Range, and Wasatch and Uinta Mountains. Of the ecoregions in the planning area, no GRSG habitat is found in the Mojave Basin and Range ecoregion. Rapid ecoregional assessments have been completed for the two largest ecoregions in Utah, the Colorado Plateau and the Central Basin and Range. Preliminary data are available for the Northern Great Basin and Wyoming Basin. No ecoregional assessment has been prepared for the Wasatch and Uinta Mountains ecoregion. The ecoregional assessments are important because they are the primary sources for climate change assessment information related to GRSG. An ecoregion is a large landscape defined by its characteristics (BLM 2012a). Current and predicted climate change trends for the two largest ecoregions, the Colorado Plateau and Central Basin and Range, are discussed below. Climate change trends for the other ecoregions in the planning area are very similar.

Colorado Plateau Ecoregion

The Colorado Plateau ecoregion covers the southeastern half of Utah, western Colorado, northern New Mexico, and northwestern Arizona.

The climate of the Colorado Plateau varies from north to south and from low to high elevations. In the north, the climate is closely tied to that of the Great Basin; summers are hot with infrequent afternoon thunderstorms that tend to focus mostly on higher-elevation areas. In the south, peak precipitation occurs in the winter and again in the summer because of moisture from southern monsoonal weather patterns. Spring and fall are generally the driest periods. Annual precipitation amounts are less than 10 inches at the mid and lower elevations, while areas above 8,000 feet receive over 20 inches of precipitation. The few and highly scattered mountains that reach elevations near or over 11,000 feet can receive nearly 3 feet of precipitation. Temperatures also vary considerably in the ecoregion. In the southern and lower elevations, temperatures range from approximately –4 to –6 degrees Celsius (°C) in the winter to approximately 35°C in the summer. At mid and upper elevations, temperatures range from the low 60s and 70s (degrees Fahrenheit [°F]; 15 to 21°C) in the summer, to the single digits and low teens (°F; –17 to –7°C) in the winter (BLM 2011a).

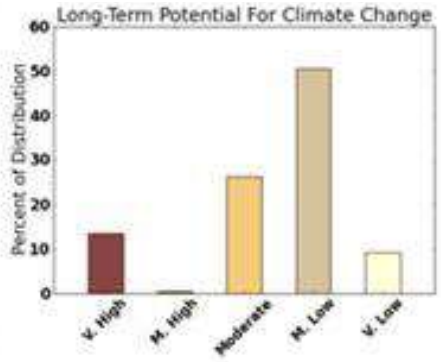
Climate change modeling predictions show that the ecoregion is expected to undergo general warming over the entire region, with the greatest warming occurring in the southern portion of the ecoregion and with average winter temperatures increasing more than average summer temperatures (Bryce et al. 2012). Climate change modeling predicts up to a 0.6°C increase (2015 to 2030) and 1°C increase (2045 to 2060) in average summer temperatures in the

northern portion of the ecoregion and up to a 0.8°C increase (2015 to 2030) and 1.2°C increase (2045 to 2060) in the southern portion of the ecoregion (Bryce et al. 2012). Climate change modeling predicts up to a 0.8°C increase (2015 to 2030) and 1.2°C increase (2045 to 2060) in average winter temperatures in the northern portion of the ecoregion and up to a 1.6°C increase (2015 to 2030) and 2°C increase (2045 to 2060) in the southern portion of the ecoregion (Bryce et al. 2012).

Precipitation is expected to decline throughout much of the year during the 2015 to 2030 time period (with the exception of a couple months in the fall), with severe drought likely to occur in some areas. The 2045 to 2060 time period remains drier (or comparable to historic conditions) during most of the year, but sporadic wetter months (e.g., February, June, and October) could result in overall increases in annual precipitation in some areas (Bryce et al. 2012).

When summarized in a histogram (**Figure 3.1**), about 85 percent of the current GRSG distribution in the Colorado Plateau ecoregion is in the moderate to very low categories. See **Map 3.5-1**.

Figure 3.1
Long-Term Potential for Climate Change



Overall, the southern portion of the ecoregion is expected to experience more extreme long-range climate change effects than the northern portion of the ecoregion, where GRSG distribution occurs. This is because the northern portion of the ecoregion is north of the influence of the summer monsoon; it may also be considered transitional to the mid- and northern latitudes, where climate change predictions may differ from those for the southwestern region (Bryce et al. 2012). Some models predict that winters in mid-latitudes will be wetter as well as warmer (Miller et al. 2011).

Central Basin and Range Ecoregion

The Central Basin and Range Ecoregion constitutes the western portion of Utah and extends through Nevada and into California and Idaho.

Rain shadow effects from the east and west create an arid climate throughout the ecoregion. The Sierra Nevada range effectively captures precipitation traveling west from the Pacific Ocean, while the Rocky Mountains intercept precipitation heading northwest from the Gulf of Mexico.

Temperatures vary drastically among high and low elevations. Average winter temperatures are 10 to 40°F, while summer temperatures are typically 50 to 90°F (BLM 2012b).

In the Central Basin and Range ecoregion, models suggest there is no strong trend toward either wetter or drier conditions either in the near future, through the 2020s, or in the long term, through the 2050s. However, models show significant increases in maximum monthly temperatures by 2020, primarily in the summer months (July, August, and September). The highest maximum temperature increase projected is 6°F (3.3°C). These increases are predicted to occur mostly in the southern and northeastern edges of the ecoregion (Comer et al. 2012). Forecasts for 2060 predict substantial increases in maximum temperature for all months. Similar to forecasts for 2020, the greatest increases are predicted during the summer months and along the southern and northeastern edges of the ecoregion (Comer et al. 2012).

Based on quantitative data that measure climate change over the past 100 years, climate change and the effects of climate change are expected to continue. Over the past 100 years, annual temperature and precipitation have increased, and climate models predict that they will continue to increase through the twenty-first century. Extreme weather events such as severe drought and intense rainfall are expected to increase in frequency in the future as well (National Conference of State Legislatures 2008).

The ecoregional climate change assessments indicate that the overall potential change in GRSG habitat in the population areas from the current status is generally moderate to moderately low in the Colorado Plateau Ecoregion (**Table 3.6**) and moderately low to moderately high in the Central Basin and Range Ecoregion (**Table 3.7**). Areas that are projected to experience the most change are located in the Central Basin and Range Ecoregion. These areas include Bald Hill, Box Elder, Hamlin Valley, and Sheeprocks Population Areas. Noticeable changes in climate (high to very high) are only expected in isolated locations distributed throughout the planning area. The potential climate change influence on Parker Mountain Population Area is less certain due to the difference in trend predictions of the Colorado Plateau and Central Basin and Range assessments.

Another important element influencing the effects of climate change in the population areas is the resiliency of the vegetative communities, which is directly related to the ecological condition of the communities providing GRSG habitat. The ecoregional assessments provide information about the vegetation condition, habitat quality, development, and fragmentation by assessing the ecological condition, or ecological intactness as termed in the Colorado Plateau Ecoregional Assessment and landscape condition classes as termed in the Central Basin and Range Ecoregional Assessment. The categories for intactness are different in the two ecoregional assessments because of differing methodologies and terminology and contractors used to complete the ecoregional assessments. However, the products provided similar and compatible outcomes.

Table 3.6
GRSG Occupied and Potential Future Climate Change (Long-Term) in the Colorado Plateau Ecoregion

Population Area	Total Acres of Mapped Occupied Habitat in Population Area	Total Acres of Mapped Occupied Habitat within Ecoregion	Potential Future Climate Change	Acres	Percent of Landscape
Carbon	497,800	397,100	Very High	36,774	9%
			Mod High	0	0%
			Moderate	249,105	63%
			Mod. Low	111,210	28%
			Very Low	0	0%
Panguitch	343,890	40,800	Very High	3,226	8%
			Mod High	4,278	10%
			Moderate	33,253	82%
			Mod. Low	34	0%
			Very Low	0	0%
Emery	96,200	96,200	Very High	16,330	17%
			Mod High	598	1%
			Moderate	37,956	39%
			Mod. Low	41,313	43%
			Very Low	0	0%
Uintah	1,557,300	1,512,300	Very High	148,763	10%
			Mod High	0	0%
			Moderate	361,835	24%
			Mod. Low	912,608	60%
			Very Low	89,090	6%
Strawberry	181,300	181,300	Very High	30,126	17%
			Mod High	0	0%
			Moderate	41,022	23%
			Mod. Low	110,336	61%
			Very Low	0	0%
Parker	792,520	204,500	Very High	19,766	10%
			Mod High	5,567	3%
			Moderate	173,844	85%
			Mod. Low	5,312	3%
			Very Low	0	0%

Source: BLM 2012a

Table 3.7
GRSG Occupied and Climate Space Trends (Long-Term) in the Central Basin and Range Ecoregion

Population Area	Total Occupied Acres in Population Area	Total Acres within Ecoregion	Climate Space Trends Intensity 2060	Acres	Percent
Bald Hills	347,930	347,972	1 - 3	0	0%
			4 - 6	103,267	30%
			7 - 9	244,705	70%
			10 - 12	0	0%
Box Elder	1,020,900	833,269	1 - 3	101,579	12%
			4 - 6	451,251	54%
			7 - 9	256,653	31%
			10 - 12	0	0%
Carbon	497,800	1,005	1 - 3	0	0%
			4 - 6	0	0%
			7 - 9	1,005	100%
			10 - 12	0	0%
Hamlin Valley	143,200	143,116	1 - 3	0	0%
			4 - 6	102,205	71%
			7 - 9	36,994	26%
			10 - 12	3,916	3%
Ibapah	85,200	85,100	1 - 3	0	0%
			4 - 6	85,100	100%
			7 - 9	0	0%
			10 - 12	0	0%
Panguitch	343,890	46,979	1 - 3	3,571	8%
			4 - 6	39,554	84%
			7 - 9	3,854	8%
			10 - 12	0	0%
Parker Mountain	792,520	14,661	1 - 3	0	0%
			4 - 6	2,656	18%
			7 - 9	10,199	70%
			10 - 12	1,806	12%
Rich	1,226,010	86,276	1 - 3	0	0%
			4 - 6	25,228	29%
			7 - 9	61,049	71%
			10 - 12	0	0%
Sheeprocks	836,280	836,656	1 - 3	0	0%
			4 - 6	201,122	24%
			7 - 9	548,357	66%
			10 - 12	87,176	10%

Source: BLM 2012b

The Colorado Plateau Ecoregional Assessment used very high to very low class categories, with the very high being the most intact. The Central Basin and Range Ecoregional Assessment used a 0.0 to 1.0 rating system, with 1.0 being the most intact. The ecoregional assessment data indicate generally that intactness is moderately high to high in more than 50 percent of mapped occupied GRSG habitat. Two exceptions are the Emery Population Area in the Colorado Plateau Ecoregion where only 34 percent of the mapped occupied habitat is in the moderately high to high range and the Ibapah Population Area in the Central Basin and Range ecoregion where 65 percent of the mapped occupied habitat is in the moderately high to high range (see **Table 3.8** and **Table 3.9**). Differences in ecological intactness statewide are displayed in **Map 3.5-2**. The differences are reflective of the current threats to GRSG habitat from a combination of climate, fire, pinyon-juniper, and invasive species, being most prominent in the Central Basin and Range Ecoregion.

Table 3.8
Mapped GRSG Occupied Habitat and Ecological Intactness in the Colorado Plateau Ecoregion

Population Area	Total Acres of Occupied Habitat in Population Area	Total Acres of Occupied Habitat in Ecoregion	Percent of Occupied Habitat in Ecoregion	Ecological Intactness	Occupied Habitat in Ecoregion by Condition Class	
					Acres	Percent
Carbon	497,800	397,100	80%	Very High	3,280	1%
				High	84,980	21%
				Mod High	127,221	32%
				Mod Low	135,266	34%
				Low	43,233	11%
				Very Low	3,111	1%
Panguitch	343,890	40,800	12%	Very High	6,786	17%
				High	9,889	24%
				Mod High	21,238	52%
				Mod Low	2,797	7%
				Low	81	0%
				Very Low	0	0%
Emery	96,200	96,200	100%	Very High	0	0%
				High	10,328	11%
				Mod High	22,016	23%
				Mod Low	59,736	62%
				Low	4,117	4%
				Very Low	0	0%
Uintah	1,557,300	1,512,300	98%	Very High	254,038	17%
				High	229,099	15%
				Mod High	420,427	28%
				Mod Low	471,802	31%
				Low	119,538	8%
				Very Low	17,391	1%

Table 3.8
Mapped GRSG Occupied Habitat and Ecological Intactness in the Colorado Plateau Ecoregion

Population Area	Total Acres of Occupied Habitat in Population Area	Total Acres of Occupied Habitat in Ecoregion	Percent of Occupied Habitat in Ecoregion	Ecological Intactness	Occupied Habitat in Ecoregion by Condition Class	
					Acres	Percent
Strawberry	181,300	181,300	100%	Very High	4,694	3%
				High	52,034	29%
				Mod High	63,306	35%
				Mod Low	61,449	34%
				Low	2	0%
				Very Low	0	0%
Parker	792,520	204,500	26%	Very High	24,872	12%
				High	76,058	37%
				Mod High	44,658	22%
				Mod Low	58,083	28%
				Low	784	0%
				Very Low	31	0%

Source: BLM 2012a

Table 3.9
Mapped GRSG Occupied Habitat and Landscape Condition Class in the Central Basin and Range Ecoregion

Population Area	Total Acres of Occupied Habitat	Total Acres of Occupied Habitat in Ecoregion	Percent of Occupied Habitat in Ecoregion	Landscape Condition Class	Occupied Habitat in Ecoregion by Condition Class	
					Acres	Percent
Bald Hills	347,930	347,930	100%	0.0–0.3	136,755	39%
				0.31–0.6	82,416	23%
				0.61–1.0	128,802	37%
Box Elder	1,020,900	842,863	84%	0.0–0.3	842,863	31%
				0.31–0.6	291,188	34%
				0.61–1.0	299,737	35%
Hamlin Valley	143,200	143,200	100%	0.0–0.3	143,116	34%
				0.31–0.6	31,626	23%
				0.61–1.0	61,426	44%
Ibapah	85,200	85,200	100%	0.0–0.3	85,101	21%
				0.31–0.6	29,033	34%
				0.61–1.0	38,176	45%
Panguitch	343,890	50,692	15%	0.0–0.3	50,980	26%
				0.31–0.6	18,174	36%
				0.61–1.0	19,723	39%
Parker	792,520	18,297	2%	0.0–0.3	18,298	26%
				0.31–0.6	5,188	28%
				0.61–1.0	8,439	46%

Table 3.9
Mapped GRSG Occupied Habitat and Landscape Condition Class in the Central Basin and Range Ecoregion

Population Area	Total Acres of Occupied Habitat	Total Acres of Occupied Habitat in Ecoregion	Percent of Occupied Habitat in Ecoregion	Landscape Condition Class	Occupied Habitat in Ecoregion by Condition Class	
					Acres	Percent
Rich	1,226,010	90,172	7%	0.0–0.3	90,173	51%
				0.31–0.6	17,245	20%
				0.61–1.0	27,494	30%
Sheeprocks	836,280	797,580	100%	0.0–0.3	836,655	33%
				0.31–0.6	194,631	24%
				0.61–1.0	367,485	44%
Carbon	497,800	1,676	0%	0.0–0.3	1,676	9%
				0.31–0.6	4	0%
				0.61–1.0	1,522	91%

Source: BLM 2012b

Under natural conditions, moderate fire return intervals and low-intensity fires promoted the mixed composition of sagebrush communities required by GRSG for lekking, nesting, and brood rearing. However, the ecological role of fire has changed significantly. In conjunction with climate change and the expansion of invasive annual species, wildfire now covers larger areas more frequently, reducing habitat quality and quantity for GRSG (Connelly and Braun 1997; Connelly et al. 2000; Nelle et al. 2000; Fischer et al. 1996). Invasive species occurrences and fire history are often linked and have been estimated to contribute to an increase in pinyon-juniper woodlands in the Intermountain West (Miller and Tausch 2002), which are avoided by GRSG. Tree establishment within sagebrush communities generally decreases forb availability due to moisture depletion (Bates et al. 2000). In Wyoming big sagebrush communities, invasion by annual grasses or weeds (e.g., cheatgrass and medusahead) is the greatest threat, because these fuels increase the fire frequency from greater than 100 years to less than 10 years (Whisenant 1990).

3.6 SOIL RESOURCES

Soil processes determine, to a large extent, the structure and function of ecosystems. Soil health is integral to mandates designed to sustain the health, diversity, and productivity of BLM-administered and National Forest System lands. In combination with climate, soil type and quality are the primary determining factors that determine whether sagebrush can exist in a given location. Soil type and quality also determine which variety of sagebrush community is able to thrive. Since the presence of GRSG is dependent upon the presence of sagebrush, and sagebrush type and viability are dependent on soil type and quality, soils are an important element in GRSG habitat.

The varied geology, topography, and climatic conditions in Utah have produced soils with unique characteristics and distributions. In general, soils of the mountains and benches are slightly acidic to neutral with thick, dark-colored surface horizons, while soils of the deserts are alkaline and lightly colored. Extensive areas of outcropping rock, drifting sand dunes, and playa lakebeds are

also characteristic of Utah. Seven of the twelve soil orders are found in Utah. Aridisols, Entisols, and Mollisols dominate, followed by Alfisols and Inceptisols. Histosols and Vertisols occur in very small tracts where parent material or moisture influences their formation (Utah State University 2009).

3.6.1 Conditions Statewide

Recent trends in the planning area include decreased soil health and integrity due to the following factors:

- Increasing average temperatures and increasing rain-to-snow precipitation ratios over the past half century (Gillies et al. 2011) are continuing to reduce soil moisture content as well as vegetation health and growth, which in turn reduces the ability of plant root systems to provide erosion control for soils;
- Winters are becoming shorter and warmer such that they can no longer kill off bark beetle infestations, which in turn causes tree death, decreased soil moisture content due to decreased shading, decreased biodiversity, and decreased production of organic matter to nourish soils;
- Decreased winter snowpack, resulting in earlier, hotter, and drier fire seasons, which in turn destroy more of Utah's forests and decrease soil health and integrity as mentioned above;
- Increase in rainfall and decrease in snowfall (Gillies et al. 2011), resulting in more soil-eroding rain events and less gradual hydration of soils through snowmelt; and
- Long-term increases in outdoor recreation, which continue to disturb and remove vegetation and to destabilize and compact soils, thereby degrading soil health and integrity.

3.6.2 Conditions in Population Areas

The discussion of existing conditions, as well as the impact analysis in **Chapter 4**, focuses on the presence of sensitive soils within each of the population areas. "Sensitive soils" are those identified as having characteristics that make them extremely susceptible to impacts or difficult to restore or reclaim after disturbance. These properties can include high wind or water erosion hazard (steep slopes), moderate to high salinity, low nutrient levels, low water holding capacity (droughty), or high water table (wetland/riparian soils). The numeric criteria used to classify soils as "sensitive" are provided below in **Table 3.10**.

The presence of sensitive soils within the specific population areas was determined by the soil order occurring within each population area, and the soil properties associated with each soil order. Soil orders were determined from NRCS State Soil Geographic Data Base data (USGS 1995). The State Soil Geographic Data Base was designed primarily for regional, multicounty, river basin, state, and multistate resource planning, management, and monitoring. State Soil Geographic data are not detailed enough to make interpretations at or below the county level. Due to the scale of these data (1:500,000) and generalization as the dataset was developed, the soils were identified by soil order and include general soil properties. Due to data scale and limitations, they should be considered an estimation of their occurrence and extent.

Table 3.10
Numeric Criteria for Sensitive Soils

Soil Property	Criteria	Restrictive Feature
Slope (percent)		Water Erosion Hazard (Steep Slopes)
Whole soil factor (Kw) < 0.20	>40	
Kw 0.20 – 0.36	>35	
Kw >0.36	>25	
Wind Erodibility Group (Surface Layer)	1, 2	Wind Erosion Hazard
Available Water Capacity (Average to 40 inches or limiting layer) (inches/inches)	<0.05	Droughty Soils
Salinity (Surface Layer) (millimhos per centimeter)	≥16	Excess Salts
Sodium Adsorption Ratio (Surface Layer)	≥13	Excess Sodium
Depth to Bedrock/Cemented Pan (inches)	<10	Rooting Depth

Source: NRCS 2012

Current management requires that any proposed activities located in sensitive soils (e.g., hydric, saline, gypsiferous, or highly wind/water erodible soils) would incorporate BMPs to minimize soil erosion and maintain soil stability and that site-specific mitigation measures to protect soil resources and maintain soil productivity would need to be determined through project-specific NEPA analyses.

Based on BLM analysis of NRCS State Soil Geographic Data Base data, **Table 3.11** provides a numerical overview of the occurrence of sensitive soils within each of the GRSG population areas.

Available data on prime farmland, unique farmland, and farmland of statewide importance is not of sufficient accuracy to add value to this discussion or to the related impact analysis. Any future site-specific projects would require an evaluation of soil types.

Table 3.11
Acres of Sensitive Soils by Population Area

Population Area	Wind Erosion	Bedrock/ Hardpan	Available Water	Water Erosion	Sodium
Bald Hills	106,358	88,105	107,153	0	44,032
Box Elder	404,061	474,637	225,055	124,719	31,906
Carbon	3,321	761,135	0	668,043	18,207
Emery	13,768	157,885	6,239	103,263	0
Hamlin Valley	54	124,806	8,234	0	0
Ibapah	30,122	22,445	54,622	0	35,134
Panguitch	69,615	250,993	144,014	49,795	0
Parker Mountain	119,901	277,414	116,074	0	8,774
Rich	0	651,058	164,388	569,964	0

Table 3.11
Acres of Sensitive Soils by Population Area

Population Area	Wind Erosion	Bedrock/ Hardpan	Available Water	Water Erosion	Sodium
Sheeprocks	239,259	302,244	248,251	9,232	318,629
Strawberry	0	252,195	0	127,406	0
Uintah	465,110	1,044,000	106,746	191,935	4,971
Wyoming - Blacks Fork	3,790	3,790	0	0	0
Wyoming – Uinta	237	47,814	34,519	0	0

Source: NRCS 2012

3.7 WATER RESOURCES

This section includes a description of existing conditions and trends for water resources within the planning area, and provides an overview of perennial streams within the population areas. Streams and water quality are the focus of this section. Wetlands (including riparian areas) are discussed in **Section 3.8**, Vegetation. Water on BLM-administered and National Forest System lands is regulated by the Clean Water Act, Safe Drinking Water Act, BLM Utah Public Land Health Standards, and other laws, regulations, and policy guidance at the federal, state, and local levels. The State of Utah and the Utah National Forests have agreed, through a 1993 Memorandum of Understanding, to use Forest Plan Standard and Guidelines and the Forest Service Handbook 2509.22, Soil and Water Conservation Practices, to meet the water quality protection elements of the Utah Nonpoint Source Management Plan.

3.7.1 Conditions Statewide

Clean and adequate supplies of water are necessary to promote healthy watersheds, provide fish and wildlife habitat, maintain drinking water sources, and allow safe recreational use of surface water.

Recent analyses by the Utah Division of Water Resources show that Utah's per capita water use continues to be among the highest in the nation. Each year Utah diverts about 5,000,000 acre-feet of water from natural sources through pipes, conduits, or canals. Of this volume, Utah consumes (depletes) approximately 4,460,000 acre-feet per year, while the remaining 2,481,000 acre-feet are returned back to the environment. Agricultural irrigation accounts for approximately 75 percent of these volumes, with municipal and industrial uses accounting for an additional 18 percent, and mining and thermoelectric power accounting for the remaining 2 percent (Maupin et al. 2014).

At less than 15 inches per year, Utah receives less precipitation than any other state except Nevada. Most of the precipitation in Utah is due to the state's mountain ranges, which force passing storm systems to rise in altitude, cool, and release their moisture onto the lands below. Precipitation varies widely according to topography, with some flat desert areas receiving as little as 3 inches per year and high-altitude areas receiving as much as 40 inches per year.

Western and northern Utah form the eastern portion of the Great Basin, a multi-state area that has no surface outflow to the ocean, while most eastern Utah drains to the Colorado River both directly and via several of its tributaries. Aside from creeks, streams, and rivers, Utah's

primary surface water bodies are the Great Salt Lake, Utah Lake, Sevier Lake, and Bear Lake, all within the Great Basin, and Lake Powell, a man-made reservoir along the Colorado River. Currently, there are 4,952 miles of perennial streams within the population areas. The number of linear miles of perennial streams per population area is shown in **Table 3.12**.

Table 3.12
Miles of Perennial Stream by Population Area

Population Area	Miles of Perennial Streams
Bald Hills	51
Box Elder	398
Carbon	612
Emery	248
Hamlin Valley	8
Ibapah	61
Panguitch	276
Parker Mountain	348
Rich	1,054
Sheeprocks	397
Strawberry	696
Uintah	723
Wyoming – Blacks Fork	0
Wyoming – Uinta	40
Lucerne	40

Source: USGS 2012a

In 2014, the Utah Department of Environmental Quality completed its latest water quality assessment. The State of Utah is required by Section 303(d) of the Clean Water Act to identify waters that are water quality impaired because of failing to meet their designated beneficial uses. Section 303(d) requires that each state develop a list of water bodies that fail to meet water quality standards and delineate stream segments and listing criteria for all streams. The Section 303(d) list of impaired waters is updated biannually, and the state is required to develop a total maximum daily load allocation for each pollutant of concern. The Utah Department of Environmental Quality assessed 14,459 stream miles and found that 22 percent are supporting beneficial uses, 24 percent have insufficient data to determine if beneficial uses are being supported, and 54 percent are impaired for at least one beneficial use as of 2014 in Utah (Utah Department of Environmental Quality 2014). The Utah Department of Environmental Quality also assessed 132 lakes (including reservoirs). Of the roughly 469,070 acres of lakes assessed, 67 percent were fully supporting and 33 percent were impaired for at least one beneficial use in Utah (Utah Department of Environmental Quality 2014). **Table 3.13** lists information for impaired streams and lakes on BLM-administered and National Forest System lands in the planning area. Stream impairment was due to a variety of causes, including pathogens, biological integrity, oxygen depletion, flow and habitat alterations, temperature changes, nutrients, toxic inorganics, metals, mineralization, and pH conditions. Lake impairment was due to a variety of causes, including oxygen depletion, high temperatures, phosphorus, polychlorinated biphenyls and mercury in fish tissue, total dissolved solids, and acidic conditions. Causes of water quality

Table 3.13
Impaired Waters in Greater Sage-Grouse Habitat in the Decision Area

Population Area	Number of Evaluation Units	Numbers of Evaluation Units with Impairment	Causes or Sources of Impairment
Bald Hills	9	2	Use Class 2B: pH; Use Class 3A: pH, Phosphorus-Total, Physical substrate habitat alteration, Water Temperature, Benthic-Macroinvertebrate Bioassessment, Dissolved Oxygen
Box Elder	28	0	N/A
Carbon	66	25	Use Class 3A: Water Temperature, Dissolved Oxygen, pH, Phosphorus (Total); Use Class 3B: Selenium; Use Class 3C: Benthic-Macroinvertebrate Bioassessments; 3D: Selenium; Use Class 4: Boron, Total Dissolved Solids, Arsenic
Emery	26	2	Use Class 3A: Benthic-Macroinvertebrate Bioassessments, pH, Water Temperature
Hamblin Valley	3	0	N/A
Ibapah	3	0	N/A
Lucerne	7	0	N/A
Panguitch	17	9	Use Class 2B: pH; Use Class 3A: pH, Phosphorus (Total), Sedimentation/Siltation, Water Temperature, Physical substrate habitat alterations, Dissolved Oxygen, Benthic-Macroinvertebrate Bioassessment; Use Class 4: Total Dissolved Solids
Parker Mountain	39	18	Use Class 3A: pH, Benthic-Macroinvertebrate Bioassessments, Phosphorus (Total), Water Temperature, Physical substrate habitat alterations, Sedimentation/Siltation, Dissolved Oxygen; Use Class 3C: Water Temperature; Use Class 4: Total Dissolved Solids
Rich County	120	26	Use Class 1C: Arsenic, Escherichia coli; Use Class 2B: pH, Escherichia coli; Use Class 3A: pH, Cadmium, Total Dissolved Solids, Zinc, Phosphorus (Total), Physical substrate habitat alterations, Sedimentation/Siltation, Benthic-Macroinvertebrate Bioassessments, Dissolved Oxygen, Water Temperature; Use Class 4: pH, Cadmium, Total Dissolved Solids
Sheeprocks	18	0	N/A
Strawberry	30	4	Use Class 3A: Dissolved Oxygen, Phosphorus (Total)
Uintah	113	25	Use Class 3A: Dissolved Oxygen, Phosphorus (Total), Water Temperature, Benthic-Macroinvertebrate Bioassessments; Use Class 3B: Selenium, Physical substrate habitat alterations; Use Class 4: Total Dissolved Solids; Use Class 4: Selenium, Total Dissolved Solids, Boron
Total	479	111	

impairment in lakes and reservoirs were identified as being from animal feedlots, crop production, livestock grazing, habitat alterations, construction activities, permitted discharges from industrial, municipal, and stormwater sources (including urban stormwater), and lesser so from channelization, sewage disposal, mine tailings, hardrock mining, industrial forestry, and recreation and tourism (Utah Department of Environmental Quality 2014). It is important to clarify, however, that not all areas with such activities resulted in water quality impairments; such impairments are generally site specific in nature and depend on the conditions of the area.

Existing management that affects water resources is generally related to surface-disturbing activities, activities that remove vegetation, and activities that reduce the quantity of water available. Vegetation removal and surface-disturbing activities generally result in additional soil erosion, which may increase sediment transport into waterways, or result in soil compaction, which reduces infiltration rates and increases run off rates, which may result in increased sediment load and pollutants in waterways. Additionally, surface-disturbing activities near riparian and wetland areas may result in increased sediment and pollutant transport into waterways due to nearness to water resources. However, mitigation measures, setbacks, stipulations, and BMPs are in place to prevent degradation of water resources within the Planning Area. The resource programs with the highest potential for surface-disturbing activities and therefore the highest potential to affect water quality are livestock grazing, mineral exploration and development, energy development lands and realty, travel and transportation, and recreation (BLM 2014a). Additionally mineral and energy development can divert water resources limiting its use elsewhere, or consume large volumes of water for construction and operation of facilities (BLM 2014a).

As discussed in **Section 3.8**, pinyon-juniper woodlands have expanded across the landscape over the last 120 years. Mature trees displace shrubs, grasses, and forbs through direct competition for resources that are important components of GRSG habitat (Manier et al. 2013). In semi-arid landscapes where water is already limited, the type and amount of woody plant cover can affect water, soil, and plant interactions by altering:

1. The distribution of vegetation and canopy cover across the landscape;
2. Increasing bare ground and soil erosion; and
3. Plant species composition or diversity and production.

These changes can result in changes to the amount of surface runoff, soil infiltration and moisture, evaporation, and transpiration, which results in changes to the amount of water going into waterways. Decreases in soil moisture content due to increases in bare ground results in decreases in stream flow and groundwater levels. In water-limited systems, such as the Planning Area, reducing woody vegetation possibly results in water-savings and increased provision water for shrub and herbaceous species production, and increased stream flow, spring flow, and groundwater levels (Stringham 2011).

Trends

Competing uses for water in an ever-drier climate may result in decreases in water quantity and quality in the planning area over the long term. As described in **Section 3.5**, Climate Change, annual average temperatures have increased and are projected to continue increasing over the

coming decades. Changes in precipitation and soil moisture will likely affect groundwater recharge rates, causing diminished spring and well discharge rates on BLM-administered and National Forest System lands. Earlier spring runoff and decreased snowpack could complicate prior appropriation systems and interstate water compacts, affecting which rights holders and irrigation operations receive water.

There has been a trend towards increasing surface water diversion and groundwater extraction in the planning area for municipal, domestic, agricultural, and industrial uses due to population growth and increased energy demands, although conservation efforts have greatly reduced per capita use and have somewhat reduced overall freshwater use as of 2005 (Utah Department of Environmental Quality 2010). Diversion and extraction of both surface and groundwater resources are expected to continue to increase to meet industry and population growth.

3.8 VEGETATION (INCLUDING NOXIOUS WEEDS AND RIPARIAN AND WETLAND ECOSYSTEMS)

Vegetation serves multiple purposes on the landscape and provides many ecosystem services, including, but not limited to, stabilizing soils, preventing erosion, absorbing carbon dioxide, releasing oxygen, increasing species diversity, and providing habitat and food for animals and products for human use. Many land management policies are directed toward maintenance of healthy vegetation communities. Vegetation can be characterized generally by ecological provinces and more specifically by plant communities for each GRSG population.

3.8.1 Conditions Statewide

GRSG habitat in Utah is primarily in the Wasatch and Uinta Mountains and Colorado Plateaus EPA Level III ecoregions (EPA 2011). The Wasatch and Uinta Mountains ecoregion includes high, precipitous mountains with narrow crests and valleys. The lowest elevations are generally grass or shrub-covered and are used by livestock. Middle elevations are composed of areas of aspen, interior chaparral, and pinyon-juniper and scrub oak. Higher elevations are covered by coniferous forests or alpine vegetation. The Colorado Plateaus ecoregion is an uplifted, eroded, and deeply dissected tableland. Common vegetation in this ecoregion includes pinyon-juniper, Gambel oak, and saltbrush-greasewood (EPA 2011). The sections below discuss general vegetation types in the planning and population areas, riparian and wetland ecosystems, invasive species and noxious weeds, and forestry and seed collection. **Map 3.8-1** displays the general vegetation types in the planning area. Vegetation descriptions are based on the Southwest Regional GAP Analysis Project (ReGAP) land cover descriptions (USGS 2005). ReGAP data represent currently observable vegetation communities; however, they may not adequately display a departure from ecological sites. The Southwest ReGAP was used, as it is considered more accurate and more appropriate for vegetation analysis compared to other land cover descriptions, such as LANDFIRE.

Sagebrush

Widely distributed in the Colorado River Basin and Great Basin, the sagebrush vegetation community is found throughout the planning area. Sagebrush communities generally occur on the drier portions of pinyon-juniper woodlands and mesic portions of the desert shrub community. Precipitation in these areas averages 8 to 15 inches per year, and soils are dry, with a thin organic horizon. Forbs with shallow root systems are favored in wetter years, whereas

deeply rooted shrubs have the competitive advantage during droughts and survive by tapping deeply infiltrated moisture. Sagebrush species include big sagebrush, Wyoming big sagebrush, and basin sagebrush. Different types of sagebrush vegetation communities are described below, and their distribution is displayed on **Map 3.8-2**.

The distribution of GRSG is closely aligned with the distribution of sagebrush-dominated landscapes (Schroeder et al. 2004, p. 364), and GRSG require large, intact, and connected expanses of sagebrush shrubland to exist (Aldridge et al. 2008, Wisdom et al. 2011). GRSG use different components of their sagebrush habitat for breeding, nesting, brood rearing, and wintering. For more details regarding GRSG and their habitat requirements, see **Section 3.1**.

Sagebrush habitat has been lost throughout Utah. There are many factors for this, including conversion of sagebrush steppe, introduction of invasive plant species like cheatgrass, wildfires, juniper encroachment, past sagebrush conversion projects, and other land uses (UDWR 2009a, p. 30).

"Climate change scenarios for the sagebrush region predict increasing trends in temperatures, increased atmospheric carbon dioxide, and increased frequency of severe weather events which may result in a decline in sagebrush communities. Changing environmental conditions may also favor invasive species (e.g., cheatgrass) expansions and result in increased fire sizes and frequencies. In addition, an estimated 12 percent of the current distribution of sagebrush is predicted to be replaced, primarily by expansion of woody vegetation (e.g., pinyon and juniper), for each one degree Celsius increase in temperature" (UDWR 2009a, p. 30). The combined interactions of invasive plant species, uncharacteristic fire events, and climate change will likely continue to change sagebrush communities (UDWR 2009a, p. 30).

Colorado Plateau Mixed Low Sagebrush Shrubland

This ecological system occurs in canyons, gravelly draws, hilltops, and dry flats at elevations generally below 6,000 feet. Soils are often rocky, shallow, and alkaline. It includes open shrublands and steppe dominated by black sagebrush (*Artemisia nova*) or flat sagebrush (*Artemisia bigelovii*) and sometimes with Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) codominant. Semi-arid grasses such as Indian ricegrass (*Achnatherum hymenoides*), purple three-awn grass (*Aristida purpurea*), blue grama (*Bouteloua gracilis*), needle-and-thread (*Hesperostipa comata*), James' galleta (*Pleuraphis jamesii*), or muttongrass (*Poa fendleriana*) are often present and may form a graminoid layer with over 25 percent cover (USGS 2005, p. 103).

Inter-Mountain Basins Big Sagebrush Shrubland

This ecological system occurs throughout much of the western US, typically in broad basins between mountain ranges, plains, and foothills between 5,000 and 7,500 feet elevation. Soils are typically deep, well drained, and nonsaline. These shrublands are dominated by basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) and/or Wyoming big sagebrush. Scattered Juniper (*Juniperus* spp.), greasewood (*Sarcobatus vermiculatus*), and atriplex (*Atriplex* spp.) may be present in some stands. Rubber rabbitbrush (*Ericameria nauseosa*), sticky-leaf rabbitbrush (*Chrysothamnus viscidiflorus*), antelope bitterbrush (*Purshia tridentata*), or mountain snowberry (*Symphoricarpos oreophilus*) may codominate disturbed stands. Perennial herbaceous components typically contribute less than 25 percent vegetative cover. Common graminoid species include Indian ricegrass, blue grama, streamside wild rye (*Elymus lanceolatus*), Idaho fescue (*Festuca idahoensis*),

needle-and-thread, Great Basin wildrye (*Leymus cinereus*), James' galleta, western wheatgrass (*Pascopyrum smithii*), curly bluegrass (*Poa secunda*), or bluebunch wheatgrass (*Pseudoroegneria spicata*) (USGS 2005, p. 111).

Inter-Mountain Basins Big Sagebrush Steppe

This matrix-forming ecological system is widespread, and soils are typically deep and nonsaline, often with a microphytic crust. This shrub-steppe is dominated by perennial grasses and forbs (over 25 percent cover) with basin big sagebrush, Wyoming big sagebrush, foothill big sagebrush (*Artemisia tridentata* ssp. *xericensis*), threetip sagebrush (*Artemisia tripartita* ssp. *tripartita*), and antelope bitterbrush dominating or codominating the open to moderately dense (10 to 40 percent cover) shrub layer. Shadscale (*Atriplex confertifolia*), sticky-leaf rabbitbrush, rubber rabbitbrush, horsebrush (*Tetradymia* spp.), or prairie sagebrush (*Artemisia frigida*) may be common especially in disturbed stands. Associated graminoids include Indian ricegrass, plains reedgrass (*Calamagrostis montanensis*), streamside wild rye (*Elymus lanceolatus* ssp. *lanceolatus*), Idaho fescue, big rough fescue (*Festuca campestris*), prairie junegrass (*Koeleria macrantha*), curly bluegrass, and bluebunch wheatgrass. Common forbs are Hood's phlox (*Phlox hoodii*), sandwort (*Arenaria* spp.), and milkvetch (*Astragalus* spp). The natural fire regime of this ecological system likely maintains a patchy distribution of shrubs, so the general aspect of the vegetation is a grassland. Shrubs may increase following heavy grazing or with fire suppression, particularly in moist portions of the northern Columbia Plateau where it forms a landscape mosaic pattern with shallow-soil scabland shrublands (USGS 2005, p. 157).

Inter-Mountain Basins Montane Sagebrush Steppe

This ecological system includes sagebrush communities occurring at montane and subalpine elevations across the western US from 3,200 to over 9,800 feet. Climate is cool, semi-arid to subhumid. This system primarily occurs on deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. In general, this system shows an affinity for mild topography, fine soils, and some source of underground moisture. It is composed primarily of mountain sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and related taxa such as spiked big sagebrush (*Artemisia tridentata* ssp. *spiciformis*). Antelope bitterbrush may codominate or even dominate some stands. Other common shrubs include snowberry, serviceberry (*Amelanchier* spp.), rubber rabbitbrush, squaw-apple (*Peraphyllum ramosissimum*), wax currant (*Ribes cereum*), and sticky-leaf rabbitbrush. Most stands have an abundant perennial herbaceous layer (over 25 percent cover), but this system also includes mountain sagebrush shrublands. Common graminoids include Arizona fescue (*Festuca arizonica*), Idaho fescue, needle-and-thread, muttongrass, slender wild rye (*Elymus trachycaulus*), mountain brome (*Bromus marginatus*), curly bluegrass, spike fescue (*Leucopoa kingii*), tufted hairgrass (*Deschampsia caespitosa*), pine reedgrass (*Calamagrostis rubescens*), and bluebunch wheatgrass. In many areas, frequent wildfires maintain an open herbaceous-rich steppe condition, although at most sites, shrub cover can be unusually high for a steppe system (over 40 percent), with the moisture providing equally high grass and forb cover (USGS 2005, p. 161).

Great Basin Xeric Mixed Sagebrush Shrubland

Great Basin Xeric Mixed Sagebrush Shrubland occurs in the Great Basin on dry flats and plains, alluvial fans, rolling hills, rocky hillslopes, saddles, and ridges at elevations between 3,300 and 8,500 feet. Sites are dry, often exposed to desiccating winds, with typically shallow, rocky,

nonsaline soils. Shrublands are dominated by black sagebrush at mid and low elevations and low sagebrush (*Artemisia arbuscula*) at higher elevations and may be codominated by Wyoming big sagebrush or sticky-leaf rabbitbrush. Other shrubs that may be present include shadscale, ephedra, rabbitbrush, spiny hop-sage (*Grayia spinosa*), Shockley's desert-thorn (*Lycium shockleyi*), bud sagebrush (*Picrothamnus desertorum*), greasewood, and horsebrush. The herbaceous layer is likely sparse and composed of perennial bunch grasses such as Indian ricegrass (*Achnatherum hymenoides*), desert needlegrass (*Achnatherum speciosum)*, Thurber's needlegrass (*Achnatherum thurberianum*), squirreltail (*Elymus elymoides*), or curly bluegrass (*Poa secunda*) (USGS 2005, p. 109).

Wyoming Basins Low Sagebrush Shrubland

This vegetation community is composed of sagebrush dwarf-shrublands that occur in a variety of dry habitats throughout the basins of central and southern Wyoming. Wyoming threetip sagebrush (*Artemisia tripartita* ssp. *rupicola*)-dominated dwarf-shrublands typically occur on wind-swept ridges and south and west aspect slopes above 7,000 feet in central and southeastern Wyoming. Substrates are shallow, fine-textured soils. Black sagebrush-dominated dwarf-shrublands occur on shallow, coarse-textured, calcareous substrates at lower elevations. Other shrubs and dwarf-shrubs present may include antelope bitterbrush and other species of sagebrush. Common graminoids include Idaho fescue, prairie junegrass, bluebunch wheatgrass, and curly bluegrass. Many forbs also occur and may dominate the herbaceous vegetation (USGS 2005, p. 145).

Pinyon-Juniper

Pinyon-juniper woodlands occupy the driest woodland sites in Utah and grow on foothills, low mountains, mesas, and plateaus ranging from 3,000 to 8,000 feet in elevation, depending on precipitation and soil conditions. The upper limits of the pinyon-juniper woodland community in Utah are 6,500 feet on north-facing slopes and 8,400 feet on south-facing slopes. Plant species present in these areas vary widely. Typically, juniper dominates at lower elevations, and pinyon dominates at higher elevations. In general, pinyon-juniper communities do not provide suitable habitat for GRSG, and further, mature trees displace shrubs, grasses, and forbs through direct competition for resources that are important components of GRSG habitat (Manier et al. 2013).

Juniper forests have expanded across the landscape over the last 120 years (Miller et al. 2008, p. 1, Rowland et al. 2008, p. 2). There are three phases of juniper succession as identified by Miller et al. (2005). In Phase I, juvenile trees are present on site, with an occasional mature, seed-producing tree present, but shrub and herbaceous vegetation still maintain dominance of ecological processes (hydraulic, nutrient, and energy cycles). As juniper saplings develop in Phase I, GRSG use declines rapidly. In Phase II, trees are established on site and contribute an equal influence on ecological processes along with shrub and herbaceous species. Trees are increased in size and density in this phase. Phase III of juniper expansion is the final stage by which trees have established dominance on the site and are the primary plant group influencing ecological processes. At this point, the shrub steppe community has been almost completely converted to woodland with greater than 75 percent of the pre-invasion shrub layer eliminated (Miller et al. 2005). The expansion of pinyon-juniper communities has been attributed to the reduced role of fire, the introduction of livestock grazing, increases in global carbon dioxide concentrations, climate change, and natural recovery from past disturbance (USFWS 2010a, p. 13938).

Pinyon-Juniper Shrubland

This ecological system is characteristic of the rocky mesatops and slopes on the Colorado Plateau, but these stunted tree shrublands may extend further upslope along the low-elevation margins of taller pinyon-juniper woodlands. Substrates are shallow/rocky and shaley soils at elevations between 4,000 to 6,500 feet. The vegetation is dominated by dwarfed (usually less than 3 meters tall) two-needle pinyon pine (*Pinus edulis*) and/or Utah Juniper (*Juniperus osteosperma*) trees forming extensive tall shrublands in the region along low-elevation margins of pinyon-juniper woodlands. Other shrubs, if present, may include black sagebrush, Wyoming sagebrush, sticky-leaf rabbitbrush, or blackbrush (*Coleogyne ramosissima*). Herbaceous layers are sparse to moderately dense and typically composed of xeric graminoids (USGS 2005, p. 105).

Pinyon-Juniper Woodland

This ecological system is typically found at lower elevations ranging from 5,000 to 8,000 feet. These woodlands occur on warm, dry sites on mountain slopes, mesas, plateaus, and ridges. Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. Soils supporting this system vary in texture ranging from stony, cobbly, gravelly sandy loams to clay loam or clay. Two-needle pinyon-pine and/or Utah juniper dominate the tree canopy. Rocky Mountain juniper (*Juniperus scopulorum*) may codominate or replace Utah juniper at higher elevations. Understory layers are variable and may be dominated by shrubs or graminoids, or may be absent. Associated species include greenleaf manzanita (*Arctostaphylos patula*), big sagebrush, littleleaf mountain-mahogany (*Cercocarpus intricatus*), Colorado birchleaf mountain-mahogany (*Cercocarpus montanus*), blackbrush, Stansbury's cliffrose (*Purshia stansburiana*), antelope bitterbrush, Gambel oak (*Quercus gambelii*), blue grama, James' galleta, or muttongrass (USGS 2005, p. 45).

Aspen

Quaking aspen (*Populus tremuloides*) is found on relatively moist sites between 7,500 and 10,500 feet in mountainous areas within the planning area. It also grows at lower elevations in riparian communities and at other sites with deep soil and adequate soil moisture. In very high exposed places, aspen becomes stunted, with the stem bent or almost prostrate from snow and wind. At its lower-elevation limit, it is a scrubby tree growing along creeks (Burns and Honkala 1990). Aspen trees grow together in clones or in groups of stems that share the same root system and genetic makeup. Quaking aspen seedlings at 1 year of age are capable of reproducing by root sprouts (suckers), and mature stands reproduce vigorously by this means. Root collar sprouts and stump sprouts are produced only occasionally by mature trees, but saplings commonly produce them (Burns and Honkala 1990). Aspen clones may regenerate readily after clearcutting or burning by producing numerous root sprouts. Root damage during logging can reduce sprouting. Clearcutting of a mixed aspen-conifer stand may lead to replacement with pure aspen stands, depending on location.

Communities of quaking aspen are deteriorating in locations throughout the western US. Comparisons of data from historical records indicate that the area occupied by aspen has declined by 60 to 90 percent or more since European settlement (Bartos and Campbell 1998, p. 17). This decline has been attributed to a reduction in fire occurrence, overbrowsing by livestock and wildlife in certain localities, and loss of habitat due to lowering of water tables

(Yuskavitch 2001). However, the importance of this community to GRSG seasonal habitat requirements is likely low. Aspen communities are not generally considered suitable habitat for GRSG (Connelly et al. 2000, pp. 970-972).

Conifer

Conifer vegetation can be further subdivided into mixed conifer and ponderosa pine vegetation communities. Mixed conifer vegetation communities within the planning area are dominated by two associations—white fir (*Abies concolor*) and Douglas fir (*Pseudotsuga menziesii*). Mixed conifer vegetation communities and associations are found within the planning area at elevations ranging from 5,000 to 8,500 feet. This mesic vegetation community generally occurs on steep, lower slopes and benches with northern aspects, and in narrow canyons and ravines. Its soils are generally deep, coarse-textured alluvium. Mixed conifer vegetation communities include upper montane/subalpine riparian forests, shrublands, and herbaceous riparian areas. These riparian areas are linear or patches confined to specific environments occurring on floodplains or terraces of rivers and streams. Shrubs found in these areas include thinleaf alder (*Alnus incana*), water birch (*Betula occidentalis*), red osier dogwood (*Cornus sericea*), coyote willow (*Salix exigua*), yellow willow (*S. lutea*), and mountain willow (*S. moniticola*) (Rondeau 2001; Welsh et al. 1993). Understory conditions vary widely from dry, open-canopy forests with grassy undergrowth on open slopes and ridges to moist, closed-canopied stands dominated by numerous herbaceous plants in the canyons and ravines.

In the white fir association, white fir is well represented in the tree canopy, with height averaging 60 to 80 feet. The subcanopy is dominated by bigtooth maple (*Acer grandidentatum*) and other species contributing 30 to 70 percent of the total subcanopy and canopy cover, which may include Douglas fir, black maple (*Acer negundo*), and Gambel oak. Subshrubs include creeping mahonia (*Mahonia repens*), mountain lover (*Paxistima myrsinites*), and mountain snowberry. The herbaceous layer may be diverse but does not contribute significant groundcover.

In the mixed conifer-Douglas fir association, Douglas fir is the dominant species in the canopy layer, represented by few to several mature trees. Mature Rocky Mountain juniper is likely to be represented in the subcanopy by young trees and seedlings. At some sites, the subcanopy is dominated by Gambel oak. The canopy and subcanopy species combined provide high foliar cover. Herbaceous cover is sparse and commonly represented by mesic forest species, starry false Solomon's seal (*Maianthemum stellatum*), Fendler's meadow rue (*Thalictrum fendleri)*, and bracken fern (*Pteridium aquilinum*) (USGS 2004).

Ponderosa pine (*Pinus ponderosa*) is the most widely distributed pine species in North America, ranging north to south from southern British Columbia to central Mexico and east to west from central Nebraska to the West Coast (Little 1971). In climax forests, ponderosa pine stands often contain many small, even-aged groups rather than a continuous uneven-aged structure. Ponderosa pine communities are usually the lowest in elevation of the coniferous forest types, and often border shrublands or pinyon-juniper woodlands. Dominant understory species include curlleaf mountain-mahogany (*Cercocarpus ledifolius*), greenleaf manzanita, black sagebrush, Gambel oak, and mountain snowberry. Ponderosa pine and mountain muhly (*Muhlenbergia microsperma*) occur mainly in central and southern Utah (Youngblood and Mauk 1985). Trends

for conifer forests in Utah have been identified as apparently stable or trend unknown (UDWR 2005b, p. 7-8). In general, conifer vegetation is not considered suitable GRSG habitat (Connelly et al. 2000, pp. 970-972).

Desert Shrub/Salt Desert Scrub

Desert shrub includes the salt shrubs—shadscale, greasewood, blackbrush, and desert grassland vegetation cover types. Located primarily on the valley floors, this vegetation community is most common on well-drained, sandy to rocky soils. It can, however, tolerate saline and alkaline soils. Plants within this community are adapted to a wide temperature range, and many are capable of photosynthesis at temperatures as low as 11°F (Simonin 2001). Precipitation in these areas ranges from 6 to 14 inches annually but is mostly from 8 to 12 inches per year. Depending on the elevation, typical desert shrub/salt desert scrub plant species include shadscale, greasewood, blackbrush, a variety of *Atriplex* species, halogeton (*Halogeton glomeratus*), Mormon tea (*Ephedra* spp.), horsebrush, creosote (*Larrea tridentata*), white bursage (*Ambrosia dumosa*), and snakeweed (*Gutierrezia sarothrae*) (UDWR 2005b, p. 7-3). Trends for desert shrub/salt desert scrub in Utah have been identified as apparently stable or trend unknown (UDWR 2005b, p. 7-8). In general, desert shrub/salt desert scrub vegetation is not considered suitable GRSG habitat (Connelly et al. 2000, pp. 970-972).

Grassland

Grassland types include native perennial grasslands, seedings of native species, exotic perennial grasses (primarily crested wheatgrass), and some cheatgrass. Trends for grasslands in Utah have been identified as apparently stable or trend unknown (UDWR 2005b, p. 7-8). In general, grassland vegetation does not provide suitable GRSG habitat unless it is within a wet meadow complex or opening in sagebrush vegetation (Connelly et al. 2000, pp. 970-972).

Mountain Shrub

There are two types of mountain shrub communities within the planning area—mountain big sagebrush and mixed mountain shrub. Their distribution depends on soil type, aspect, and elevation. Mountain big sagebrush communities extend from the upper edge of the pinyon-juniper woodlands to 10,000 feet. The soil is usually well-drained, shallow, course textured, and rocky. Mountain big sagebrush seldom exceeds 4 feet in height. On protected, north-facing slopes with sufficient soil moisture, aspen will invade, which in turn may be succeeded by shade-tolerant conifers.

Associated with mountain big sagebrush are rabbitbrush (*Chrysothamnus* ssp.), antelope bitterbrush, and snowberry. Grasses are usually abundant. Grasses, shrubs, and forbs associated with mountain big sagebrush include bluebunch wheatgrass, streamside wild rye, needle-and-thread, muttongrass, curly bluegrass (Poa secunda), sheep fescue (*Festuca ovina*), mountain low rabbitbrush (*Chrysothamunus viscidiflorus lanceolatus*), arrowleaf balsamroot (*Balsamorhiza sagittata*), and lupine (*Lupinus* spp.).

The mixed mountain shrub community is found at elevations ranging from 7,000 to 8,500 feet. It is typically found on soils with dark-colored surface horizons where roots can grow deep. This community is more diverse on protected slopes where the force of the wind is moderated. Common shrubs include true mountain mahogany, Utah serviceberry (*Amalanchier utahensis*), chokecherry (*Prunus virginiana*), snowberry, mountain big sage, squawbush (*Rhus trilobata*), wax

current (*Ribes cereum*), and Mormon tea. Common grasses and forbs include needle-and-thread, muttongrass, prairie junegrass, mountain brome, fescue grasses (*Festuca* ssp.), arrowleaf balsamroot, scarlet gilia (*Gilia aggregata*), and lupines. Trends for mountain shrub communities in Utah have been identified as apparently stable or trend unknown (UDWR 2005b, p. 7-8). In general, mountain shrub vegetation is not considered suitable habitat for GRSG (Connelly et al. 2000, pp. 970-972).

Nonvegetated/Other

Nonvegetated lands consist of a variety of areas with less than 30 percent vegetation cover. Examples of these types of areas include lava outcrops, canyon cliffs, sand dunes, barren areas, playas, badlands, washes, alpine areas, tundra, and canyon and tablelands. Trends for nonvegetated habitats in Utah have been identified as apparently stable or trend unknown (UDWR 2005b, p. 7-8). In general, the nonvegetated communities are not considered suitable GRSG habitat (Connelly et al. 2000, pp. 970-972).

Water/Riparian/Wetland

Wetlands are defined by federal policy as areas inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and which under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include marshes, shallow swamps, lakeshores, bogs, wet meadows, estuaries, and riparian areas. Riparian areas are a form of wetland transition between permanently saturated wetlands and upland areas. These areas exhibit vegetation or physical characteristics reflective of permanent surface or underground water influence. Lands along, adjacent to, or contiguous with perennially and intermittently flowing rivers and streams, and on shores of lakes and reservoirs with stable water levels, are typical riparian areas. Excluded are such sites as ephemeral streams or washes that do not exhibit the presence of vegetation dependent upon free water in the soil. GRSG use riparian and wetland areas for late brood-rearing habitat (Connelly et al. 2000, p. 980).

Riparian-wetland areas comprise less than 1 percent of the BLM-administered and National Forest System lands in Utah. However, these small but unique areas are among the most important, productive, and diverse ecosystems in the state. Riparian areas in the planning area include both lowland and mountain riparian areas. Lowland riparian areas are generally found at elevations lower than 5,500 feet, with Fremont cottonwood (*Populus fremontii*), salt cedar (*Tamarix pentandra*), netleaf hackberry (*Celtis reticulata*), velvet ash (*Fraxinus velutina*), desert willow (*Chilopsis linearis*), other willow (*Salix* spp.), and squawbush (*Rhus trilobata*) (UDWR 2005b, p. 7-1). Mountain riparian areas are generally found at elevations higher than 5,500 feet, with willow, narrowleaf cottonwood (*Populus angustifolia*), thinleaf alder (*Alnus tenuifolia*), water birch (*Betula occidentalis*), black hawthorn (*Crataegus douglasii*), rocky mountain maple (*Acer glabrum*), red-osier dogwood (*Cornus stolonifera*), and wild rose (*Rosa woodsii*) (UDWR 2005b).

Wetlands in the planning area are primarily adjacent to riparian zones and reservoirs but also occur as isolated seeps and springs and around constructed water impoundments. Low-elevation marsh and wetland areas below 5,500 feet elevation are typically composed of cattail (*Typha latifolia*), bullrush (*Scirpus* spp.), and sedge (*Carex* spp.) (UDWR 2005b, p. 7-1). Principle species in wet meadows include sedges, rushes, reedgrass (*Calamagrostis* spp.), timothy (*Phleum*

spp.), alpine (*Poa* spp.), hairgrass (*Deschampsia cespitosa*), willowherb (*Epilobium* spp.), cinquefoil (*Potentilla* spp.), and saxifrage (*Saxifraga* spp.). Primary associated woody species include willow, honeysuckle (*Lonicera* spp.), and water birch (UDWR 2005b, p. 7-2).

In the past, many riparian/wetland areas were degraded by uncontrolled uses and have resulted in riparian areas that (1) have inadequate vegetation to protect streambanks from erosion; (2) lack appropriate diverse vegetation that provides habitat for riparian-dependent wildlife species; (3) contain incised channels that do not allow streams to dissipate flood energy and provide water storage; and (4) provide inadequate pools and shade for aquatic species.

The Riparian-Wetland Initiative for the 1990s (BLM 1991) establishes goals and objectives for managing riparian-wetland resources on BLM-administered and National Forest System lands and includes a strategy to focus management on entire watersheds. The BLM Utah Riparian Management Policy (IM UT-2005-091) is tiered to this overall national strategy with objectives to "identify, maintain, restore, and/or improve riparian values to achieve a healthy and productive ecological condition…in order to provide watershed protection while still preserving quality riparian dependent aquatic and terrestrial species habitats and, as appropriate, allow for reasonable resource uses." The BLM Utah Public Land Health Standards also contain ecologically based riparian standards that must be met, or toward which riparian conditions must be progressing. The ecological condition of riparian-wetland areas is determined using proper functioning condition assessments. Proper functioning condition assessments provide a consistent approach for considering hydrology, vegetation, and erosion/deposition (soils) attributes and processes to assess the condition of riparian-wetland areas (DOI 1998, DOI 1999). A proper functioning condition assessment is a qualitative assessment based on quantitative science to determine how well a riparian-wetland area's physical processes are functioning. Proper functioning condition is a state of resiliency that allows an area to produce desired values, such as fish habitat, neotropical bird habitat, or forage, over time. Riparian-wetland areas that are not functioning properly cannot sustain these values.

On National Forest System lands, direction is provided in Executive Order 11990, Protection of Wetlands. This order requires the Forest Service to take action to minimize destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. In addition, Executive Order 11988, Floodplain Management requires the Forest Service to provide leadership and to take action to (1) minimize adverse impacts associated with occupancy and modification of floodplains and reduce risks of flood loss; (2) minimize impacts of floods on human safety, health, and welfare; and (3) restore and preserve the natural and beneficial values served by flood plains. In compliance with this order, the Forest Service requires an analysis be completed to determine the significance of proposed actions in terms of impacts on floodplains. The State of Utah and the Utah National Forests have agreed, through a 1993 Memorandum of Understanding, to use Forest Plan Standard and Guidelines and the Forest Service Handbook 2509.22, Soil and Water Conservation Practices (SWCPs), to meet the water quality protection elements of the Utah Nonpoint Source Management Plan. Overall, compliance with the described standards and guides should allow for acceptable riparian and wetland conditions.

The Riparian Management Program annually reports riparian and wetland area conditions in the BLM's Public Land Statistics. In 2013, the BLM Utah reported that of the lotic (flowing waters) riparian areas 61 percent were in proper functioning condition, 32 percent were functioning at risk, 6 percent nonfunctioning and 1 percent unknown (BLM 2014b, p. 48). In 2013, the BLM Utah reported that of the lentic (nonflowing) wetland areas, 46 percent were in proper functioning condition, 25 percent were functioning at risk, 9 percent nonfunctioning and 20 percent unknown (BLM 2014b, p. 49). For National Forest System lands, riparian trends have generally been improving when compared with historical use. More detailed information regarding acreages/miles and causal factors are not available on a sub-regional or population area basis. Water quality is discussed in **Section 3.7** and **Table 3.13** presents information regarding impaired streams and lakes in the planning area.

Agriculture

Agricultural land within the planning area is an aggregation of areas with grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops.

Western rangelands were converted to agricultural lands on a large scale beginning with the series of Homestead Acts in the 1800s, especially where suitable deep soil terrain and water were available. It has been estimated that 10 percent of sagebrush steppe that existed prior to Euroamerican settlement has been converted to agriculture (USFWS 2010a, p. 13924). Trends for agricultural lands in Utah have been identified as possibly decreasing (UDWR 2005b, p. 7-8). Cropland may provide breeding and brood-rearing habitat for GRSG (Connelly et al. 2000, p. 973 and 970), though they generally avoid landscapes dominated by agriculture (USFWS 2010a, 13925).

Developed/Disturbed

Developed or disturbed areas generally represent places where native vegetation has been removed and replaced with facilities, buildings, or other human developments. In some instances, areas are revegetated with native or ornamental vegetation, but in other areas, invasive weeds may dominate. Developed/disturbed acreage only includes areas that satellite imagery identified has being sufficiently large to dominate the pixel sizes. Smaller areas of development and/or disturbance occur in various areas that are not indicated in the vegetation data. Trends for developed sites in Utah have been identified as definitely increasing (UDWR 2005b, p. 7-8). Developed and disturbed areas do not provide suitable habitat for GRSG (USFWS 2010a, p. 13927).

Invasives

These sites are dominated by nonnative, invasive species, including noxious weeds. Invasive species include plants able to establish on a site where they were not present in the original plant composition, and are of particular concern following a disturbance. Invasive species aggressively outcompete native species within a community and often alter the physical and biotic components enough to affect the entire ecological community. They are often exotic species that do not have naturally occurring, local predators. Noxious weeds are a subset of invasive species; the Utah Noxious Weed Act defines a noxious weed as any plant that is determined by the Commissioner of Agriculture to be especially injurious to public health, crops, livestock, land, or other property.

There are 27 species that have been designated as state noxious weeds (**Table 3.14**). In addition, the BLM Utah has designated several other invasive plants as new and invasive weeds. These plants, although not listed by the state, are identified based on their potential to invade and possibly alter plant communities in the sub-region (**Table 3.14**). For National Forest System lands, Forest-level decisions for treatments generally tie to the state-defined list of noxious weeds. The Forest Service may also consider the Federal Noxious Weeds list managed by the USDA Animal Health and Plant Inspection Service and the North American Noxious Weeds or Undesirable Plan List managed by the North American Invasive Species Association. The Forest Service controls noxious weeds on all disturbed areas as per direction in the Forest Service Handbook (2080.5), the 1999 Executive Order on Invasive Species, the Forest Service's 2000 Guide to Noxious Weeds Prevention Practices, and the January 2000 Dixie National Forest Environmental Assessment for Noxious Weed Management.

It should be noted that a species' absence from the list above does not mean that the species is not considered in management decisions. For example, although large areas of uplands and rangelands are being converted to invasive annual species, including cheatgrass (*Bromus tectorum*) and Russian thistle (*Salsola tragus*), neither species is included in any of the above lists. Once cheatgrass has established on a site and gone through a couple of cycles of seed production and dispersal, the seed bank can contain 2 or 3 times as many viable cheatgrass seeds as there are established plants in the community (Zouhar 2003). Cheatgrass invasion may be accelerated by disturbance, including, but not limited to, wildland fire. Disturbance is not, however, required for establishment. Cheatgrass can also thrive in areas that have little or no history of cultivation or grazing by domestic livestock. It may establish in these relatively undisturbed areas when seed disperses from nearby patches and establishes on sites of small natural disturbances, such as where rodents or predators dig in the soil (Zouhar 2003).

The establishment of cheatgrass in a wildland community fosters more frequent fire return intervals by extending the time during which the community is susceptible to wildland fire ignitions. In the summer, cheatgrass dries out 4 to 6 weeks earlier than perennial grasses and forms a fine-textured, highly flammable fuel. After cheatgrass dominates a site, the fire regime is altered to more frequent stand-replacing fires. Shortened natural and historical fire rotations affect perennial vegetation by killing the tops of the plants and allowing less time and fewer growing seasons between recurrent fires.

An evaluation of cheatgrass intensity and frequency looked at cheatgrass-affected landscapes within mapped occupied habitat from 2000 to 2013. The study area consisted of SGMAs, which account for approximately 72 percent of mapped occupied habitat. The evaluation used remote sensing to find areas with continuous early spring green-up and early summer die-off in order to identify areas where cheatgrass is present and may be a problem. Generally, timing and duration of cheatgrass green-up depends on temperature and precipitation. Cheatgrass is highly adaptive, either germinating after fall precipitation and/or in the spring, but intensity in any year depends on the timing and levels of local temperature and precipitation. The dates when cheatgrass generally completes its life cycle within a year were used to calculate annual cheatgrass intensity (Gifford et al. 2014). The frequency of high intensity cheatgrass was observed for the years 2011 to 2013 (**Table 3.15**). The evaluation indicated that 7 percent of mapped occupied habitat had

Table 3.14
Utah Noxious Weeds and BLM New and Invading Weeds

Common Name	Scientific Name	Weed Status	
		Utah Noxious	BLM New and Invading
Black henbane	*Hyoscyamus niger*	x	x
Diffuse knapweed	*Centaurea diffusa*	x	
Johnsongrass	*Sorghum halpense*	x	
Leafy spurge	*Euphorbia esula*	x	
Medusahead	*Taeniatherum caput-medusae*	x	
Oxeye daisy	*Chrysanthemum leucanthemum*	x	
Purple loosestrife	*Lythrum salicaria*	x	
St. Johnswort	*Hypericum perforatum*	x	x
Spotted knapweed	*Centaurea maculosa*	x	
Sulfur cinquefoil	*Potentilla recta*	x	
Yellow starthistle	*Centaurea solstitialis*	x	
Purple starthistle	*Centaurea calcitrapa*		x
Yellow toadflax	*Linaria vulgaris*	x	
Bermudagrass	*Cynodon dactylon*	x	
Dalmation toadflax	*Linaria genistifolia*	x	x
Dyer's woad	*Isatis tinctoria*	x	
Hoary cress	*Cardaria draba*	x	
Musk thistle	*Carduus nutans*	x	
Perennial pepperweed	*Lepidium latifolium*	x	
Poison hemlock	*Conium maculatum*	x	x
Russian knapweed	*Centaurea repens*	x	
Squarrose knapweed	*Centaurea virgate*	x	
Scotch thistle	*Onopordum acanthium*	x	
Canada thistle	*Cirsium arvense*	x	
Field bindweed	*Convolvulus arvensis*	x	
Houndstongue	*Cynoglossum officinale*	x	
Quackgrass	*Elytrigia repens*	x	
Camel thorn	*Alhagi camelorum*		x
Goatsrue	*Galega officinalis*		x
Joined goatgrass	*Aegilops cylindrical*		x
Silverleaf nightshade	*Solanum elaeagnifolium*		x
Skeletonweed	*Chondrilla junceato*		x
Velvetleaf	*Abutilon theophrasti*		x
Water hemlock	*Cicuta douglasii*		x
Wild proso millet	*Panicum miliaceum*		x
Yellow nutsedge	*Cyperus esculentus*		x
Yellow toadflax	*Linaria vulgaris*		x
Saltcedar	*Tamarix ramosissima*	x	

Source: BLM 2012c

Table 3.15
High Intensity Cheatgrass Frequency in Mapped Occupied Habitat

	Percent of Mapped Occupied Habitat				
	0/3 years	**1/3 years**	**2/3 years**	**3/3 years**	**Outside Study Area**
Bald Hills	69.3%	19.4%	9.8%	0.1%	1.5%
Box Elder	85.2%	11.3%	2.6%	0.1%	0.8%
Carbon	40.8%	0.8%	0.0%	0.0%	58.4%
Emery	87.9%	0.1%	0.0%	0.0%	11.9%
Hamlin Valley	85.2%	14.6%	0.1%	0.0%	0.0%
Ibapah	66.0%	18.2%	2.8%	0.2%	12.7%
Lucerne	0.0%	0.0%	0.0%	0.0%	100.0%
Panguitch	99.2%	0.7%	0.0%	0.0%	0.1%
Parker Mountain	95.5%	0.4%	0.0%	0.0%	4.1%
Rich	79.0%	3.0%	0.2%	0.0%	17.9%
Sheeprocks	42.4%	13.8%	5.5%	0.7%	37.5%
Strawberry	87.8%	0.3%	0.0%	0.0%	11.9%
Uintah	33.9%	0.9%	0.0%	0.0%	65.2%
Total	**65.3%**	**5.5%**	**1.5%**	**0.1%**	**27.5%**

Source: BLM 2015, based on data from Gifford et al. 2014

high intensity cheatgrass in 1 or more of those years while the western population areas of Bald Hills, Box Elder, Hamlin Valley, Ibapah, and Sheeprocks had high intensity growth for 1 or more years in at least 14 percent of their occupied habitat. Only Bald Hills and Sheeprocks had 2 or more years of high intensity growth in 5 percent or more of their occupied habitat. Additionally, some portions of the study area adjacent to mapped occupied habitat were also analyzed and had similar high intensity growth. These areas represent potential areas of cheatgrass prevalence that could contribute to increased frequency and potential expansion of cheatgrass into GRSG habitats.

The BLM and Forest Service work cooperatively with other federal, state, and county agencies as well as private landowners to prevent and control the spread of noxious weeds. Due to weed treatments over the past 25 years, many of the noxious weed infestations are small and localized. Trends in increasing recreational and commercial activities, as well as ongoing natural events such as wildfires and climate change, will maintain the potential to introduce and increase areas affected by invasive weeds. However, following wildfire, the BLM and Forest Service revegetate burned areas through Emergency Stabilization and Rehabilitation efforts to ensure that soil site stability, hydrologic function, and the integrity of the biotic community are provided for. Additionally, federal, state, and county governments expend great effort and financial investment in efforts to identify and treat weed infestations. It is anticipated that while new infestations are possible, through the efforts identified above the introduction and spread of invasive and noxious weeds will be minimized.

Changing climate in combination with changing land uses and increased global commerce may be assisting plant invasions (Bradley et al. 2010, p. 314). For example, increasing atmospheric carbon dioxide concentrations appear to favor invasive annual grasses and yellow starthistle at the expense of native species (Bradley et al. 2010, p. 314; Dukes et al. 2011, p. 1887). Interactions between increasing atmospheric carbon dioxide and changing temperature and precipitation regimes are complex and may favor some invasive species while disfavoring others (Bradley et al. 2010, p. 310). The effects of climate change, including changing atmospheric carbon dioxide concentrations remain largely unknown for most invasive species as well as for most herbaceous native species.

3.8.2 Conditions in Population Areas

The three most common vegetation communities in the planning area are desert shrub/salt desert scrub (11,689,200 acres, 21 percent of the planning area), pinyon-juniper (10,930,600 acres, 20 percent of the planning area), and sagebrush (10,099,300 acres, 18 percent of the planning area). Within mapped occupied habitat, the three most common vegetation communities are reversed, reflecting the habitat preferences of the GRSG, with 4,095,900 acres of sagebrush (56 percent of mapped occupied habitat), 1,289,200 acres of pinyon-juniper (17 percent of mapped occupied habitat), and 398,500 acres of desert shrub/salt desert scrub (5 percent of mapped occupied habitat). Inter-Mountain Basins Montane Sagebrush Steppe is the sagebrush community with the largest acreage within the planning area (2,000,900 acres, 20 percent of all sagebrush within the planning area).

Uintah

The Uintah Population Area is composed of a variety of vegetation types (**Table 3.16**). Of these, the three most common vegetation communities within the population area and within mapped occupied habitat in the population area are sagebrush (41 percent of the population area), pinyon-juniper (30 percent of the population area), and desert shrub/salt desert scrub (6 percent of the population area). Inter-Mountain Basins Big Sagebrush Shrubland is the sagebrush community with the largest acreage within the population area and within mapped occupied habitat in the population area (54 percent of all sagebrush within the population area).

In the Uintah Population Area, vegetation distribution, abundance, and complexity are generally organized in overlapping belts because of gradations in elevation and precipitation. The lowest elevations are composed primarily of desert shrub/salt desert shrub intermingled with agriculture and development (e.g., minerals and power lines). Big sagebrush dominates the lower benches, and moving upslope it transitions with sagebrush steppe/shrublands. As elevation increases, the sagebrush steppe/shrubland transitions to a woodland belt composed of dense/dominant communities of pinyon-juniper. That transition zone is composed of interspersed sagebrush and juniper trees, with a general tendency for juniper trees to encroach downward into the upper reaches of the sagebrush communities, and in some cases crowding out and replacing the sagebrush.

Positioned above the woodland belt is the montane zone, composed of mountain shrub/ montane sagebrush steppe, sparsely distributed quaking aspen that generally occupies the northern exposures, and pockets of conifers composed of Douglas-fir/spruce further upslope. Little of the area, if any, is high enough to support a sub-alpine meadow belt.

Table 3.16
Vegetation Types in the Uintah Population Area

Vegetation Type	Acres within the Population Area	Acres within Mapped Occupied Habitat
Sagebrush	977,500	815,700
Colorado Plateau Mixed Low Sagebrush Shrubland	116,000	88,800
Great Basin Xeric Mixed Sagebrush Shrubland	0	0
Inter-Mountain Basins Big Sagebrush Shrubland	527,500	433,900
Inter-Mountain Basins Big Sagebrush Steppe	0	0
Inter-Mountain Basins Montane Sagebrush Steppe	333,000	292,100
Wyoming Basins Low Sagebrush Shrubland	1,000	900
Pinyon-Juniper	707,900	337,100
Pinyon-Juniper Shrubland	246,900	149,900
Pinyon-Juniper Woodland	461,000	187,200
Agriculture	121,400	94,400
Aspen	49,000	26,700
Conifer	103,300	27,600
Desert Shrub/Salt Desert Scrub	149,100	106,400
Developed/Disturbance	11,800	8,700
Grassland	9,600	7,600
Invasives	22,200	15,400
Mountain Shrub	73,900	53,900
Nonvegetated/Other	78,600	43,500
Water/Riparian/Wet Meadow	54,400	20,300

Source: USGS 2006a

The topographic diversity of this population area also creates areas where the standard gradation explained above is modified, resulting in pockets of vegetation adapted to the site-specific conditions. Scattered plateaus rising from the valley floor are composed of vegetation suitable to the given elevation and precipitation zones, including irregular patches of sagebrush interspersed with juniper, aspen, or other conifer.

Geographic variability within the Uintah Population Area, such as slope, aspect, size, elevation, and juxtaposition of GRSG habitat components across seven distinct topographic areas (South Slope, Diamond Mountain, Halfway Hollow, Deadman's Bench, Blue Mountain, East Bench, and Book Cliffs), account for variations in the values of vegetation for GRSG. Deadman's Bench and the lower elevations of the East Bench, South Slope, and Halfway Hollow are mostly composed of the lower-elevation vegetation such as big sagebrush and transitions between big sagebrush and desert shrub communities. The Diamond Mountain and Blue Mountain areas, as well as the upper elevations of the South Slope and Halfway Hollow, are more represented by sagebrush

steppe/shrubland, with large areas interspersed with and in some areas dominated by pinyon-juniper woodlands. The Book Cliffs area and the southern portions of the East Bench area are characterized by a topographically diverse landscape with plateaus broken up by canyons with resulting variations in vegetation types. Vegetation communities in these areas are diverse, and they change based on the varied conditions of the landscape, resulting in irregular patches of multiple vegetation communities of varying size and distribution.

Carbon

The Carbon Population Area is composed of a variety of vegetation types (**Table 3.17**). Of these, the three most common vegetation communities within the population area and within mapped occupied GRSG habitat in the population area are sagebrush (31 percent of the population area), pinyon-juniper (26 percent of the population area), and aspen (13 percent of the population area). Inter-Mountain Basins Montane Sagebrush Steppe is the sagebrush community with the largest acreage within the population area and within mapped occupied habitat in the population area (66 percent of all sagebrush within the population area).

The Carbon Population Area is formed by six individual geographical units (Tavaputs, Anthro, Emma Park, Schofield, Gordon Creek, and Sanpete) that provide habitat for the Carbon Population Area. Each individual unit supports vegetation based upon the elevation, aspect, and precipitation.

The valley floors are dominated by basin big sagebrush communities that have persisted through the continual expansion of dense pinyon-juniper woodlands that occupy 26 percent of the total population area.

Consistent with each of the six units, Colorado Plateau mixed low sagebrush shrubland grows across the slopes that rise from the valley floors, forming a narrow band across the benches. Throughout the majority of the units, basin montane sagebrush steppe dominates above the low sagebrush shrub land, as well as at the higher-elevation northern aspects. Grasslands, although scattered, occur intermixed within the sagebrush steppe. Along the western and eastern aspects, basin big sagebrush shrubland has dominated.

Unique to the Carbon Population Area, along the higher elevations there are healthy stands of basin montane sagebrush steppe, growing directly below and interspersed with healthy stands of aspen and mixed conifers. Approximately 13 percent of all vegetation is composed of aspen. The largest stands of aspen/conifer occupy the high elevations of the Emma Park, Tavaputs, and Sanpete units.

Some developed disturbance in the forested areas around Schofield Reservoir and along Soldiers Summit account for nonvegetated, invasive species, and open areas. Agricultural lands primarily occur within the lowland areas of the Sanpete Unit.

Emery

The Emery Population Area is composed of a variety of vegetation types (**Table 3.18**). Of these, the three most common vegetation communities within the population area and within mapped occupied habitat in the population area are sagebrush (36 percent of the population

Table 3.17
Vegetation Types in the Carbon Population Area

Vegetation Type	Acres within the Population Area	Acres within Mapped Occupied Habitat
Sagebrush	355,700	225,200
Colorado Plateau Mixed Low Sagebrush Shrubland	48,000	23,500
Great Basin Xeric Mixed Sagebrush Shrubland	0	0
Inter-Mountain Basins Big Sagebrush Shrubland	72,200	48,500
Inter-Mountain Basins Big Sagebrush Steppe	0	0
Inter-Mountain Basins Montane Sagebrush Steppe	235,500	153,200
Wyoming Basins Low Sagebrush Shrubland	0	0
Pinyon-Juniper	304,400	104,800
Pinyon-Juniper Shrubland	36,000	7,100
Pinyon-Juniper Woodland	268,400	97,700
Agriculture	29,000	23,100
Aspen	149,100	53,200
Conifer	111,400	21,000
Desert Shrub/Salt Desert Scrub	16,700	9,900
Developed/Disturbance	5,800	3,900
Grassland	15,700	7,700
Invasives	1,900	1,300
Mountain Shrub	93,500	27,400
Nonvegetated/Other	59,700	13,100
Water/Riparian/Wet Meadow	12,100	7,200

Source: USGS 2006a

area), pinyon-juniper (19 percent of the population area), and aspen (14 percent of the population area). Inter-Mountain Basins Montane Sagebrush Steppe is the sagebrush community with the largest acreage within the population area and within mapped occupied habitat in the population area (94 percent of all sagebrush within the population area).

The Emery Population Area is a long narrow geographic formation with the placement of vegetation consistent with elevation. Minimal acreage of the population area is composed of agriculture, grasslands, and water/riparian/wet meadow, primarily scattered across the base of the eastern side of the population area.

Across the lower elevations, a narrow band of desert shrub/salt desert scrub runs parallel to the steep nonvegetated slopes/cliff faces, with dense pinyon-juniper (19 percent of the entire vegetation type) and patches of basin big sagebrush shrubland forming across the toe-slope of the steep slopes/cliff faces.

Table 3.18
Vegetation Types in the Emery Population Area

Vegetation Type	Acres within the Population Area	Acres within Mapped Occupied Habitat
Sagebrush	122,500	56,200
Colorado Plateau Mixed Low Sagebrush Shrubland	200	0
Great Basin Xeric Mixed Sagebrush Shrubland	0	0
Inter-Mountain Basins Big Sagebrush Shrubland	7,000	300
Inter-Mountain Basins Big Sagebrush Steppe	0	0
Inter-Mountain Basins Montane Sagebrush Steppe	115,300	55,900
Wyoming Basins Low Sagebrush Shrubland	0	0
Pinyon-Juniper	64,500	14,200
Pinyon-Juniper Shrubland	6,800	0
Pinyon-Juniper Woodland	57,700	14,200
Agriculture	1,500	200
Aspen	49,500	11,400
Conifer	46,500	6,300
Desert Shrub/Salt Desert Scrub	8,300	0
Developed/Disturbance	800	400
Grassland	3,300	1,100
Invasives	0	0
Mountain Shrub	19,400	4,100
Nonvegetated/Other	22,800	1,300
Water/Riparian/Wet Meadow	4,500	1,000

Source: USGS 2006a

Above the steep slopes/cliff faces, a large community of mountain shrub and basin montane sagebrush steppe (94 percent of all sagebrush species in the Emery Population Area) occupies the middle to upper to elevations and the majority of the southern end of the population area.

The mountain shrub/montane sagebrush steppe community transitions into a dense aspen community (14 percent of the population area) that rises upslope into a mixed stand of aspen/conifer. The aspen/conifer stand occupies the highest elevations of the population area. Conifer species are abundant, accounting for approximately 10 percent of the species within population area.

Parker Mountain

The Parker Mountain Population Area is composed of a variety of vegetation types (**Table 3.19**). Of these, the three most common vegetation communities within the population area and within mapped occupied habitat in the population area are sagebrush (54 percent of the population area), pinyon-juniper (17 percent of the population area), and conifer (11 percent of

the population area). Inter-Mountain Basins Montane Sagebrush Steppe is the sagebrush community with the largest acreage within the population area and within mapped occupied habitat in the population area (75 percent of all sagebrush within the population area).

Table 3.19
Vegetation Types in the Parker Mountain Population Area

Vegetation Type	Acres within the Population Area	Acres within Mapped Occupied Habitat
Sagebrush	616,000	528,700
Colorado Plateau Mixed Low Sagebrush Shrubland	800	600
Great Basin Xeric Mixed Sagebrush Shrubland	0	0
Inter-Mountain Basins Big Sagebrush Shrubland	153,700	130,800
Inter-Mountain Basins Big Sagebrush Steppe	0	0
Inter-Mountain Basins Montane Sagebrush Steppe	461,500	397,300
Wyoming Basins Low Sagebrush Shrubland	0	0
Pinyon-Juniper	196,300	87,000
Pinyon-Juniper Shrubland	1,500	0
Pinyon-Juniper Woodland	194,800	87,000
Agriculture	36,100	31,600
Aspen	86,200	46,600
Conifer	120,200	58,700
Desert Shrub/Salt Desert Scrub	5,100	3,800
Developed/Disturbance	5,700	3,000
Grassland	4,250	4,020
Invasives	0	0
Mountain Shrub	17,600	3,600
Nonvegetated/Other	31,900	15,300
Water/Riparian/Wet Meadow	17,600	10,200

Source: USGS 2006a

In the Parker Mountain Population Area, vegetation distribution and complexity is generally organized consistent to elevation, valleys, and plateaus.

The extreme southern end of the Parker Mountain Population Area is composed of valley bottoms and adjoining side slopes. Bottomland is primarily water/riparian/wet meadow, while the side slopes are basin montane sagebrush steppe, fringed by mountain shrub at the highest points.

A mixing point of vegetation, landform, and elevation occurs at and around Otter Creek Reservoir. Water/riparian/wet meadow form at the lowest elevations and desert scrub gives rise to basin big sagebrush shrubland, bordered by basin montane sagebrush steppe. Bands of pinyon-juniper exist between the basin montane sagebrush steppe and the higher elevations,

where mountain shrub, aspen, and stringers of conifers exist, primarily on the higher benches of the Mount Dutton and Monroe Mountains, within the Parker Mountain Population Area.

Agriculture consumes a large portion of the lower elevations of Grass Valley along the extreme western edges of the population area. However, water/riparian/wet meadow exists in the lowest valley elevations. Basin big sagebrush shrubland forms along the western edge of the valley, heavily dissected by stringers of pinyon-juniper. The extreme northern end of Grass Valley is primarily basin big sagebrush steppe intermingled with mountain shrub.

The center area, and largest component of the Parker Mountain Population Area, is primarily basin montane sagebrush steppe. Small pockets of riparian and wet meadow are scattered throughout. At the extreme southern end of the plateau, extending midway along the length of the extreme eastern edge of the plateau, aspen exists in a band with an understory of mountain shrub. In this same area, conifer exists in pockets along the north-facing ridges.

A large pocket of agriculture exists in the middle area along the eastern boundary of the population area. This is low elevation with water present. This area is surrounded by a band of desert shrub that gives rise to basin big sagebrush shrubland.

The extreme northeast portion of the population area is formed by a generally east-facing slope that is composed of basin montane sagebrush steppe, giving rise at the upper elevations to aspen and conifer communities that extend downward from the Fishlake National Forest.

Panguitch

The Panguitch Population Area is composed of a variety of vegetation types (**Table 3.20**). Of these, the three most common vegetation communities within the population area and within mapped occupied habitat in the population area are pinyon-juniper (42 percent of the population area), sagebrush (34 percent of the population area), and conifer (9 percent of the population area). Inter-Mountain Basins Big Sagebrush Shrubland is the sagebrush community with the largest acreage within the population area and within mapped occupied habitat in the population area (54 percent of all sagebrush within the population area).

In the Panguitch Population Area, vegetation distribution is generally organized consistent with elevation. A long valley forms the southern one-third of the population area and the entire eastern perimeter of the population area. That eastern perimeter rises in elevation to the west, transitioning into the foothills that give rise to aspen-conifer stands. The population area generally turns from the valley area into the sagebrush valleys and rolling hills that form the extreme northern end of the population area.

The valleys are composed of water/riparian/wet meadow that supports agriculture. Vegetation transitions to desert shrub in and around the townsite of Panguitch, where Colorado Plateau mixed low sagebrush shrubland dominates. This shrubland is replaced by basin big sagebrush shrubland in the higher foothills.

Table 3.20
Vegetation Types in the Panguitch Population Area

Vegetation Type	Acres within the Population Area	Acres within Mapped Occupied Habitat
Sagebrush	239,600	175,500
Colorado Plateau Mixed Low Sagebrush Shrubland	14,700	14,400
Great Basin Xeric Mixed Sagebrush Shrubland	0	0
Inter-Mountain Basins Big Sagebrush Shrubland	128,600	94,600
Inter-Mountain Basins Big Sagebrush Steppe	0	0
Inter-Mountain Basins Montane Sagebrush Steppe	96,300	66,500
Wyoming Basins Low Sagebrush Shrubland	0	0
Pinyon-Juniper	292,400	110,490
Pinyon-Juniper Shrubland	1,200	90
Pinyon-Juniper Woodland	291,200	110,400
Agriculture	21,300	17,600
Aspen	14,700	2,900
Conifer	66,200	13,500
Desert Shrub/Salt Desert Scrub	6,600	4,900
Developed/Disturbance	4,600	1,500
Grassland	1,500	800
Invasives	0	0
Mountain Shrub	37,900	12,800
Nonvegetated/Other	14,900	2,600
Water/Riparian/Wet Meadow	3,600	1,300

Source: USGS 2006a

Along the western edge of the population area, and surrounding the Southern Valley area, dense communities of pinyon-juniper dominate the landscape. Higher upslope, aspen and dense communities of conifer are dominant. Basin big sagebrush shrubland exists within the pinyon-juniper as possible.

The extreme northern end of the Panguitch Population Area is composed of dense pinyon-juniper basins that support basin montane sagebrush steppe in the bottoms and valley stringers.

This area also supports populations of mountain shrub at the higher elevations. Once again, aspen and conifer exist along the higher ridge tops.

In total, 42 percent of all vegetation is pinyon-juniper, 34 percent are sagebrush species, and 9 percent are conifers.

Bald Hills

The Bald Hills Population Area is composed of a variety of vegetation types (**Table 3.21**). Of these, the three most common vegetation communities within the population area and within mapped occupied habitat in the population area are sagebrush (47 percent of the population area), pinyon-juniper (34 percent of the population area), and desert shrub/salt desert scrub (12 percent of the population area). Inter-Mountain Basins Big Sagebrush Shrubland is the sagebrush community with the largest acreage within the population area and within mapped occupied habitat in the population area (93 percent of all sagebrush within the population area).

Table 3.21
Vegetation Types in the Bald Hills Population Area

Vegetation Type	Acres within the Population Area	Acres within Mapped Occupied Habitat
Sagebrush	262,900	197,800
Colorado Plateau Mixed Low Sagebrush Shrubland	5,400	4,700
Great Basin Xeric Mixed Sagebrush Shrubland	3,500	2,300
Inter-Mountain Basins Big Sagebrush Shrubland	244,600	182,600
Inter-Mountain Basins Big Sagebrush Steppe	9,400	0
Inter-Mountain Basins Montane Sagebrush Steppe	0	8,200
Wyoming Basins Low Sagebrush Shrubland	0	0
Pinyon-Juniper	187,400	82,300
Pinyon-Juniper Shrubland	0	0
Pinyon-Juniper Woodland	187,400	82,300
Agriculture	18,000	9,100
Aspen	0	0
Conifer	510	130
Desert Shrub/Salt Desert Scrub	65,900	45,900
Developed/Disturbance	3,600	1,600
Grassland	2,900	2,600
Invasives	5,400	4,000
Mountain Shrub	4,300	1,300
Nonvegetated/Other	4,500	2,200
Water/Riparian/Wet Meadow	2,300	1,000

Source: USGS 2006a

Vegetation in the population area is distributed along elevational gradients that run in a general south to north pattern.

The lowest elevations, along the southern extremities of the population area, are composed primarily of desert shrub/salt desert shrub. Intermingled with, and existing across the majority of the desert shrub/salt desert shrub community, are dense stands of invasive cheatgrass.

Basin big sagebrush communities, 47 percent of the population area, extend across the lower benches and move upslope in transition with scattered populations of pinyon-juniper. Large "islands" of pinyon-juniper exist atop the higher elevations, forming dense canopies across the eastern and northern portions of the Bald Hills Population Area. Pinyon–juniper occupies 34 percent of the population area.

Agriculture and developed disturbance occurs at the lowest elevations; however, it is minimal.

Hamlin Valley

The Hamlin Valley Population Area is composed of a variety of vegetation types (**Table 3.22**).

Table 3.22
Vegetation Types in the Hamlin Valley Population Area

Vegetation Type	Acres within the Population Area	Acres within Mapped Occupied Habitat
Sagebrush	140,300	99,400
Colorado Plateau Mixed Low Sagebrush Shrubland	0	0
Great Basin Xeric Mixed Sagebrush Shrubland	15,700	6,700
Inter-Mountain Basins Big Sagebrush Shrubland	114,900	86,100
Inter-Mountain Basins Big Sagebrush Steppe	0	0
Inter-Mountain Basins Montane Sagebrush Steppe	9,700	6,600
Wyoming Basins Low Sagebrush Shrubland	0	0
Pinyon-Juniper	213,400	30,700
Pinyon-Juniper Shrubland	0	0
Pinyon-Juniper Woodland	213,400	30,700
Agriculture	0	0
Aspen	320	300
Conifer	750	600
Desert Shrub/Salt Desert Scrub	3,400	2,100
Developed/Disturbance	0	0
Grassland	3,100	2,400
Invasives	3,300	2,800
Mountain Shrub	6,300	4,800
Nonvegetated/Other	100	0
Water/Riparian/Wet Meadow	130	100

Source: USGS 2006a

Of these, the three most common vegetation communities within the population area and within mapped occupied habitat in the population area are pinyon-juniper (58 percent of the population area), sagebrush (38 percent of the population area), and mountain shrub (2 percent of the population area). Inter-Mountain Basins Big Sagebrush Shrubland is the sagebrush community with the largest acreage within the population area and within mapped occupied

habitat in the population area (82 percent of all sagebrush within the population area). The Hamlin Valley Population Area is best characterized as a dense "block" of pinyon-juniper, transected by two large (north-south) stringers of basin big sagebrush in the lower valleys. The stringers extend nearly the entire length of the population area. Sagebrush accounts for 41 percent of the population area. The lowest elevations of the eastern-most sagebrush stringer support a narrow band of Great Basin Xeric Mixed Sagebrush Shrubland, reflective of low moisture and shallow soils. Nestled within the dense pinyon-juniper community is a centrally located island of montane sagebrush steppe occupying the ridge top running between the two large stringers of basin big sagebrush. The extreme south end of the western-most big sagebrush stringer is heavily infested with invasive annual grasses, the result of previously disturbed (fire) vegetation. Small remnant populations of basin big sagebrush are scattered throughout the dense "block" of pinyon juniper.

Sheeprocks

The Sheeprocks Population Area is composed of a variety of vegetation types (**Table 3.23**). Of these, the three most common vegetation communities within the population area and within mapped occupied habitat in the population area are sagebrush (41 percent of the population area), pinyon-juniper (33 percent of the population area), and desert shrub/salt desert scrub (9 percent of the population area). Inter-Mountain Basins Big Sagebrush Shrubland is the sagebrush community with the largest acreage within the population area and within mapped occupied habitat in the population area (77 percent of all sagebrush within the population area).

The Sheeprocks Population Area can be characterized as a large (over 900,000 acres) crescent-shaped polygon.

The higher elevations of the population area include pockets of aspen/conifer stands on the northern exposures. Inter-Mountain Basins Montane Sagebrush Steppe surrounds the higher elevations in dense canopies and move downward, interfacing with Inter-Mountain Basins Big Sagebrush Shrubland that occupies nearly 35 percent of the total area of the Sheeprocks.

Pinyon-juniper woodland (approximately 35 percent of all vegetation in the area) forms a large dense "skirt" around the mountains and extends upslope from the lower elevations, directly above the desert shrub/salt desert scrub into the mid elevations. At the higher elevations, pinyon-juniper is restricted to opportunistic stringers that have invaded the Inter-Mountain Basins Big Sagebrush Shrubland. Pockets of residual basin sagebrush are found scattered throughout the pinyon-juniper woodland.

In the past 20 years, much of the land in the south and southwest portions of the population area, at the lowest elevations (south of Weis Highway and south of Highway 132 in Juab County) has been burned and reseeded with fire-tolerant grasses. Many of the burned areas may also contain invasive annual grasses in areas once occupied by desert shrub.

On the extreme northern tip of the population area, approximately 2 percent of the vegetation has been replaced through disturbances and developments.

Table 3.23
Vegetation Types in the Sheeprocks Population Area

Vegetation Type	Acres within the Population Area	Acres within Mapped Occupied Habitat
Sagebrush	399,700	360,800
Colorado Plateau Mixed Low Sagebrush Shrubland	0	0
Great Basin Xeric Mixed Sagebrush Shrubland	14,300	11,900
Inter-Mountain Basins Big Sagebrush Shrubland	307,900	287,000
Inter-Mountain Basins Big Sagebrush Steppe	0	0
Inter-Mountain Basins Montane Sagebrush Steppe	77,500	61,900
Wyoming Basins Low Sagebrush Shrubland	0	0
Pinyon-Juniper	321,400	246,400
Pinyon-Juniper Shrubland	0	0
Pinyon-Juniper Woodland	321,400	246,400
Agriculture	28,200	26,300
Aspen	1,080	880
Conifer	2,600	1,800
Desert Shrub/Salt Desert Scrub	91,000	81,000
Developed/Disturbance	21,800	21,600
Grassland	14,800	11,400
Invasives	80,700	70,000
Mountain Shrub	10,800	9,700
Nonvegetated/Other	2,100	1,800
Water/Riparian/Wet Meadow	4,700	4,600

Source: USGS 2006a

Ibapah

The Ibapah Population Area is composed of a variety of vegetation types (**Table 3.24**). Of these, the three most common vegetation communities within the population area and within mapped occupied habitat in the population area are sagebrush (65 percent of the population area), desert shrub/salt desert scrub (14 percent of the population area), and pinyon-juniper (12 percent of the population area). Inter-Mountain Basins Big Sagebrush Shrubland is the sagebrush community with the largest acreage within the population area and within mapped occupied habitat in the population area (57 percent of all sagebrush within the population area).

The Ibapah Population Area is a rectangular polygon characterized by bands or elevational gradations of plant communities. A narrow (north/south) band of grasslands, riparian/wet meadow, occupies the lower elevations along the entire Ibapah population area. Agricultural lands account for a small portion of those grasslands.

Table 3.24
Vegetation Types in the Ibapah Population Area

Vegetation Type	Acres within the Population Area	Acres within Mapped Occupied Habitat
Sagebrush	73,500	61,700
Colorado Plateau Mixed Low Sagebrush Shrubland	0	0
Great Basin Xeric Mixed Sagebrush Shrubland	18,100	16,800
Inter-Mountain Basins Big Sagebrush Shrubland	41,900	40,800
Inter-Mountain Basins Big Sagebrush Steppe	400	400
Inter-Mountain Basins Montane Sagebrush Steppe	13,100	3,700
Wyoming Basins Low Sagebrush Shrubland	0	0
Pinyon-Juniper	13,200	3,100
Pinyon-Juniper Shrubland	0	0
Pinyon-Juniper Woodland	13,200	3,100
Agriculture	570	570
Aspen	750	0
Conifer	1,400	0
Desert Shrub/Salt Desert Scrub	16,000	15,900
Developed/Disturbance	0	0
Grassland	2,200	2,000
Invasives	280	280
Mountain Shrub	1,400	0
Nonvegetated/Other	400	150
Water/Riparian/Wet Meadow	2,600	1,500

Source: USGS 2006a

Directly above the riparian/wet meadow grasslands, and below the basin xeric mixed sagebrush shrubland, is a healthy band of desert shrub/salt desert scrub that extends the entire width of the Ibapah.

The most dominant plant community, located upslope from the desert shrub/salt desert scrub, is the basin big sagebrush shrubland that accounts for 65 percent of all vegetation in the population area. This community forms a wide band across the entire population area. Thin bands of big sagebrush steppe and montane sagebrush steppe exist across the highest elevations of the population area.

Dense communities of pinyon-juniper exist at the higher elevations outside of the Ibapah Population Area, although scattered stringers/patches of pinyon-juniper move downslope from these dense communities into all three big sagebrush communities. Pinyon-juniper accounts for 12 percent of all vegetation in the population area.

Box Elder

The Box Elder Population Area is composed of a variety of vegetation types (**Table 3.25**). Of these, the three most common vegetation communities within the population area and within mapped occupied habitat in the population area are sagebrush (46 percent of the population area), desert shrub/salt desert scrub (23 percent of the population area), and pinyon-juniper (14 percent of the population area). Inter-Mountain Basins Big Sagebrush Shrubland is the sagebrush community with the largest acreage within the population area and within mapped occupied habitat in the population area (55 percent of all sagebrush within the population area).

Table 3.25
Vegetation Types in the Box Elder Population Area

Vegetation Type	Acres within the Population Area	Acres within Mapped Occupied Habitat
Sagebrush	669,100	580,000
Colorado Plateau Mixed Low Sagebrush Shrubland	0	0
Great Basin Xeric Mixed Sagebrush Shrubland	151,100	127,800
Inter-Mountain Basins Big Sagebrush Shrubland	367,700	302,300
Inter-Mountain Basins Big Sagebrush Steppe	6,100	6,100
Inter-Mountain Basins Montane Sagebrush Steppe	144,200	143,800
Wyoming Basins Low Sagebrush Shrubland	0	0
Pinyon-Juniper	206,100	198,900
Pinyon-Juniper Shrubland	0	0
Pinyon-Juniper Woodland	206,100	198,900
Agriculture	67,500	28,800
Aspen	4,200	4,200
Conifer	2,000	2,000
Desert Shrub/Salt Desert Scrub	330,100	109,200
Developed/Disturbance	1,340	900
Grassland	49,400	28,900
Invasives	60,400	27,900
Mountain Shrub	18,200	12,700
Nonvegetated/Other	22,400	17,200
Water/Riparian/Wet Meadow	11,600	10,200

Source: USGS 2006a

Lower elevations of the population area (characterized by a gradient running northeast to southwest) are dominated by large communities of desert shrub/salt desert scrub. The desert shrub moves upslope across the south facing slopes and up the valley bottoms. The salt desert scrub extends southward into the nonvegetated lakebed of ancient Lake Bonneville.

Large valley bottoms, lying between north-south hilly ranges north of the desert shrub/salt desert scrub and in the northeast corner of the population area have been converted to agricultural production, pastures, and hayfields. The same valley bottoms support water/riparian/ wet meadow habitat. Invasive plant species, primarily the result of surface-disturbing activities (e.g., fire, vehicles, agriculture, and grazing), are abundant in the extreme northeastern portions of the population area.

The Box Elder Population Area is composed largely (46 percent) of sagebrush. Basin xeric mixed sagebrush shrubland merges with the desert shrub at the lower elevations. Across the mid-elevations and widespread throughout the area is the basin big sagebrush shrubland that accounts for nearly 55 percent of all sagebrush. The higher elevations are characterized by montane sagebrush steppe with basin big sagebrush steppe in the elevations directly below.

Pinyon-juniper occupies the higher ridge tops and scatters downslope into the sagebrush communities. Pinyon-juniper is the dominant plant species in the extreme southwestern part of the population area, although it is a relatively small component of the entire population area. Overall, pinyon-juniper accounts for nearly 14 percent of the vegetation in the population area. Small pockets of aspen and conifer communities exist in the higher elevations, primarily along the northern exposures.

Rich

The Rich Population Area is composed of a variety of vegetation types (**Table 3.26**). Of these, the three most common vegetation communities within the population area are sagebrush (54 percent of the population area), mountain shrub (12 percent of the population area), and aspen (11 percent of the population area). The most common vegetation communities within mapped occupied habitat in the population area are slightly different, with sagebrush, agriculture, and mountain shrub covering the greatest acreage. Inter-Mountain Basins Montane Sagebrush Steppe is the sagebrush community with the largest acreage within the population area and within mapped occupied habitat in the population area (82 percent of all sagebrush within the population area).

The Rich Population Area is a large watershed sloping towards a broad valley bottom. As such, the arrangement of vegetation occurs in zones from the higher ridges to the valley floor.

Across the high elevations on the west of the valley, dense aspen-conifer communities interspersed with mountain shrub communities extend north-south along the highest ridgelines. The aspen and mountain shrub component continues downslope in a generally easterly direction across the upper elevations, forming a lush vegetative community that comprises 23 percent of vegetation in the population area.

The aspen/mountain shrub community transitions below into the basin montane sagebrush steppe community that exists as a very prominent vegetative component across the mid-slope elevations of the population area. The basin montane sagebrush steppe comprises 79 percent of all sagebrush within the population area. The extent of the community can be visualized where 54 percent of the total vegetation within the population area is composed of sagebrush.

Table 3.26
Vegetation Types in the Rich Population Area

Vegetation Type	Acres within the Population Area	Acres within Mapped Occupied Habitat
Sagebrush	941,000	768,200
Colorado Plateau Mixed Low Sagebrush Shrubland	0	0
Great Basin Xeric Mixed Sagebrush Shrubland	0	0
Inter-Mountain Basins Big Sagebrush Shrubland	52,800	49,300
Inter-Mountain Basins Big Sagebrush Steppe	114,800	110,900
Inter-Mountain Basins Montane Sagebrush Steppe	773,400	608,000
Wyoming Basins Low Sagebrush Shrubland	0	0
Pinyon-Juniper	39,200	30,910
Pinyon-Juniper Shrubland	200	110
Pinyon-Juniper Woodland	39,000	30,800
Agriculture	151,300	127,600
Aspen	185,300	72,000
Conifer	71,700	17,400
Desert Shrub/Salt Desert Scrub	0	0
Developed/Disturbance	40,500	32,200
Grassland	31,300	28,000
Invasives	14,700	11,500
Mountain Shrub	203,100	103,500
Nonvegetated/Other	6,590	3,300
Water/Riparian/Wet Meadow	49,000	31,400

Source: USGS 2006a

Located below and somewhat interspersed with the montane sagebrush steppe is the basin big sagebrush steppe community. It occupies a narrow band at lower elevations across valley slopes on the east and west sides of the valley, giving way to the basin big sagebrush shrubland that occupies the drier sights on both sides of the valley. These two communities are interspersed with scattered stands of pinyon-juniper trees that form closed canopies, crowding out the sagebrush where they have established, primarily in the drainage bottoms, north side-slopes, and extensively on the east side of the valley. Pinyon-juniper is a minor vegetative component across the Rich Population Area; however, it is problematic where it does occur.

Extensive areas of agricultural development are adjacent to the sagebrush shrublands. The agricultural lands are composed primarily of irrigated fields of alfalfa, hay, and grass meadows. The population area is unique in that it is composed of approximately 10 percent agricultural lands.

Located within the valley bottoms are water/riparian/wet meadow areas that support aquatic vegetative species that have established along the Bear River that drains to the north across the valley floor. This community occupies approximately 2 percent of the total vegetation of the population area.

Strawberry

The Strawberry Population Area is composed of a variety of vegetation types (**Table 3.27**). Of these, the three most common vegetation communities within the population area and within mapped occupied habitat in the population area are sagebrush (43 percent of the population area), aspen (19 percent of the population area), and pinyon-juniper (12 percent of the population area). Inter-Mountain Basins Montane Sagebrush Steppe is the sagebrush community with the largest acreage within the population area and within mapped occupied habitat in the population area (79 percent of all sagebrush within the population area).

This population area is distinctly composed of a high-elevation basin surrounded by high ridge tops, while to the east, a lower-elevation mixed sagebrush/pinyon-juniper community exists.

The valley floor of the high-elevation basin is composed primarily of water/riparian/wet meadow that occupies approximately 8 percent of the total area, including Strawberry Reservoir situated in the bottom of the valley. The basin montane sagebrush steppe (79 percent of the sagebrush community in the population area) occupies the remainder of the valley floors and moves upslope into a large (19 percent of all vegetation in the population area) community of aspen. A mixed conifer/aspen community exists along the highest ridges and extending downslope into the northern aspects.

The eastern portion of the Strawberry Population Area is composed of north-south drainages that rise from the southern boundary of the population area. These drainages support healthy populations of mountain shrub that extend into and along the high, south-facing ridge tops where aspen dominates.

At the lower elevations of the eastern portion of the population area, nonvegetated/disturbed and agricultural areas exist where summer cabins and small farm plots have been established. Rising back to the north is a large mixed stand of basin big sagebrush shrubland and pinyon-juniper that occupies approximately 12 percent of the Strawberry Population Area.

Wyoming – Uinta

The Wyoming-Uinta Population Area is composed of a variety of vegetation types (**Table 3.28**). Of these, the three most common vegetation communities within the population area are conifer (76 percent of the population area), aspen (12 percent of the population area), and sagebrush (5 percent of the population area). Inter-Mountain Basins Montane Sagebrush Steppe is the only sagebrush community within the population area and within mapped occupied habitat in the population area, representing 100 percent of all sagebrush within the population area.

The Wyoming-Uinta Population Area is primarily an extension of the Uinta Mountains (North Slope) into Wyoming. It is composed of higher-elevation vegetation, almost entirely a conifer community (76 percent of the population area) that drains gradually to the north. At the lower elevations, aspen coexist with the conifer and comprise 12 percent of the population area.

Table 3.27
Vegetation Types in the Strawberry Population Area

Vegetation Type	Acres within the Population Area	Acres within Mapped Occupied Habitat
Sagebrush	152,700	107,200
Colorado Plateau Mixed Low Sagebrush Shrubland	100	0
Great Basin Xeric Mixed Sagebrush Shrubland	0	0
Inter-Mountain Basins Big Sagebrush Shrubland	31,900	28,200
Inter-Mountain Basins Big Sagebrush Steppe	100	0
Inter-Mountain Basins Montane Sagebrush Steppe	120,600	79,000
Wyoming Basins Low Sagebrush Shrubland	0	0
Pinyon-Juniper	44,600	26,100
Pinyon-Juniper Shrubland	4,300	1,800
Pinyon-Juniper Woodland	40,300	24,300
Agriculture	6,600	5,400
Aspen	69,300	17,100
Conifer	19,200	3,200
Desert Shrub/Salt Desert Scrub	150	100
Developed/Disturbance	1,900	1,500
Grassland	750	200
Invasives	0	0
Mountain Shrub	23,400	9,500
Nonvegetated/Other	5,200	1,300
Water/Riparian/Wet Meadow	33,300	9,700

Source: USGS 2006a

Transitioning from aspen to sagebrush is a small component of basin montane sagebrush steppe, accounting for all sagebrush in the population area, yet it accounts for only 5 percent of all vegetation. Mountain shrub and water/riparian/wet meadow exist in isolated pockets across the sagebrush steppe community.

Wyoming – Blacks Fork

The Wyoming-Blacks Fork Population Area is composed of a variety of vegetation types (**Table 3.29**). Of these, the three most common vegetation communities within the population area and within mapped occupied habitat in the population area are sagebrush (51 percent of the population area), desert shrub/salt desert scrub (29 percent of the population area), and nonvegetated/other (13 percent of the population area). Inter-Mountain Basins Big Sagebrush Shrubland is the sagebrush community with the largest acreage within the population area and within mapped occupied habitat in the population area (76 percent of all sagebrush within the population area).

Table 3.28
Vegetation Types in the Wyoming-Uinta Population Area

Vegetation Type	Acres within the Population Area	Acres within Mapped Occupied Habitat
Sagebrush	1,900	1,500
Colorado Plateau Mixed Low Sagebrush Shrubland	0	0
Great Basin Xeric Mixed Sagebrush Shrubland	0	0
Inter-Mountain Basins Big Sagebrush Shrubland	0	0
Inter-Mountain Basins Big Sagebrush Steppe	0	0
Inter-Mountain Basins Montane Sagebrush Steppe	1,900	1,500
Wyoming Basins Low Sagebrush Shrubland	0	0
Pinyon-Juniper	0	0
Pinyon-Juniper Shrubland	0	0
Pinyon-Juniper Woodland	0	0
Agriculture	0	0
Aspen	4,400	2,800
Conifer	28,400	16,200
Desert Shrub/Salt Desert Scrub	0	0
Developed/Disturbance	180	90
Grassland	70	50
Invasives	0	0
Mountain Shrub	940	560
Nonvegetated/Other	10	10
Water/Riparian/Wet Meadow	1,700	790

Source: USGS 2006a

The Wyoming-Blacks Fork is primarily wide canyon bottoms occupied by Flaming Gorge Reservoir. Steep side slopes and narrow canyons form along the southern two-thirds of the Reservoir, while the northern one-third is flat lands that constitute the upper end of the reservoir.

Vegetation along the southern end is primarily composed of pockets of basin big sagebrush shrubland and scattered pinyon-juniper trees that rise above the rocky cliffs/shores of Flaming Gorge.

The upper end of the reservoir is primarily flat desert shrub/salt desert scrub that gradually drains towards the shores of the reservoir and may be inundated during high water years.

Water/riparian/wet meadow is located around the reservoir and constitutes a small portion of the total population area.

Table 3.29
Vegetation Types in the Wyoming–Blacks Fork Population Area

Vegetation Type	Acres within the Population Area	Acres within Mapped Occupied Habitat
Sagebrush	27,810	27,810
Colorado Plateau Mixed Low Sagebrush Shrubland	0	0
Great Basin Xeric Mixed Sagebrush Shrubland	0	0
Inter-Mountain Basins Big Sagebrush Shrubland	21,000	21,000
Inter-Mountain Basins Big Sagebrush Steppe	6,800	6,800
Inter-Mountain Basins Montane Sagebrush Steppe	10	10
Wyoming Basins Low Sagebrush Shrubland	0	0
Pinyon-Juniper	640	640
Pinyon-Juniper Shrubland	60	60
Pinyon-Juniper Woodland	580	580
Agriculture	30	30
Aspen	0	0
Conifer	580	580
Desert Shrub/Salt Desert Scrub	15,810	15,810
Developed/Disturbance	120	120
Grassland	10	10
Invasives	190	190
Mountain Shrub	310	310
Nonvegetated/Other	7,340	7,340
Water/Riparian/Wet Meadow	1,960	1,960

Source: USGS 2006a

3.8.3 Use of Vegetative, Forestry, and Woodland Products

The most desirable woodland and forest products, sought after by both commercial and private interests, include sawtimber, fuelwood, posts, and Christmas trees. Historically, pinyon pine was the preferred species for fuelwood; more recently, juniper is increasingly used for fuelwood. Further, trees harvested for posts are generally found on the more productive juniper sites where the soils are deep and well drained.

Interest in biomass is increasing and is expected to continue to grow as new uses and technologies develop. There has been limited demand for the collection and sale of live plants and live plant seed. Generally, this limited demand has focused on collection of live Utah juniper (*Juniperus osteosperma*), pinyon pine (*Pinus edulis*), and sagebrush (*Artemisia* spp.). Seed collection has mainly included sagebrush (*Artemisia* spp.), fourwing saltbush (*Atriplex canescens*), and winterfat (*Ceratoides lanata*). The demand for woodland products continues to increase; however, the ability to satisfy the demand for woodland products is limited by the available woodland resource.

Commercial sales or commercial harvesting of forest resources are permitted by the BLM and the Forest Service. Douglas fir, ponderosa pine, limber pine, aspen, and cottonwood trees may be sold in designated areas to protect forest stands from disease or to prevent wildland fires. Increasing demand to collect native seeds from BLM-administered and Nation Forest System lands has increasingly been an issue over the past decade. To ensure that use of seed resources is performed in an ecologically sound and sustainable manner, the collection of large amounts of seed requires a permit or contract and must be adequately analyzed through the NEPA procedures prior to issuance, including necessary archeological and special status species clearances. Mitigation measures, in the form of special permit stipulations, can be attached to address and mitigate any issues identified through the NEPA process. If issues cannot be mitigated to an acceptable level through stipulations, then the permit or contract is not usually issued.

Management of wildland seed resources is an important component of ecosystem based resource management. An effectively managed seed collection program will benefit the BLM, Forest Service, and the public. These benefits complement other resource programs, contribute to the economic stability and well-being in local communities, aid in providing locally adapted native seeds for restoration projects and programs and contribute to partnerships, and educate the public as to the social and economic value of our natural renewable resources.

Utah experiences regular periods of prolonged drought. Protection of the vegetative resource is paramount, and caution is used when authorizing seed collection during these periods of vegetation stress. Verification of good vegetative condition (species vigor, root reserves, viable seed, seed abundance, etc.) is required prior to seed collection permit issuance. Generally, the local unit Botanist or Range Specialist makes this determination, which must be completed prior to permit issuance. The long-term health and abundance of the species and the vegetative community must be assured. If the future vegetative and ecological site condition can be assured, then a seed collection permit may be issued at the discretion of the Field Office/Forest. If other priorities will not allow a Field Office/Forest to assess the vegetative condition, or if the vegetative resource is in questionable vigor, then permits are not usually issued.

3.8.4 Regional Context

Table 3.30 through **Table 3.32** display data compiled in a BER produced by the USGS and BLM (Manier et al. 2013).

Table 3.30
Acres of Sagebrush and Pinyon-Juniper Interface within GRSG Habitat in the Planning Area

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat[1]	
		Within Planning Area	Within Management Zone
BLM	II & VII	121,200	1,095,200
	III	212,200	1,145,400
	IV	64,00	1,250,000
Forest Service	II & VII	17,000	80,500
	III	123,000	333,800

Table 3.30
Acres of Sagebrush and Pinyon-Juniper Interface within GRSG Habitat in the Planning Area

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat[1]	
		Within Planning Area	Within Management Zone
	IV	100	476,300
Tribal and Other Federal	II & VII	37,800	165,500
	III	25,400	34,000
	IV	0	21,100
Private	II & VII	124,200	918,800
	III	164,500	249,400
	IV	78,300	722,700
State	II & VII	42,400	204,400
	III	46,600	47,100
	IV	9,500	137,300
Other	II & VII	0	2,400
	III	0	0
	IV	0	9,300

Source: Manier et al. 2013
[1]Includes the number of acres where sagebrush land cover occurs within 120 meters (394 feet) of pinyon-juniper land cover

Table 3.31
Acres of Cheatgrass Potential within GRSG Habitat in the Planning Area

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat[1]	
		Within Planning Area	Within Management Zone
BLM	II & VII	691,100	13,416,200
	III	1,544,100	7,678,900
	IV	644,300	20,230,400
Forest Service	II & VII	151,400	531,500
	III	627,300	1,308,800
	IV	400	2,608,500
Tribal and Other Federal	II & VII	174,500	1,954,000
	III	235,500	303,900
	IV	0	1,714,300
Private	II & VII	818,200	11,834,100
	III	1,425,700	2,440,300
	IV	782,800	9,901,200
State	II & VII	200,300	1,997,300
	III	418,800	428,100
	IV	83,000	1,968,400
Other	II & VII	0	36,100
	III	0	100
	IV	0	148,700

Source: Manier et al. 2013
[1]Acreage comprised of areas with a high potential for cheatgrass occurrence

Table 3.32
Acres of Cropland within GRSG Habitat in the Planning Area

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat[1]	
		Within Planning Area	Within Management Zone
BLM	II & VII	200	5,300
	III	2,700	4,800
	IV	2,400	29,300
Forest Service	II & VII	0	300
	III	300	400
	IV	0	2,700
Tribal and Other Federal	II & VII	1,100	6,600
	III	2,000	2,100
	IV	0	2,300
Private	II & VII	18,900	492,000
	III	65,600	76,400
	IV	18,200	288,800
State	II & VII	100	11,000
	III	700	800
	IV	200	5,200
Other	II & VII	0	100
	III	0	0
	IV	0	1,500

Source: Manier et al. 2013
[1]Based on data provided by the National Agricultural Statistics Service

3.9 OTHER SPECIAL STATUS SPECIES

Special status species include both animals and plants that require specific management attention because of population or habitat concerns. The six categories of these species are the following:

- Federally listed threatened and endangered species and designated critical habitats
- Federally proposed species and proposed critical habitats
- Federal candidate and petitioned species
- BLM sensitive species
- Forest Service sensitive species and Management Indicator Species
- State of Utah listed or sensitive species

3.9.1 Federally Listed Species

Threatened and Endangered Species

Species are listed as either threatened or endangered under the ESA. Some listed species have critical habitat designated as essential to species conservation, or requiring special management consideration or protection. Under the ESA, all federal agencies must participate in the conservation and recovery of listed threatened and endangered species (USFWS NMFS 1998).

The ESA also states that federal agencies shall insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. The mission of USFWS is to work with other federal, state, and local agencies to conserve, protect, and enhance fish, wildlife, and plant species and their habitats. USFWS manages threatened and endangered species and designated critical habitat, in cooperation with other federal agencies, in order to support recovery. The BLM and Forest Service cooperate with USFWS in order to determine and manage habitats to support the species.

Candidate Species

Candidate species are plant and animal taxa considered for possible inclusion as listed threatened or endangered species. These are species that USFWS has sufficient data on biological vulnerability or threats to support a potential to list but issuance of a proposed rule is precluded by higher listing actions. There are currently eight candidate species in Utah. In addition to candidate species, there are four species proposed for listing under the ESA, two of which, Graham's penstemon (*Penstemon grahmii*) and White River penstemon (*Penstemon scariosus* var. *albifluvis*), occur within or near GRSG habitat. The other two species, Coral Pink Sand Dunes tiger beetle (*Cicindela albissima*) and Gunnison Sage-Grouse (*Centrocercus minimus*) do not occur in or near GRSG habitat.

Effect Determinations

Land management agencies work with USFWS to determine listed species habitat and identify and implement necessary management and recovery actions. There are three effect (impact) determinations available through Section 7 consultation with USFWS:

- No effect (concludes consultation)
- May affect, not likely to adversely affect (effects must be discountable, insignificant, or completely beneficial for this determination; Biological Assessment not required and informal consultation should occur; USFWS concurrence required)
- May affect, likely to adversely affect (the appropriate determination when adverse effects may occur as a direct or indirect consequence and are not discountable, insignificant, or completely beneficial; triggers formal consultation and requires a Biological Assessment from the action agency and, subsequently, a Biological Opinion from USFWS)

In addition to the ESA, migratory birds are protected in accordance with the Migratory Bird Treaty Act of 1918 and the Bald and Golden Eagle Protection Act of 1940 (as amended). Other fish and wildlife resources are considered under the Fish and Wildlife Coordination Act (1934).

Table 3.33 identifies the federally listed threatened, endangered, proposed, petitioned, and candidate plant and animal species that occur or have the potential to occur in the planning area.

Table 3.33
Federal Threatened, Endangered, Proposed, Petitioned, and Candidate Plant and Animal Species in the Planning Area

Common Name *Scientific Name*	Status[1]	General Habitat	Population Area
Mammals			
Black-footed ferret *Mustela nigripes*	FE/EXP	Found in the Uinta Basin and limited to grasslands, steppe, and shrub steppe ecosystems, where it relies on white-tailed prairie dogs for food and their burrows for shelter. Its habitat likely overlaps GRSG habitat and therefore is likely to occur within a GRSG population area. The population of black-footed ferrets in the Uinta Basin is an experimental population (nonessential status in Utah; see detailed discussion provided in the text).	Uintah
Canada lynx *Lynx canadensis*	FT	Found in montane coniferous forests, where it feeds mainly on snowshoe hare (*Lepus americanus*). Lynx sightings are rare in Utah, mostly in the Uinta Mountains along the Wyoming border. Though its range overlaps GRSG population areas, this species is not likely to be found in GRSG habitat.	Uintah, Rich
Utah prairie dog *Cynomys parvidens*	FT	Endemic to grasslands and shrub-steppe habitats on flat plains in Beaver, Iron, Garfield, Kane, Sevier, Wayne, and Piute Counties. There is a high degree of overlap between Utah prairie dog habitat and GRSG habitat in the population areas listed in the Bald Hills, Hamlin Valley, Panguitch, Parker Mountain population areas and the species is likely to occur in GRSG-occupied habitat in the decision area. See detailed discussion provided in text in **Section 3.9.2**, Conditions Statewide.	Bald Hills, Hamlin Valley, Panguitch, Parker Mountain
Wolverine *Gulo gulo luscus*	FP/FS	Found only in high alpine coniferous forests. Historically, wolverines were found in the Uinta Mountains and still may inhabit high mountainous areas of the state. There is mapped habitat in population areas, but no known sightings of wolverines in GRSG population areas. Therefore unlikely to occur within any population area.	Uintah, Rich, Strawberry, Carbon, Emery
Birds			
California Condor *Gymnogyps californianus*	FE/EXP	Mountainous country at low and moderate elevations, especially rocky and brushy areas with cliffs available for nest sites, with foraging habitat encompassing grasslands, oak savannas, mountain plateaus, ridges, and canyon. This species may occur in GRSG habitat within several population areas. Due to reintroduction efforts, the California condor is considered a nonessential, experimental population in south-central Utah; however, if it	Hamlin Valley, Bald Hills, Panguitch, Parker Mountain, Emery

Table 3.33
Federal Threatened, Endangered, Proposed, Petitioned, and Candidate Plant and Animal Species in the Planning Area

Common Name *Scientific Name*	Status[1]	General Habitat	Population Area
		were found elsewhere in the state, it would be considered an endangered species.	
Greater Sage-Grouse *Centrocercus urophasianus*	FC/FS/MIS	Detailed information provided in this document. For additional information for this species refer to **Section 3.1**.	All
Gunnison Sage-Grouse *Centrocercus minimus*	FT	Found in sagebrush habitats similar to those of GRSG; however, the species' range does not overlap either occupied habitat or GRSG population areas.	None
Mexican spotted owl *Strix occidentalis lucida*	FT	Found in in narrow slot canyons on the Colorado Plateau in eastern and southern Utah. In the Panguitch population area, this species does not inhabit BLM-administered lands, only National Forest System lands. It feeds primarily on rodents. This species may forage over GRSG habitat, but their nests or roosts would not be found there. This species is likely to occur in GRSG habitat while foraging.	Panguitch, Parker Mountain, Emery, Carbon, Uintah
Southwestern willow flycatcher *Empidonax traillii extimus*	FE	Found in riparian areas, especially dense willows, in southern Utah in summer. Because GRSG sometimes use riparian habitat during brood rearing, this species may occur but likely use different components of the habitat.	Panguitch, Parker Mountain
Yellow-billed cuckoo *Coccyzus americanus*	FT/FS	Inhabits dense cottonwood-willow habitats along streams and river corridors. In Utah, its range is limited to fragments of riparian habitat in the northern part of the state. Because GRSG sometimes use riparian habitat during brood rearing, this species may occur in GRSG habitat but likely uses different components of the habitat.	Rich, Strawberry, Uintah
Invertebrates			
Kanab ambersnail *Oxyloma haydeni kanab*	FE	Though occupied GRSG habitat overlaps the county, the species' range does not overlap either occupied habitat or GRSG population areas.	None
Coral Pink Sand Dunes tiger beetle *Cicindela albissima*	FP	Though occupied GRSG habitat occurs in the same county, the species' range does not overlap either occupied habitat or GRSG population areas.	None
Fish			
Bonytail *Gila elegans*	FE	Found in eddies and backwaters of the Colorado River system. Drainages associated with this river system are present in GRSG habitat.	Uintah

Table 3.33
Federal Threatened, Endangered, Proposed, Petitioned, and Candidate Plant and Animal Species in the Planning Area

Common Name *Scientific Name*	Status[1]	General Habitat	Population Area
Colorado pikeminnow *Ptychocheilus lucius*	FE	Found in larger rivers of the upper Colorado River system. Drainages associated with this river system are present in GRSG habitat.	Uintah
Humpback chub *Gila cypha*	FE	Found in whitewater in the upper Colorado River system. Drainages associated with this river system are present in GRSG habitat.	Uintah
June sucker *Chasmistes liorus*	FE	Though occupied GRSG habitat occurs in the same county, the species' range does not overlap either occupied habitat or GRSG population areas.	None
Lahontan cutthroat trout *Oncorhynchus clarkia henshawi*	FT	In Utah, limited to drainage in western Box Elder County. The drainage contains sagebrush and is potential GRSG habitat.	Box Elder
Least chub *Iotichthys phlegethontis*	FC	Found in scattered springs and streams in Millard and Juab Counties. Refuge populations exist in Box Elder County. Drainages associated with this river system are present in GRSG habitat.	Sheeprocks
Razorback sucker *Xyrauchen texanus*	FE	Found in slow backwaters of the Colorado River system. Although extremely rare, drainages associated with this river system are present in GRSG habitat.	Uintah
Greenback cutthroat trout *Oncorhynchus clarki stomias*	FT	Though occupied GRSG occurs in the same county, the species' range does not overlap either occupied habitat or GRSG population areas.	None
Virgin River Chub *Gila seminuda = G. robusta*	FE	Limited to 134 miles of the Virgin River in southwest Utah, northwest Arizona, and southeast Nevada. Drainages tributary to this river system are present in GRSG habitat.	Panguitch, Bald Hills
Woundfin *Plagopterus argentissimus*	FE	In Utah, limited to the Virgin River and La Verkin Creek, a tributary to the Virgin River. The species' range does not overlap either occupied habitat or GRSG population areas.	None
Reptiles and Amphibians			
Desert tortoise *Gopherus agassizii*	FT	In Utah, limited to desert habitat in portions of Washington County. The species' range does not overlap either occupied habitat or GRSG population areas.	None
Western (boreal) toad *Bufo boreas*	Petitioned	Found in a variety of habitats, including wetlands, springs, slow-moving streams, ponds, meadows, and woodlands. Populations currently occur in many counties across Utah. Likely to be found in GRSG habitat.	Box Elder, Rich, Strawberry, Parker Mountain, Panguitch

Table 3.33
Federal Threatened, Endangered, Proposed, Petitioned, and Candidate Plant and Animal Species in the Planning Area

Common Name *Scientific Name*	Status[1]	General Habitat	Population Area
Plants			
Autumn buttercup *Ranunculus aestivalis*	FT	Narrowly distributed to two populations in the upper Sevier River Valley, north of Panguitch. Prefers saline, wet meadow habitat at 6,450-foot elevation. Blooms August-September. Because GRSG use wet meadows, there may be limited overlap with GRSG habitat.	Panguitch
Barneby reed-mustard *Schoenocrambe barnebyi*	FE	Primarily found between Torrey and Fruita in pinyon-juniper woodland habitat in Capitol Reef National Park, 4,800- to 6,500-foot elevation. Blooms May-June. Though it is found in a GRSG population area, this species is not likely to be found in GRSG habitat.	Parker Mountain
Barneby ridge-cress *Lepidium barnebyanum*	FE	Found in Indian Canyon in Duchesne County on limestone outcrops within pinyon-juniper woodlands. Though it is found in a GRSG population area, this species is not likely to be found in GRSG habitat.	Uintah
Cisco milkvetch *Astragalus sabulosus*	Petitioned	Though occupied GRSG occurs in the same county, the species' range does not overlap either occupied habitat or GRSG population areas.	None
Clay phacelia *Phacelia argillacea*	FE	Though occupied GRSG habitat occurs in the same county, the species' range does not overlap either occupied habitat or GRSG population areas.	None
Clay reed-mustard *Schoenocrambe argillacea*	FT	Restricted distribution in Uintah County within mixed desert shrub communities on steep slopes at 4,600- to 5,900-foot elevation. Blooms June-July. Though it is found in a GRSG population area, this species is not likely to be found in GRSG habitat.	Uintah
Deseret milkvetch *Astragalus desereticus*	FT	Occurs on steep, sandy slopes in a sagebrush-juniper community near Birdseye in Wasatch County at 5,320- to 5,780-foot elevation. Blooms May-June. Though it is found in a GRSG population area, this species is not likely to be found in GRSG habitat.	Carbon
Dwarf bear-poppy *Arctomecon humulis*	FE	Grows only in the Dixie Corridor of Washington County at 2,700 to 3.300-foot elevations. Blooms in April and May. The species' range does not overlap either occupied habitat or GRSG population areas.	None
Frisco buckwheat *Eriogonum soredium*	FC	Though occupied GRSG habitat occurs in the same county, the species' range does not overlap either occupied habitat or GRSG population areas.	None

Table 3.33
Federal Threatened, Endangered, Proposed, Petitioned, and Candidate Plant and Animal Species in the Planning Area

Common Name *Scientific Name*	Status[1]	General Habitat	Population Area
Frisco clover *Trifolium friscanum*	FC	Though occupied GRSG habitat occurs in the same county, the species' range does not overlap either occupied habitat or GRSG population areas.	None
Gierisch mallow *Sphaeralcea gierischii*	FE	Grows in desert scrub on gypsum outcrops in Washington County, from 2,100-3,900-foot elevations. Blooms April to June. The species' range does not overlap either occupied habitat or GRSG population areas.	None
Goose creek milkvetch *Astragalus anserinus*	FC	Grows in sagebrush, rabbitbrush, and juniper communities on rocky outcrops in Box Elder County, 5,000- to 5,300-foot elevation. Blooms May-June. It is present in GRSG habitat.	Box Elder
Graham's beardtongue *Penstemon grahamii*	FP	Occurs in the Uinta Basin, mostly on shale outcrops with sparse vegetation, mostly desert shrub and pinyon-juniper vegetation, 4,600- to 6,700-foot elevation. Blooms May-June. Though it is found in a designated GRSG population area, this species is not likely to occur in GRSG habitat.	Uintah
Heliotrope milk-vetch *Astragalus montii*	FT	Alpine species found in openings in spruce-fir forests on plateaus in the Manti-LaSal National Forest (Sanpete and Sevier Counties), 11,000- to 11,300-foot elevation. Blooms July-August. Though it is potentially found in a GRSG population area, this species is not likely to occur in GRSG habitat.	Carbon, Emery
Holmgren milk-vetch *Astragalus holmgreniorum*		Grows in desert scrub on limestone soils in Washington County, from 2,400-2,600-foot elevations. Blooms March to April. The species' range does not overlap either occupied habitat or GRSG population areas.	None
Isely milkvetch *Astragalus iselyi*	FT	Though occupied GRSG habitat occurs in the same county, the species' range does not overlap either occupied habitat or GRSG population areas.	None
Jones cycladenia *Cycladenia jonesii*	FT	Though occupied GRSG habitat occurs in the same counties, the species' range does not overlap either occupied habitat or GRSG population areas.	None
Kodachrome bladderpod *Lesquerella tumulosa*	FE	Though occupied GRSG habitat occurs in the same county, the species' range does not overlap either occupied habitat or GRSG population areas.	None
Last chance townsendia *Townsendia aprica*	FT	Grows on clay soils in Emery, Sevier, and Wayne Counties in pinyon-juniper woodland, desert shrub, and sagebrush habitats, 6,100- to 8,000-foot elevation. Blooms April-May. Though it is found in	Emery, Parker Mountain

Table 3.33
Federal Threatened, Endangered, Proposed, Petitioned, and Candidate Plant and Animal Species in the Planning Area

Common Name *Scientific Name*	Status[1]	General Habitat	Population Area
		GRSG population areas, this species is not likely to occur in GRSG habitat.	
Maguire primrose *Primula maguirei*	FT	This species is found in Logan Canyon on steep slopes in conifer forests. Though it is found in a GRSG population area, this species is not likely to occur in GRSG habitat.	
Navajo sedge *Carex specuicola*	FT	Grows in hanging gardens on Navajo Sandstone in San Juan County, from 5,700-6,000-foot elevations. Blooms May to July. The species' range does not overlap either occupied habitat or GRSG population areas.	None
Ostler's peppergrass *Lepidium ostleri*	FC	Though occupied GRSG habitat occurs in the same county, the species' range does not overlap either occupied habitat or GRSG population areas.	None
Pariette cactus *Sclerocactus brevispinus*	FT	Found on saline/alkaline soil in clay badlands of Pariette Draw, approximately 4,600-foot elevation. Though habitat may extend into a GRSG population area, this species is not likely to occur in GRSG habitat.	Uintah
San Rafael cactus *Pediocactus despainii*	FE	Though occupied GRSG habitat overlaps the county, the species' range does not overlap either occupied habitat or GRSG population areas.	None
Shivwits milk-vetch *Astragalus ampullarioides*	FE	Grows on gypsum soils in Washington County. The species' range does not overlap either occupied habitat or GRSG population areas.	None
Shrubby reed-mustard *Schoenocrambe suffrutescens*	FE	Limited to salt desert shrub and pinyon-juniper woodland areas, 3,000- to 5,200-foot elevation. Blooms March-April. Though it is found in a GRSG population area, this species is not likely to occur in GRSG habitat.	Uintah
Siler pincushion cactus *Pediocactus sileri*	FT	Though occupied GRSG habitat occurs in the same county, the species' range does not overlap either occupied habitat or GRSG population areas.	None
Uinta Basin hookless cactus *Sclerocactus wetlandicus*	FT	Found in salt desert shrub and pinyon-juniper woodland communities on slopes and hills of Uintah County, 4,500- to 6,600-foot elevation. Blooms April-May. Though it is found in a GRSG population area, this species is not likely to occur in GRSG habitat.	Uintah
Ute ladies'-tresses *Spiranthes diluvialis*	FT	Found in wet meadows, streambanks, and marshes in Uintah and Duchesne Counties, 4,300- to 5,500-foot elevation. Blooms July-October. Because	Uintah

Table 3.33
Federal Threatened, Endangered, Proposed, Petitioned, and Candidate Plant and Animal Species in the Planning Area

Common Name *Scientific Name*	Status[1]	General Habitat	Population Area
		GRSG sometimes use wet meadows, there could be overlap with Ute ladies'-tresses habitat.	
Welsh's milkweed *Asclepias welshii*	FT	Though occupied GRSG habitat occurs in the same county, the species' range does not overlap either occupied habitat or GRSG population areas.	None
White River penstemon *Penstemon scariosus* var. *albifluvis*	FC	Grows on sparsely vegetated shale outcrops with desert shrubs, sagebrush, and pinyon-juniper woodland in Uintah County, 5,000- to 6,800-foot elevation. Blooms May-June. Though it is found in a GRSG population area, this species is not likely to occur in GRSG habitat.	Uintah
Winkler cactus *Pediocactus winkleri*	FT	Though occupied GRSG habitat occurs in the same county, the species' range does not overlap either occupied habitat or GRSG population areas.	None
Wright fishhook cactus *Sclerocactus wrightiae*	FE	Though occupied GRSG occurs in the same county, the species' range does not overlap either occupied habitat or GRSG population areas.	None

Source: UDWR 2003; USFWS 2013b, 2013c
[1]FE – Federally listed as endangered
FT – Federally listed as threatened
FC – Federally listed as a candidate species
FP – Federally listed as a proposed species
EXP – Federally recognized experimental population (nonessential)
FS – Forest Service Sensitive Species
MIS – Management Indicator Species
Petitioned – Federally petitioned species

BLM

Special status species include plant and animal species designated by USFWS as threatened or endangered under the ESA, species proposed or petitioned for listing, or are candidates for listing. Special status species also include species determined by the BLM as undergoing a downward trend or experiencing threats to their habitats and therefore are on the BLM Sensitive Species List.

Responsibilities for management of federally listed, proposed, petitioned, candidate species, and BLM sensitive species are outlined in BLM Manual 6840, Special Status Species Management. The policy for management of federally listed species is to not authorize, fund, or implement any actions that are likely to jeopardize the continued existence of listed species, or to destroy or adversely modify designated critical habitat, and to develop programs to conserve listed species.

BLM Manual 6840, Special Status Species Management, defines special status species as:

- Species listed, or proposed for listing, under the ESA; and
- Species requiring special management consideration in order to promote their conservation and to reduce the likelihood and need for future listing under the ESA, which are designated as BLM sensitive by the State Director(s).

All federal candidate species, proposed species, and delisted species will be conserved as BLM sensitive species for at least 5 years following delisting.

BLM/Utah State Sensitive Species

Species designated as BLM sensitive species must be native species found on BLM-administered lands for which the BLM has the capability to significantly affect the conservation status of the species through management, and either:

- There is information that a species has recently undergone, is undergoing, or is predicted to undergo a downward trend such that the viability of the species or a distinct population segment of the species is at risk across all or a significant portion of the species range, or
- The species depends upon ecological refugia or specialized or unique habitats on BLM-administered lands, and there is evidence that such areas are threatened with alteration such that the continued viability of the species in that area would be at risk (BLM Manual 6840, Special Status Species Management).

The BLM Utah State Director's sensitive species list includes sensitive animal and plant species that are recognized by the BLM and the UDWR; however, these lists are maintained separately. Many of the sensitive species listed by the BLM overlap with Utah state sensitive species list, but the lists differ slightly. These lists are subject to periodic updates, and new lists will be incorporated into the land use planning document through plan maintenance or amendments. The most recent IM listing BLM Utah State Sensitive species is IM UT-2011-037. The most recent list was updated July 27, 2011. The most recent UDWR list was updated March 29, 2011.

Table 3.34 lists the sensitive species in the decision area. These species are managed as necessary to protect the species and their habitat from loss in accordance with the FLPMA, NFMA, BLM and Forest Service guidelines, and federal directives. In addition, the BLM Utah sensitive species are managed in accordance with BLM Manual 6840, Special Status Species Management, as described above.

Table 3.34
BLM and Forest Service Sensitive Species in the Planning Area

Common Name *Scientific Name*	Status[1]	General Habitat	Population Area
		Mammals	
Allen's big-eared bat *Idionycteris phyllotis*	SS	Inhabits rocky and riparian woodland and scrubland in mountainous regions of the Southwest. In Utah, occurs in Grand, San Juan, Washington, Garfield, and Kane counties. Though it is found in a GRSG population area, this species is not likely to be found in GRSG habitat.	Panguitch
Big free-tailed bat *Nyctinomops macrotis*	SS	Found in rocky canyons where it roosts in caves, mines, buildings, and rock crevices. Rare but widespread in Utah. Though it is found in GRSG population areas, this species is not likely to be found in GRSG habitat.	All
Rocky Mountain Bighorn sheep *Ovis Canadensis*	FS**	Found in open or semi-open terrain with a mix of steep and gentle slopes, broken cliffs, rock outcrops, and canyons. In Utah, found in Kane and San Juan counties. Though it is found in a GRSG population area, this species is not likely to be found in GRSG habitat.	Panguitch
Dark kangaroo mouse *Microdipodops megacephalus*	SS	Occurs in sagebrush areas with sandy soils in the Great Basin, in Iron, Beaver, Millard, Juab, Tooele, and Box Elder counties. It is present in GRSG habitat.	Ibapah, Sheeprocks, Box Elder
Fringed myotis *Myotis thysanodes*	SS	Found in caves, mines, and buildings in southern Utah, including Washington, Kane, Garfield, and San Juan counties. Prefers desert and woodland areas. Though it is found in GRSG population areas, this species is not likely to be found in GRSG habitat.	Panguitch, Uintah
Kit fox *Vulpes macrotis*	SS	Occurs in a variety of low-elevation cover types such as shrublands, grassland, and wetland communities. In Utah, they are uncommon but widespread, and likely to use GRSG habitat; therefore, likely to occur.	Sheeprocks, Box Elder, Ibapah, Panguitch, Hamlin Valley, Bald Hills
Pygmy rabbit *Brachylagus idahoensis*	SS/FS	Prefers tall, dense sagebrush habitat with loose soils. Found in many Utah counties and is present in GRSG habitat.	Hamlin Valley, Ibapah, Panguitch, Parker Mountain, Rich, Bald Hills, Box Elder
Spotted bat *Euderma maculatum*	SS/FS	Roosts and hibernates in caves and rock crevices. Found in a variety of habitats, including cliffs, dense forests, agricultural fields, marshes, riparian areas, and shrub-steppe grasslands. It may forage in GRSG habitat.	Uintah, Bald Hills

Table 3.34
BLM and Forest Service Sensitive Species in the Planning Area

Common Name ***Scientific Name***	**Status**[1]	**General Habitat**	**Population Area**
Townsend's big-eared bat *Corynorhinus townsendii*	SS/FS	Roosts and hibernates in caves, buildings, and abandoned mines; typically found in riparian areas, forests, and edge habitats. It is found in population areas and GRSG habitat throughout Utah.	All population areas have at least some limited-value habitat. Observed in the Uintah, Box Elder, and Bald Hills Population Areas
Western red bat *Lasiurus blossevillii*	SS	Mostly migratory in nature but known to roost in caves, mines, and trees. Found near water, often in wooded areas. Sparsely distributed through northcentral, central, and southwestern Utah. It may forage in GRSG habitat, but would not roost there.	Carbon, Emery, Uintah, Panguitch, Parker Mountain
White-tailed prairie dog *Cynomys leucurus*	SS	Lives in colonies in grassland and shrub-type vegetation. May use sagebrush habitat adjacent to grassland in Rich, Daggett, Uintah, Duchesne, Carbon, Emery, and Grand counties. They are present in GRSG habitat.	Uintah, Carbon, Rich, Emery
Preble's shrew *Sorex preblei* Silky pocket mouse *Perognathus flavus*	SS SS	Though occupied GRSG habitat overlaps the county, the species' ranges do not overlap either occupied habitat or GRSG population areas.	None
Birds			
American white pelican *Pelecanus erythrorhynchus*	SS	Occurs in open areas of brackish or freshwater lakes near vegetation or rocks. Though it is found in GRSG population areas, this species is not likely to be found in GRSG habitat.	Bald Hills, Parker Mountain, Uintah
Bald eagle *Haliaeetus leucocephalus*	SS/FS	Nests in tall trees (typically mature cottonwood in Utah) along waterways and hunts for fish and waterfowl. Primarily winter residents in southern Utah; nesting does not occur in all population areas. Known to forage for mammal carcasses in deer winter range within sagebrush habitat; therefore, species is likely to forage in GRSG habitat.	Sheeprocks, Uintah, Bald Hills, Carbon, Hamlin Valley, Panguitch, Parker Mountain
Bobolink *Dolichonyx oryzivorous*	SS	Nest and forage in wet meadows, grasslands, wetlands, and irrigated agricultural areas. Rare but widely distributed throughout Utah, occurring in nearly every county. Though it is found in GRSG population areas, this species is not likely to be found in GRSG habitat.	All except for Hamlin Valley, Bald Hills, and Panguitch

Table 3.34
BLM and Forest Service Sensitive Species in the Planning Area

Common Name ***Scientific Name***	**Status**[1]	**General Habitat**	**Population Area**
Burrowing owl *Athene cunicularia*	SS	Found in short-grass prairie and shrubland where it nests in rodent burrows and is often associated with prairie dog colonies. It is present in GRSG habitat.	All
Ferruginous hawk *Buteo regalis*	SS	Occurs in prairies, plains, shrublands, and agricultural fields and nests in cliffs or tall trees. Likely to forage in GRSG habitat.	All
Grasshopper sparrow *Ammodramus savannarum*	SS	In Utah, limited to native grassland in the northernmost region of the state, where it nests on the ground in clumps of grass. It is likely to occur in GRSG habitat.	Box Elder, Rich, Sheeprocks, Ibapah, Parker Mountain, Uintah
Lewis' woodpecker *Melanerpes lewis*	SS	Favors open pine woodlands, and other forest and woodland areas, where it nests in snags and stumps. Though it is found in GRSG population areas, this species is not likely to be found in GRSG habitat.	Box Elder, Rich, Sheeprocks, Ibapah, Panguitch, Parker Mountain, Uintah, Strawberry
Long-billed curlew *Numenius americana*	SS	Nests on the ground in short-growth grasslands, mixed-grass prairies, meadows, scrub communities, pastures, mud flats, and pond edges. It is likely to occur in GRSG habitat.	All
Mountain plover *Charadrius montanus*	SS	Nests in shrub steppe habitats dominated by black sagebrush and shadscale, often near white-tailed prairie dog mounds. Breeding has been documented in Duchesne and Uinta counties. It is likely to occur in GRSG habitat.	Uintah, Strawberry, Carbon
Northern goshawk *Accipiter gentiles*	CA/FS	Breeds in mixed coniferous, forest, open woodland, and riparian areas, where it nests in mature trees. May prefer pinyon-juniper woodlands for winter habitat and would overlap with GRSG habitat more frequently in winter than in summer.	Uintah, Carbon, Hamlin Valley, Rich, Panguitch, Parker Mountain, Emery, Strawberry
Peregrine falcon *Falco peregrinus anatum*	FS	Builds nests on cliffs or tall structures with wide views, low disturbance, and abundance of prey. Widespread range in Utah but very infrequent sightings. This species may be an occasional visitor in shrubland habitat and therefore may occur in GRSG habitat.	All

Table 3.34
BLM and Forest Service Sensitive Species in the Planning Area

Common Name ***Scientific Name***	**Status**[1]	**General Habitat**	**Population Area**
Sharp-tailed grouse *Tympanuchus phasianellus*	SS	This species inhabits sagebrush/native bunchgrass habitat in foothills of Box Elder, Cache, and Morgan counties. It displays on leks and nests nearby in clumps of grass or near bushes. It is likely to occur in GRSG habitat.	Box Elder
Short-eared owl *Asio flammeus*	SS	Prefers grasslands, shrublands, and other open habitats and nests in depressions in the ground. Found in most of Utah, though distribution has decreased in its traditional range along the Wasatch. It is likely to occur in GRSG habitat.	Box Elder, Hamlin Valley, Bald Hills, Ibapah, Parker Mountain, Sheeprocks, Uintah
Snowy plover *Charadrius alexandrinus*	SS*	Migratory shorebird common in Utah, with large concentrations found on the Great Salt Lake. Prefers open or sparsely vegetated areas near water and nests on the ground. Though it is found in GRSG population areas, this species is not likely to be found in GRSG habitat.	Box Elder, Sheeprocks, Ibapah, Carbon
Three-toed woodpecker *Picoides tridactylus*	SS/FS	Permanent resident of coniferous forests in Utah, generally above 8,000 feet and known to inhabit the Uinta Mountains. Nest in mature trees and require snags and dead trees for foraging. Though it is found in GRSG population areas, this species is not likely to be found in GRSG habitat.	Carbon, Emery, Parker Mountain, Panguitch, Rich, Strawberry, Uintah
Black swift *Cypseloides niger*	SS	Though occupied GRSG habitat overlaps the county, the species' range does not overlap either occupied GRSG habitat or population areas.	None
Boreal Owl *Aegolius funereus*	FS	Inhabits mature and older, multilayered spruce/fir forests that maintain large-diameter trees, canopy structure, and forest floor moisture. Though it is found in GRSG population areas, this species is not likely to use GRSG habitat; therefore, it is unlikely to occur.	Wyoming-Uinta, Rich, Wyoming-Blacks Fork, Uintah, Carbon
Great Grey Owl *Strix nebulosa*	FS	Occurs in boreal forests across North America in subalpine and montane forests. They typically nest near meadows, marshes, muskegs, or lakes and forage in open areas. Though it is found in GRSG population areas, this species is not likely to use GRSG habitat; therefore, it is unlikely to occur.	Wyoming-Blacks Fork, Carbon, Rich, Wyoming-Uinta

Table 3.34
BLM and Forest Service Sensitive Species in the Planning Area

Common Name ***Scientific Name***	**Status**[1]	**General Habitat**	**Population Area**
Flammulated Owl *Otus flammeolus*	FS	Montane forests with mature and old growth ponderosa pine and Douglas fir with open stand structure. Though it is found in GRSG population areas, this species is not likely to use GRSG habitat; therefore, it is unlikely to occur.	Wyoming-Blacks Fork, Uintah, Panguitch, Parker Mountain, Emery, Strawberry, Wyoming-Uinta, Rich, Carbon
		Fish	
Bluehead sucker *Catostomus discobolus*	CA	Found in the Colorado River system, Snake River system, and Lake Bonneville basin. Drainages associated with this river system occur in GRSG habitat.	Emery, Carbon, Rich, Uintah
Bonneville cutthroat trout *Oncorhynchus clarkii utah*	CA/FS	Found in the Lake Bonneville basin, including Bear Lake and Strawberry Reservoir. Habitat ranges from high gradient mountain streams to grassland streams at lower elevations. Spawns in streams with gravel substrate in the spring. Additional habitat requirements include functional riparian zones for refugia and bank stability. Drainages associated with this river system occur in GRSG habitat.	Rich, Ibapah, Panguitch, Parker Mountain, Strawberry
Colorado River cutthroat trout *Oncorhynchus clarkii pleuriticus*	CA/FS	Found in the upper Colorado River Basin, where it is now restricted to isolated high-elevation streams. Drainages associated with this river system are not likely to be found in GRSG habitat.	Rich, Emery, Parker Mountain
Flannelmouth sucker *Catostomus latipinnis*	CA	Occurs in the Colorado River Basin, including the mainstem and large tributaries. Drainages associated with this river system are likely to be found in GRSG habitat.	Carbon, Emery, Uintah
Roundtail chub *Gila robusta*	CA	Occurs in murky pools near strong currents in large rivers of the Colorado River Basin. Drainages associated with this river system are likely to be found in GRSG habitat.	Uintah
Southern leatherside chub *Lepidomeda aliciae*	CA/FS	Historically inhabited the Beaver River and is now found in Utah Lake and Sevier River drainages. Drainages associated with this river system are likely to be found in GRSG habitat.	Parker Mountain, Panguitch
Yellowstone cutthroat trout *Oncorhynchus clarkii bouvieri*	CA	Present in and limited to the northwest portion of Box Elder County (Snake River drainage). Drainages associated with this river system are likely to occur in GRSG habitat.	Box Elder

Table 3.34
BLM and Forest Service Sensitive Species in the Planning Area

Common Name ***Scientific Name***	**Status**[1]	**General Habitat**	**Population Area**
		Reptiles and Amphibians	
Arizona toad *Bufo microscaphus*	SS	Found in streams, washes, irrigated croplands, reservoirs, and uplands adjacent to water. Restricted to Washington County and extreme southern Iron County in Utah. Though it is found in a GRSG population area, this species is not likely to be found in GRSG habitat.	Bald Hills
Boreal toad *Anaxyrus boreas boreas*	FS	Found in a variety of habitats, including wetlands, springs, slow-moving streams, ponds, meadows, and woodlands. Populations currently occur in many counties across Utah. Likely to be found in GRSG habitat.	Box Elder, Rich, Strawberry, Parker Mountain, Panguitch
Columbia spotted frog *Rana luteiventris*	CA/FS	Prefers isolated springs and seeps. In Utah, exist in isolated populations in the West Desert and along the Wasatch Front. Though it is found in GRSG population areas, this species is not likely to be found in GRSG habitat.	Carbon, Emery, Parker Mountain, Ibapah
Cornsnake *Elaphe guttata*	SS	Usually found near streams or in rocky or forested habitats. In Utah, reported in only a few localities in Uintah, Grand, and San Juan counties. Though it is found in GRSG population areas, this species is not likely to be found in GRSG habitat.	Uintah
Great Plains toad *Bufo cognatus*	SS	Inhabits prairies, agricultural areas, and deserts, where it breeds in shallow water after rains. Occurs in scattered areas throughout Utah. It is likely to be found in GRSG habitat.	All but Ibapah and Box Elder
Smooth greensnake *Opheodrys vernalis*	SS	Prefers moist grassy areas and meadows, where it is camouflaged. Uncommon in Utah. It is likely to be found in GRSG habitat.	Rich, Strawberry, Uintah
		Plants	
Wheeler's angelica *Angelica wheeleri*	FS	Found in wet or boggy areas near seeps and springs at 5,000- to 10,000-foot elevation in Cache, Juabe, Piute, Salt Lake, Sevier, Tooele, Utah, and Wasatch counties. It is likely found in the upper elevations of GRSG habitat.	Box Elder, Hamlin Valley, Bald Hills, Ibapah, Parker Mountain, Sheeprocks, Uintah
Atwood's columbine *Aquilegia atwoodii*	SS	Endemic to Desolation Canyon in the Firewater Canyon area in spring and seep habitat; associated vegetation includes copperweed and mixed shrubs. Though it is found in a GRSG population area, this species is not likely to be found in GRSG habitat.	Uintah

Table 3.34
BLM and Forest Service Sensitive Species in the Planning Area

Common Name ***Scientific Name***	**Status**[1]	**General Habitat**	**Population Area**
Rock columbine *Aquilegia scopulorum goodrichii*	SS	Found in high elevation conifer forest habitat on the West Tavaputs Plateau in Duchesne County. Though it is found in a GRSG population area, this species is not likely to be found in GRSG habitat.	Carbon
Park rockcress *Arabis vivariensis*	SS	Found on limestone and sandstone outcrops in mixed desert shrub and pinyon-juniper woodland from 5,000- to 6,000-foot elevation; blooms in May. Occurs in Uintah County but not within GRSG habitat.	Uintah
Horseshoe milkvetch *Astragalus equisolensis*	SS	Grows on sandstone outcrops in sagebrush and other mixed desert shrub habitat south of Vernal in Uintah County. It is likely to occur in GRSG habitat.	Uintah
Glenwood milkvetch *Astragalus loanus*	SS	Found in sagebrush and pinyon-juniper woodland habitat in Sevier County, from 6,300- to 6,800-foot elevation. Blooms May-June.	Parker Mountain
Peabody's milkvetch *Astragalus pubentissimus* var. *peabodianus*	SS	Found in channels on the west and south flanks of the Tavaputs Plateau in pinyon-juniper woodland and mixed desert shrub, from 4,300 to 5,800 feet. Blooms May-July. Found in Emery and Grand counties.	Carbon
Welsh's milkvetch *Astragalus welshii*	SS	An endemic plant of igneous gravels in sagebrush, pinyon-juniper woodland, and aspen communities, 7,000- to 9,200-foot elevation. Blooms May-June.	Panguitch (potential), Parker
Gumbo milkvetch *Astragalus ampullarius*	SS	Found in mixed juniper and desert shrub communities in clay soils in Kane County, 3,200- to 5,400-foot elevation. Blooms April-May.	Panguitch (potential)
Hamilton's milkvetch *Astragalus hamiltonii*	SS	Found in pinyon-juniper woodland and desert shrub vegetation communities in western Uintah County, 5,250- to 6,200-foot elevation. Blooms May-June. It is unlikely to occur in GRSG habitat.	Uintah
Pohl's milkvetch *Astragalus lentiginosus pohlii*	SS	Endemic to Rush and Skull Valleys in Tooele County, 4,400- to 5,400-foot elevation. Blooms May-June; associated vegetation includes greasewood, shadscale, horsebrush, and big sagebrush. It is likely present in GRSG habitat.	Sheeprocks
Pink egg milkvetch *Astragalus oophorus lonchocalyx*	SS	Found in pinyon-juniper woodland, sagebrush and mixed desert shrub vegetation communities in Iron and Beaver counties, 5,800- to 7,550-foot elevation. Blooms May.	Hamlin Valley

Table 3.34
BLM and Forest Service Sensitive Species in the Planning Area

Common Name ***Scientific Name***	**Status**[1]	**General Habitat**	**Population Area**
Escarpment milkvetch *Astragalus striatiflorus*	SS	Endemic to the Colorado Plateau where it is found in sandy soils and sand bars in pinyon-juniper woodland, ponderosa pine, and desert shrub communities, 4,900- to 6,600-feet elevation. Blooms May-June.	Panguitch
Aquarius paintbrush *Castilleja aquariensis*	FS	Alpine, sub-alpine meadows, silver sagebrush, and high-elevation black sagebrush. 9,600- and 11,200-foot elevation. Though it is found in GRSG population areas, this species is not likely to be found in GRSG habitat due to different elevation preferences.	Parker Mountain
Barneby's cryptanth *Cryptantha barnebyi*	SS	Same as Graham penstemon. Occurs on sparsely vegetated shale outcrops in Uintah County.	Uintah
Graham cryptanth *Cryptantha grahamii*	SS	Mixed desert shrub, sagebrush, pinyon-juniper woodland, and mountain brush vegetation communities in Duchesne and Uintah counties. Endemic to the Uinta Basin, 5,000- to 7,400-foot elevation. Blooms May-June.	Uintah
Hole-in-the-Rock prairie clover *Dalea flavescens epica*	SS	Blackbrush and mixed desert shrub communities in southern and eastern Utah, 4,700- to 5,000-foot elevation. Blooms May-June.	Panguitch, Parker Mountain, Carbon, Uintah
Nevada willowherb *Epilobium nevadense*	SS/FS	Talus slopes or limestone outcrops in pinyon-juniper woodland or oak/mountain mahogany communities in Iron and Millard counties, 5,100- to 8,800-foot elevation. Blooms June-September. Though it is found in a GRSG population area, this species is not likely to be found in GRSG habitat.	Hamlin Valley
Greenwood's goldenbush *Ericameria lignumviridis*	SS	This plant is restricted to igneous rock outcrops in Sevier County, 6,150- to 6,250-foot elevation. Blooms August-September. Though it is found in GRSG population areas, this species is not likely to be found in GRSG habitat.	Parker Mountain, Emery
Untermann's daisy *Erigeron untermannii*	SS/FS	Grows on shale and sandstone in pinyon-juniper woodland, sagebrush, mountain mahogany, and bristlecone pine habitat in Duchesne and Uintah counties, 7,000- to 9,000-foot elevation. Blooms May-July.	Uintah

Table 3.34
BLM and Forest Service Sensitive Species in the Planning Area

Common Name ***Scientific Name***	**Status**[1]	**General Habitat**	**Population Area**
Logan buckwheat *Eriogonum brevicaule* var. *loganum*	SS/FS	Pinyon/juniper woodland, sagebrush-bunchgrass, and saltbush communities on Arapien Shale northeast of Sigurd (Sevier County), 4,700- to 8,600-foot elevation. Blooms May-June.	Emery
Cronquist's buckwheat *Eriogonum corymbosum* var. *cronquistii*	SS	Pinyon and mountain brush vegetation on steep talus slopes in the Henry Mountains in Garfield County at 8,800- to 8,900-foot elevation. Blooms in September. Though it is found in GRSG population areas, this species is not likely to be found in GRSG habitat.	Parker Mountain, Emery
Flat Top buckwheat *Eriogonum corymbosum* var. *smithii*	SS	Colorado Plateau endemic, found on rocks and dunes in purple sage, rabbitbrush, matchweed, and other desert shrub vegetation in Emery and Wayne counties, 4,500- to 5,600-foot elevation. Blooms August-September.	Parker Mountain
Ibex buckwheat *Eriogonum nummulare* var. *ammophilum*	SS	Shadscale, horsebrush, winterfat, rabbitbrush, and pinyon-juniper woodland in Millard County, 4,800- to 6,000-foot elevation. Blooms June-August. Though it is found in a GRSG population area, this species is not likely to be found in GRSG habitat.	Sheeprocks
Kaye H. Thonre's buckwheat *Eriogonum spathulatum* var. *kayeae*	SS	Desert shrub and pinyon-juniper woodland vegetation communities in Beaver County.	Hamlin Valley, Bald Hills
N/A *Eriogonum corymbosum* var. *nilesii*	SS	Shadscale, salt desert shrub, and pinyon-juniper woodland vegetation types in Kane County.	Panguitch
Utah spurge *Euphorbia nephradenia*	SS	Colorado Plateau endemic, found in mat saltbush, blackbrush, *Ephedra*, and other desert shrub and grassland vegetation on clay hills and dunes in Emery, Garfield, Kane, and Wayne counties, 3,800- to 4,800-foot elevation. Blooms June-August.	Emery, Parker Mountain, Panguitch
Ackerman's green gentian *Frasera ackermaniae*	SS	Known from a single 40-acre occurrence in clay semi-barrens with scattered juniper trees in Uintah County, 5,830- to 6,000-foot elevation. Blooms in June. Though it is found in a GRSG population area, this species is not likely to be found in GRSG habitat.	Uintah
Cedar Breaks goldenbush *Haplopappus zionis*	SS	Spruce-fir and ponderosa pine communities in Garfield, Iron, and Kane counties, on limestone, 8,000- to 10,000-foot elevation. Blooms July-August. Though it is found in	Panguitch, Parker Mountain

Table 3.34
BLM and Forest Service Sensitive Species in the Planning Area

Common Name *Scientific Name*	Status[1]	General Habitat	Population Area
		GRSG population areas, this species is not likely to be found in GRSG habitat.	
Canyon sweetvetch *Hedysarum occidentale* var. *acnone*	FS	Open slopes in pinyon-juniper, mountain brush, and sagebrush at 5,000- to 8,000-foot elevation. In Utah, it is located in Carbon, Duchesne, Emery, and San Pete counties. It is likely present within GRSG habitat.	Carbon, Emery, Uintah
Rock hymenoxys *Hymenoxys lapidicola*	SS	Endemic to pinyon-juniper woodland and ponderosa pine vegetation, typically in rock crevices, 6,100- to 8,000-foot elevation in Uintah County. Blooms in June. Though it is found in a GRSG population area, this species is not likely to occur in GRSG habitat.	Uintah
Ostler ivesia *Ivesia shockleyi* var. *ostleri*	SS	Endemic to pinyon-juniper woodland and ponderosa pine communities in the Wah Wah Mountains and Needle Range in western Beaver County, 6,400- to 7,900- foot elevation. Blooms May-August. It is not present in GRSG habitat.	Hamlin Valley
Huber's pepperplant *Lepidium huberi*	SS	Black sagebrush, ponderosa and lodgepole pine, spruce-fir, and mountain brush in sandy soils in Uintah County, 7,300- to 9,700-foot elevation. Blooms June-August. Though it is found in a GRSG population area, this species is not likely to be found in GRSG habitat.	Uintah
Goodrich's blazingstar *Mentzelia goodrichii*	SS/FS	Douglas fir, mountain mahogany, and rabbitbrush along the escarpments of Argyle and Willow Canyons in Duchesne County, 8,100- to 8,800-foot elevation. Blooms July-August. Though it is found in a GRSG population area, this species is not likely to be found in GRSG habitat.	Uintah
Horse Canyon stickleaf *Mentzelia multicaulis librina*	SS	Sagebrush, rabbitbrush, and pinyon-juniper woodland in Carbon and Emery counties at 6,200-foot elevation. Blooms July-September. It is unlikely to occur in GRSG habitat.	Carbon
Kane breadroot *Pediomelum epipsilum*	SS	Pinyon/juniper woodland and desert shrub vegetation in Kane County, 4,000- to 5,500-foot elevation. Blooms May-June.	Panguitch
Stemless penstemon *Penstemon acaulis* var. *acaulis*	SS/FS	Pinyon/juniper woodland and sagebrush habitat in Daggett County, 5,900- to 8,200- foot elevation. Blooms June-July. It is likely to occur in GRSG habitat.	Carbon, Uintah, Strawberry

Table 3.34
BLM and Forest Service Sensitive Species in the Planning Area

Common Name ***Scientific Name***	**Status**[1]	**General Habitat**	**Population Area**
Sweet penstemon *Penstemon angustifolius* var. *dulcis*	SS	Four-wing saltbush, sagebrush, and juniper vegetation in dune sands in Juab and Millard counties, 4,600- to 5,400-foot elevation. Blooms May-June.	Sheeprocks
Gibbens beardtongue *Penstemon gibbensii*	SS	In Utah, found only on steep slopes and Green River bluffs with sparse desert shrub and juniper cover in Daggett County, 5,500-7,500-foot elevation. Blooms in June. Though it is found in a GRSG population area, this species is not likely to occur in GRSG habitat.	Uintah
Goodrich's penstemon *Penstemon goodrichii*	SS	Endemic species, occurs in clay badlands in Duchesne and Uintah counties, with shadscale, juniper, and mountain mahogany, 5,600- to 6,200-foot elevation. Blooms May-June. This species is likely to be found in GRSG habitat.	Uintah
Idaho penstemon *Penstemon idahoensis*	SS	Sagebrush and scattered juniper habitat on white tuff outcrops in Box Elder County, 5,000- to 5,200-foot elevation. Blooms June-July. It is present in GRSG habitat.	Box Elder
Little penstemon *Penstemon parvus*	FS	Restricted to dry open meadows, silver and high-elevation black sagebrush. It is found at 8,500 to 10,000 feet within Garfield, Piute, Sevier and Wayne counties. Though it is found in a GRSG population area, this species is not likely to be found in GRSG habitat.	Parker Mountain, Panguitch
Ward's penstemon *Penstemon wardii*	SS/FS	*Ephedra*, rabbitbrush, shadscale, mountain mahogany, and pinyon-juniper on semi-barren soils in Millard, Sanpete, and Sevier Counties, 5,500- to 6,800-foot elevation. Blooms May-July. Though it is found in a GRSG population area, this species is not likely to be found in GRSG habitat.	Parker Mountain, Emery, Carbon
Argyle Canyon phacelia *Phacelia argylensis*	SS	Pinyon/juniper woodland, serviceberry, and Douglas-fir vegetation in Duchesne County. Though it could occur in a GRSG population area, this species is not likely to be found in GRSG habitat.	Strawberry, Uintah, Carbon
Cronquist's phacelia *Phacelia cronquistiana*	SS	Endemic to clay outcrops in pinyon-juniper woodland, sagebrush, and ponderosa pine communities in Kane County, 6,000- to 6,900-foot elevation. Blooms May-June. Though it could occur in a GRSG population area, this species is not likely to be found in GRSG habitat.	Panguitch

Table 3.34
BLM and Forest Service Sensitive Species in the Planning Area

Common Name ***Scientific Name***	**Status**[1]	**General Habitat**	**Population Area**
Utah phacelia *Phacelia utahensis*	SS	Restricted to salt desert shrub communities on clay hills and banks in Sanpete and Sevier Counties, 5,500- to 6,200-foot elevation. Blooms April-June. Though it may be found in a GRSG population area, this species is not likely to be found in GRSG habitat.	Emery, Carbon
Cottam's cinquefoil *Potentilla cottamii*	SS/FS	Found in shaded cracks and crevices in quartzite from 7,500- to 10,400-foot elevation. Blooms June-August. Though it may be found in a GRSG population area, this species is not likely to be found in GRSG habitat.	Box Elder
Arizona willow *Salix arizonica*	FS	Wet meadows and streamside communities at 8,200 to 10,600 feet in Sanpete and Sevier counties. There could be limited overlap with GRSG habitat.	Parker Mountain, Emery
Caespitose greenthread *Thelesperma caespitosa*	SS/FS	High elevation species in pinyon-juniper woodland and conifer habitats in Duchesne County. Though it may be found in GRSG population areas, this species is not likely to be found in GRSG habitat.	Strawberry, Carbon, Uintah
Uinta greenthread *Thelesperma pubescens*	FS	Found on wind-swept ridges in mountain mahogany, Hickey Mountain vicinity at 8,100 to 8,900 feet in Uinta County. Though it may occur in a GRSG population area, this species is not likely to be found in GRSG habitat.	Uintah
Sigurd townsendia *Townsendia jonesii* var. *lutea*	SS/FS	Salt and mixed desert shrub, pinyon-juniper and sagebrush communities in Juab, Piute, Sanpete, and Sevier counties, 5,500- to 6,300-foot elevation. Blooms May-June.	Parker Mountain, Emery
Strigosa townsendia *Townsendia strigosa* var. *prolixa*	SS	Found on a clay badland mixed desert shrub community in Duchesne County.	Uintah
Kane white tip clover *Trifolium variegatum* var. *parunuweapensis*	SS	Found in sand seeps and moist sandy drainage bottoms with rushes within ponderosa pine and pinyon-juniper woodlands in Kane County. Though it may occur in a GRSG population area, this species is not likely to be found in GRSG habitat.	Panguitch
Sterile yucca *Yucca sterilis*	SS	Uinta Basin endemic species, found in salt desert shrub, juniper, sagebrush, and shadscale vegetation communities in sandy soils from 4,790- to 5,800-foot elevation in Uintah and Duchesne counties. It is likely to occur in GRSG habitat.	Uintah, Strawberry

Table 3.34
BLM and Forest Service Sensitive Species in the Planning Area

Common Name ***Scientific Name***	**Status**[1]	**General Habitat**	**Population Area**
Mussentuchit gilia *Alicielia tenuis*	SS	Though occupied GRSG habitat occurs in the planning area, the species' ranges do not overlap either occupied habitat or GRSG population areas for any of these species.	None
Rabbit Valley gilia *Alicielia caespitosa*	SS		
Desolation Canyon columbine *Aquilegia desolaticola*	SS		
N/A *Arabis goodrichii*	SS		
Cronquist milkvetch *Astragalus cronquistii*	SS		
Stage milkvetch *Astragalus sabulosus vehiculus*	SS		
Dunes four-wing saltbush *Atriplex canescens gigantea*	SS		
Baird cammissonia *Cammissonia bairdii*	SS		
Bolander's camissonia *Camissonia bolanderi*	SS		
Gould cammissonia *Camissonia gouldii*	SS		
Virgin thistle *Cirsium virginensis*	SS		
Goodrich cleomella *Cleomella palmeriana goodrichii*	SS		
Mound cryptanth *Cryptantha compacta*	SS		
Creutzfeldt flower *Crytantha creutzfeldtii*	SS		
Pinnate spring-parsley *Cymopterus beckii*	SS		
Kachina daisy *Erigeron kachinensis*	SS		
Maguire's daisy *Erigeron maguirei*	SS		
Bluff buckwheat *Eriogonum racemosum nobilis*	SS		
Ibex buckwheat *Eriogonum nummulare ammophilum*	SS		
Wirestem buckwheat *Eriogonum pharnaceoides*	SS		

Table 3.34
BLM and Forest Service Sensitive Species in the Planning Area

Common Name *Scientific Name*	Status[1]	General Habitat	Population Area
cervinum			
Scarlet buckwheat *Eriogonum phoenicium*	SS		
Pine Valley goldenbush *Haplopappus crispus*	SS		
Four-petal jamesia *Jamesia tetrapetala*	SS		
Canyonlands lomatium *Lomatium latilobum*	SS		
Culter's lupine *Lupinus caudatus cutleri*	SS		
Dolores rushpink *Lygodesmia grandiflora doloresensis*	SS		
Entrada rushpink *Lygodesmia grandiflora entrada*	SS		
Arapien stickleaf *Mentzelia argillosa*	SS		
Shultz stickleaf *Mentzelia shultziorum*	SS		
Murdock's evening primrose *Oenothera murdockii*	SS		
Barneby's breadroot *Pediomelum aromaticum barnebyi*	SS		
Tuhy breadroot *Pediomelum aromaticum tuhyi*	SS		
Alcove rock-daisy *Perityle specuicola*	SS		
Franklin's penstemon *Penstemon franklinii*	SS/FS		
Pinyon penstemon *Penstemon pinorum*	SS		
Parry's petalonyx *Petalonyx parryii*	SS		
Bluff phacelia *Phacelia indecora*	SS		
Atwood's pretty phacelia *Phacelia pulchella atwoodii*	SS		
House Range primrose *Primula cusickiana domensis*	SS		

Table 3.34
BLM and Forest Service Sensitive Species in the Planning Area

Common Name ***Scientific Name***	**Status**[1]	**General Habitat**	**Population Area**
Jones indigo bush *Psorothamnus polydenius jonesii*	SS		
Chinle chia *Salvia columbariae argillacea*	SS		
Jones globemallow *Sphaeralcea caespitosa caespitosa*	SS		
Jane's globemallow *Sphaeralcea janeae*	SS		
Psoralea globemallow *Sphaeralcea psoraloides*	SS		
Smokey Mountain globemallow *Sphaeralcea grossulariifolia fumariensis*	SS		
White River swertia *Swertia gypsicola*	SS		
Thompson's talinum *Talinum thompsonii*	SS		
Alpine greenthread *Thelesperma windhamii*	SS		
Kanab thelypody *Thelypodiopsis ambigua erecta*	SS		
Beaman's townsendia *Townsendia beamanii*			

Source: Forest Service 2013; BLM Utah State Office IM 2011-037; UDWR 2011, 2013; Utah Native Plant Society 2013; USFWS 2013d; Welsh et al. 2008
[1] CA – Conservation Agreement species
SS – BLM Sensitive Species
FS – Forest Service Sensitive Species
* BLM Added Sensitive Species (not currently on UDWR Sensitive Species List)
** Species also included in **Section 3.10**, Fish and Wildlife

Forest Service

The Forest Service has policy and direction on how wildlife, fish, and plant species and their habitats are managed. These species may be threatened, endangered, or sensitive plants and animals. Direction on how these species should be managed is described in Forest Service Manual 2600, Chapter 2670. The 2670.12 USDA Directives, Departmental Regulation 9500-4 provides regulation and directs the Forest Service to:

- Manage "habitats for all existing native and desired nonnative plants, fish, and wildlife species in order to maintain at least viable populations of such species."

- Conduct activities and programs "to assist in the identification and recovery of threatened and endangered plant and animal species."
- Avoid actions "which may cause a species to become threatened or endangered."

All Forest Plans being considered for amendment or revision under this EIS were developed under the 1982 planning regulations. The NFMA requires the Forest Service to maintain the biodiversity of plant and animal communities. The 1982 planning regulations interpret this law by focusing on the agency's responsibility to provide habitats that support viable populations of native and desired nonnative vertebrates by: (1) having those populations sufficiently well distributed across the planning area; and (2) ensuring sufficient habitats are available to provide for population levels that are likely to persist on National Forest System lands.

These regulations need to be considered in light of a forest's capability to provide these habitats. As an example, GRSG use many National Forests for summer brood-rearing habitat. In these cases, the Forest Service's viability commitment is to ensure habitats are available that allow the persistence of habitats important for this species on National Forest System lands during this life requisite. This includes providing for the distribution of suitable habitats that support those populations when they are dependent on National Forest System lands.

The Forest Service is developing a viability framework that evaluates occupied GRSG habitat within the context of the larger GRSG population, assesses the distribution and quality of habitat on National Forest System lands, and reviews and updates existing Forest Plan direction to ensure that the regulatory mechanisms provide for habitats that allow populations to persist when they depend on National Forest System lands.

The Forest Service has a memorandum of understanding with USFWS (Forest Service Agreement #08-MU-1113-2400-264) that provides management direction for migratory birds and their habitat. Federal land management agencies must consult on any action that may affect a federally listed species (Threatened or Endangered, and if Proposed-conference). Section 7(c)(1) of the Act requires a Biological Assessment be performed if a listed species and/or critical habitat may be present in the action area.

Forest Service Intermountain Region 4 Office maintains and updates a list of known or suspected distribution by forest of threatened, endangered, proposed, and sensitive animal and plant species that are recognized by the Forest Service. Forest Service sensitive species are managed under Forest Service Manual 2600 and have been included in **Table 3.34**. For a complete list of Forest Service sensitive species that were reviewed for inclusion into the planning area see **Appendix P**, Forest Service Biological Evaluation.

Forest Service Management Indicator Species in Utah

The NFMA directs the Forest Service to select certain plants, communities, and vertebrate or invertebrate species to manage for maintenance and improvement of habitat. Requirements to identify and use Management Indicator Species in the decision area and project-level planning were identified under NFMA planning regulations in 1982-219.19(a) (1). Management Indicator Species are species that respond to habitat changes, are scarce or unique, are of high economic interest, or are listed as federal or state threatened or endangered species. By monitoring and

assessing population trends of Management Indicator Species, managers can determine if management actions are affecting species populations. Management Indicator Species are included in the Wildlife Specialist Report for the Greater Sage-Grouse Conservation Effort to amend the Utah National Forest Plans (see Appendix P of the Draft LUPA/EIS). The Forest Service evaluated its responsibility under NFMA and viability by looking at populations and language contained in the COT report and implications to threats to the species on National Forest System lands.

3.9.2 Conditions Statewide

Threatened and Endangered Species

The BLM and Forest Service continue to implement actions that further the conservation, protection, and recovery of listed threatened and endangered species. Consultation with USFWS is a key part of these activities.

Habitat for proposed, petitioned, and candidate, and sensitive plant and animal species continue to be managed in such a manner that actions authorized, funded, or carried out by the BLM and Forest Service reduce the likelihood for special status species to become listed under the ESA.

The BLM and Forest Service maintain some spatial data but also rely on other entities such as Utah Natural Heritage Program, which serves as a data steward for federal agencies. The listed Utah prairie dog and the black-footed ferret inhabit portions of some GRSG population areas. Their habitats are known to overlap, and their habitat requirements tend to be contradictory to some of the habitat requirements (especially winter range) for GRSG. Proposed management actions to protect and enhance GRSG habitat may directly or indirectly impact these federally listed species. Therefore, an expanded discussion regarding the Utah prairie dog and the black-footed ferret is provided below.

Utah Prairie Dog (Cynomys parvidens)

The Utah prairie dog was listed as an endangered species under the ESA, as amended on June 4, 1973. On May 29, 1984, the prairie dog was reclassified as a threatened species (49 *Federal Register* 22330–22334). Historically, the Utah prairie dog was found in portions of Beaver, Garfield, Iron, Juab, Millard, Piute, Sanpete, Sevier, Washington, and Wayne Counties (USFWS 2012). Currently, Utah prairie distribution has significantly declined from historic ranges and is restricted to portions of Iron, Beaver, Garfield, Wayne, and Sevier Counties. Population numbers also have declined from historic highs primarily due to habitat loss and fragmentation, sylvatic plague, drought, poisoning, and other factors. Prairie dog habitat is found in three designated Recovery Units that can be identified geographically and are considered essential habitat for the recovery of the species. The Awapa Plateau Recovery Unit is over 27,000 acres and includes portions of Sevier, Wayne, Garfield, and Piute Counties. The Paunsaugunt Recovery Unit is located primarily in Garfield County and is about 16,000 acres. The West Desert Recovery Unit covers nearly 17,000 acres of mapped habitat primarily in Iron County. There are nearly 60,000 acres of Utah prairie dog habitat among the three Recovery Units, and over 48 percent of these acres are BLM-administered or National Forest System lands.

The preferred habitat of the Utah prairie dog is grasslands and semiarid shrub-steppe. This prairie dog species seeks out moist swale-type landscape formations in its preferred habitat

where vegetation persists even during periods of drought (USFWS 2012, p. 1.6-1). Open habitats are important for the Utah prairie dog for foraging and avoiding predators. Vegetation that is tall and dense decreases prairie dog survival, and therefore they prefer sparse vegetation that allows them to see approaching predators (USDA NRCS 2007). Livestock grazing practices that reduce shrub height and density or vegetation treatments that remove encroaching conifers may enhance prairie dog habitat. The Utah prairie dog inhabits elevations from 6,200 feet on valley floors up to 9,180 feet (USFWS 2012, p. 1.3-3) in mountain mesa habitats. Utah prairie dog habitat covers approximately 550,600 acres of occupied GRSG habitat across the Bald Hills (77,100 acres), Hamlin Valley (11,500 acres), Panguitch (105,800 acres), and Parker Mountain (356,100 acres) population areas. The distribution of Utah prairie dog complexes in relation to GRSG population areas and occupied habitat are presented in **Map 3.9-1**.

Black-footed ferret (Mustela nigripes)

Historically, the black-footed ferrets' range overlapped with black-tailed, white-tailed, and Gunnison's prairie dogs throughout the North American Great Plains, mountain basins, and grasslands. The major declines in occupied prairie dog habitat in the early twentieth century coincided with the rapid decline of the ferret (USFWS 2013). In 1967, the black-footed ferret was listed as endangered in early legislation prior to the ESA; the ferret was officially listed as endangered in the ESA of 1973 (USFWS 2013). The black-footed ferret is intimately tied to prairie dogs (*Cynomys* spp.) and only found in association with prairie dog colonies. In Utah, the white-tailed prairie dog makes up almost all of the black-footed ferrets' diet and the ferret relies on abandoned prairie dog burrows for shelter (UDWR 2003). Utah Gap Analysis data indicates that black-footed ferret critical value habitat overlaps with Uintah, Carbon, and Emery GRSG population areas (Edwards et al. 1997). USFWS established that a minimum of 200 acres of white-tailed prairie dog towns are needed to support the black-footed ferret (USFWS 1986 p. 4.). White-tailed prairie dogs inhabit elevations ranging from 5,000 to 10,000 feet above sea level and prefer areas of desert grasslands and shrub grasslands (USFWS 2010b). White-tail prairie dogs do not maintain short stands of vegetation like black-tailed prairie dogs, but instead they prefer habitats with shrub cover to avoid predation (Keinath 2004). Therefore, the black-footed ferret also inhabits tall shrub grasslands. It has been estimated that 99 to 148 acres of occupied prairie dog habitat is needed to support one adult black-footed ferret (USFWS 2013), and females with litters have never been found on colonies less than 121 acres (USFWS 1988). In 1999, an effort to reintroduce the black-footed ferret in northeastern Utah/northwestern Colorado was initiated by many cooperating agencies, including the BLM (Wolf Creek Work Group 2001). The Coyote Basin experimental population is within the Uintah population area in Uintah and Duchesne Counties, where it has had marginal success as of 2012 (USFWS 2013).

Trends

Special status fish populations have generally been declining throughout Utah. The downward trend is largely due to habitat degradation and loss of habitat complexity caused by erosion, removal of riparian vegetation, and channelization (UDWR 2011). Additionally, increased drought, stream dewatering, and fish barriers pose substantial threats to sensitive aquatic species recovery and contribute to declining numbers. Nonnative predation on and resource competition with special status fish species increasingly threaten native aquatic populations throughout Utah (Wilson and Belk 2001).

In general, special status wildlife populations are also declining across Utah. Degradation of habitat because of human activities and natural resource development are the primary drivers that contribute to the downward trend of sensitive wildlife species in Utah (UDWR 2011). Other factors that contribute to the decline of special status wildlife species in Utah include habitat fragmentation, loss of migratory corridors, reduced gene flow, hybridization, disease, drought, and increased predation/competition with nonnative species (UDWR 2011).

Utah is rich in native flora and is remarkable for its large numbers of endemic and rare plants, which is attributed to the state's diverse range of habitats (UDWR 1998). Little information is available documenting the current trends, habitat conditions, and population size of most special status plant populations throughout the state (UDWR 2005b). Special status animal and plant species that meet specific criteria described in this section receive specific management attention due to concerns about the species' population or habitat. It is assumed that the trend for most of the special status plant populations in the planning area is in decline, most likely because of habitat degradation, increased spread of noxious weeds, and increased drought and wildfire.

As mentioned above, droughts pose a substantial threat to special status species and have had notable impacts on fish, wildlife, and plant species in the planning area. Climate change data from the past 100 years indicate that annual temperatures have been increasing and will continue to increase in the future. See **Section 3.5** for additional details on climate change in the planning area. Drought and other extreme weather effects are also expected to increase in frequency and will likely contribute to impacts on special status plant and animal species and their habitat as climate change continues.

3.10 FISH AND WILDLIFE

This section describes the existing conditions of fish and wildlife resources within the planning area, including aquatic and terrestrial animal species and their habitats.

BLM and Forest Service work closely with the UDWR to manage habitat for fish and wildlife to achieve and maintain suitable habitat for desired population levels and distribution within the decision area. The UDWR is responsible for managing wildlife population levels; the BLM and Forest Service are responsible for managing wildlife and fisheries habitat in a condition that will support desired levels of species. Both work collaboratively with the UDWR to maintain and reestablish populations of native species that have used the historic range located within the decision area boundary through habitat management and restoration.

The fish and wildlife habitats that occur in the decision area are primarily characterized in the soil, water, and vegetation existing conditions discussions in **Sections 3.6**, **3.7**, and **3.8**, respectively. The discussions that follow below identify attributes of these resources that are particularly important to their role in providing habitat. Fish species might be of high interest, economic, and recreational value; however, the proposed management alternatives within this EIS are not likely to have a substantial impact on fish species other than possibly those listed in **Section 3.9**. No proposed or existing management action would reduce protection of streams or riparian habitat. Refer to **Section 3.8** for descriptions of riparian habitats. Specifically, important wildlife species that are managed in the decision area are included in **Table 3.35**. This table lists species of high priority for BLM and Forest Service management efforts due to

their economic value, regulatory status, high public interest, or other qualities. For information regarding special status species as well as Forest Service Management Indicator Species, refer to **Section 3.9**. Also, refer to the Wildlife Specialist Report for the Greater Sage-Grouse Conservation Effort to amend the Utah National Forest Plans, located in **Appendix P**, for more information regarding Forest Service Management Indicator Species.

Table 3.35
Wildlife Species of the Planning Area

Species or Group	Rationale for Key Designation
Birds	
Other migratory birds	High interest, protected by law
Eagles/Hawks/other raptors	High interest, protected by law
Mammals	
Elk[1]	High interest, economic and recreational value
Mule deer[1]	High interest, economic and recreational value
Pronghorn	High interest, economic and recreational value
Moose	High interest, economic and recreational value
Rocky Mountain Bighorn sheep[2]	High interest, economic and recreational value
Bison	High interest, economic and recreational value

Source: UDWR 2013a
[1]Forest Service Management Indicator Species Ashley, Dixie, Fishlake, Manti-La Sal Forest Units.
[2]Forest Service Sensitive Species in the Ashley Forest Unit

3.10.1 Conditions Statewide

The presence and interspersion of many habitat types support a large number of wildlife species throughout the planning area. The discussion of fish and wildlife populations and habitat addresses the entire planning area, not just BLM-administered and National Forest System lands. Since fish and wildlife are mobile and may readily cross these boundaries, it is important to work collaboratively with all landowners and resource agencies to improve fish and wildlife management throughout the planning area.

General Wildlife

According to the UDWR, over 600 vertebrate fish and wildlife species inhabit the state permanently or seasonally (UDWR 2013a). The diversity and populations of fish and wildlife throughout the planning area provide considerable recreational opportunities and economic benefits for the State of Utah. Fish and wildlife game species are an important resource that supports hunting and fishing activities and generated over $62 million in revenue in 2012 for the state (UDWR 2013b). Several species of game and nongame fish are present in water bodies in and adjacent to GRSG habitat. Other nongame wildlife species provide value to the state through birding, photography, and wildlife viewing opportunities.

Migratory Birds

Throughout the decision area, a diversity of bird species use habitats within the region for breeding, nesting, foraging, and migratory habitats. Migratory birds are protected under the Migratory Bird Treaty Act of 1918. Under Executive Order 13186, federal agencies are responsible for implementing the provisions of the Migratory Bird Treaty Act by promoting

conservation principles and management practices into agency activities. Federal agencies must ensure that federal actions are evaluated for potential impacts on migratory birds.

The BLM and USFWS have a memorandum of understanding (BLM MOU WO-230-2010-04), which provides management direction to integrate the conservation of migratory bird species. Similarly, the Forest Service has a memorandum of understanding with USFWS (Forest Service Agreement #08-MU-1113-2400-264), which provides management direction for migratory birds and their habitat. The BLM and Forest Service memoranda of understanding provide direction for evaluating the effects of the agencies' actions on migratory birds through the NEPA process. This includes identifying potential measurable negative effects on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors. In such situations, the BLM or Forest Service would implement approaches to lessen such take.

Many raptor species, including a wide variety of hawks as well as bald and the golden eagles, inhabit the decision area permanently or as migrants. Bald eagles inhabit many GRSG population areas throughout Utah and may overlap GRSG habitat. They are recognized as a sensitive species by the BLM, Forest Service, and the State of Utah. Utah bald eagle winter populations are some of the largest in the US (UDWR 2010a). Bald eagles prefer to nest in tall trees close to open bodies of water with access to fish and waterfowl. Bald eagles are known to use sagebrush habitats such as deer winter range, where they often forage for deer and other mammal carcasses during winter months and to a lesser extent throughout the year. For more information on eagles, refer to **Section 3.9**. Golden eagles are common year-round residents of Utah and are found near mountainous areas in open country (UDWR 2013a). Nesting occurs on cliffs or large trees throughout the decision area (UDWR 2013a). Golden eagles are the primary avian predators of GRSG; hawks (*Buteo* spp.) also prey on GRSG (Boyko et al. 2004; Dinkins et al. 2012).

USFWS Birds of Conservation Concern identifies nongame birds, gamebirds without hunting seasons, as well as ESA candidate, proposed threatened or endangered, and recently delisted birds (USFWS 2008). The list of Utah Birds of Conservation Concern include species from Bird Conservation Regions 9 (Great Basin), 10 (Northern US Rockies), and 16 (Colorado Plateau). Bird Conservation Region 9 overlaps with GRSG population areas on the western half of the state and includes the Box Elder, Ibapah, Hamlin Valley, Sheeprocks, and Bald Hills population areas. Region 16 covers the eastern half of the state occurring in the Rich, Strawberry, Uintah, Carbon, Emery, and Parker Mountain population areas. A relatively small portion of the northeastern corner of the state overlaps with Region 10 in the Rich, Uintah, Lucerne, Wyoming-Uinta, and Wyoming-Blacks Fork population areas. In addition, the Utah Partners in Flight avian conservation strategy for Utah identifies "priority species" for conservation based on declining populations or distribution, or vulnerability to various local and/or range-wide risk factors (Parrish et al. 2002). One application of the strategy and priority list is to give these birds specific consideration when analyzing effects of proposed management actions and to implement recommended conservation measures where appropriate.

USFWS (2008) Birds of Conservation Concern list for species in Bird Conservation Regions 9, 10, and 16 as well as priority bird species that could inhabit the GRSG population areas identified in the Utah Partners in Flight Avian Conservation Strategy (Parrish et al. 2002) are

included in **Table 3.36**. The Utah Partners in Flight includes five physiographic regions or strata that include Great Basin, Wyoming Plateau, Utah Mountains, Colorado Plateau, and Mojave Desert. Great Basin Physiographic Region overlaps with Box Elder, Ibapah, Hamlin Valley, Sheeprocks, and Bald Hills population areas. Wyoming Plateau Physiographic Region includes Rich, Uintah, Lucerne, Wyoming-Uinta, and Wyoming-Blacks Fork Population Areas. Utah Mountain Physiographic Region overlaps with Rich, Strawberry, Uintah, Carbon, Emery, Parker Mountain, Bald Hills, and Panguitch population areas. Colorado Plateau includes Uintah, Strawberry, Carbon, and Emery population areas. Bird species listed in the Mojave Desert region of Washington County are not included in **Table 3.36**, as that region is outside of the decision area.

Table 3.36
Utah Partners in Flight Priority Species and USFWS Birds of Conservation Concern Species and Habitat

Species	Bird of Conservation Concern	Utah Partners in Flight	1st Breeding Habitat	2nd Breeding Habitat	Winter Habitat
American avocet		X	Wetland	Playa	Migrant
American bittern	X		Wetland	Wetland	Migrant
American white pelican		X	Water	Wetland	Migrant
Bald eagle	X		Lowland riparian	Agriculture	Lowland riparian
Bendire's thrasher	X	X	Low desert scrub	Low desert scrub	Migrant
Black rosy-finch	X	X	Alpine	Alpine	Grassland
Black swift	X	X	Lowland riparian	Cliff	Migrant
Black-chinned sparrow	X		Low desert scrub	High desert scrub	Migrant
Black-necked stilt		X	Wetland	Playa	Migrant
Black-throated gray warbler		X	Pinyon-juniper	Mountain shrub	Migrant
Bobolink		X	Wet meadow	Agriculture	Migrant
Brewer's sparrow	X	X	Shrubsteppe	High desert scrub	Migrant
Broad-tailed hummingbird		X	Lowland riparian	Mountain riparian	Migrant
Brown-crested flycatcher		X	Cliffs	Caves	Alpine tundra,
Burrowing owl	X		High desert scrub	Grassland	Migrant
Cassin's finch	X		Aspen	Sub-alpine conifer	Lowland riparian
Chestnut-collared longspur	X		Short-grass plains	Prairies	Open cultivated fields
Cordilleran flycatcher		X	Sub-alpine conifer	Mountain riparian	Migrant
Eared grebe	X		Wetland	Water	Water
Ferruginous hawk	X	X	Pinyon-juniper	Shrubsteppe	Grassland
Flammulated owl	X		Ponderosa pine	Sub-alpine conifer	Migrant

Table 3.36
Utah Partners in Flight Priority Species and USFWS Birds of Conservation Concern Species and Habitat

Species	Bird of Conservation Concern	Utah Partners in Flight	1st Breeding Habitat	2nd Breeding Habitat	Winter Habitat
Gambel's quail		X	Low desert scrub	Lowland riparian	Low desert scrub
Golden eagle	X		Cliff	High desert scrub	High desert scrub
Grace's warbler	X		Ponderosa pine	Mixed conifer	Migrant
Grasshopper sparrow	X	X	Grassland	Grassland	Migrant
Gray flycatcher		X	Pinyon-juniper	High desert scrub	Migrant
Gray vireo	X	X	Pinyon-juniper	Northern oak	Migrant
Greater Sage-Grouse	X	X	Shrubsteppe	Shrubsteppe	Shrubsteppe
Green-tailed towhee	X		Mountain shrub	High desert scrub	Migrant
Juniper titmouse	X		Pinyon-juniper	Pinyon-juniper	Pinyon-juniper
Lewis's woodpecker	X	X	Ponderosa pine	Lowland riparian	Oak
Loggerhead shrike	X		High desert scrub	Pinyon-juniper	High desert scrub
Long-billed curlew	X	X	Grassland	Agriculture	Migrant
Lucy's warbler		X	Lowland riparian	Low desert scrub	Migrant
Marbled godwit	X		Wetland	Playa	Migrant
McCown's longspur	X		Shortgrass prairie and native grassland	Plowed and stubble fields, and bare or nearly bare ground	Shortgrass prairie and native grassland
Mountain plover	X	X	High desert scrub	High desert scrub	Migrant
Olive-sided flycatcher	X		Sub-alpine conifer	Ponderosa pine	Migrant
Peregrine falcon	X		Cliff	Lowland riparian	Wetland
Pinyon jay	X		Pinyon-juniper	Ponderosa pine	Pinyon-juniper
Prairie falcon	X		Cliff	High desert scrub	Agriculture
Sage sparrow	X	X	Shrubsteppe	High desert scrub	Low desert scrub
Sage thrasher	X		Shrubsteppe	High desert scrub	Migrant
Sharp-tailed grouse		X	Shrubsteppe	Grassland	Shrubsteppe
Snowy plover	X		Playa	Playa	Migrant
Spotted owl (Mexican)		X	Cliff	Lowland riparian	Cliff
Swainson's hawk	X		Agriculture	Aspen	Migrant
Three-toed woodpecker		X	Sub-alpine conifer	Lodgepole pine	Sub-alpine conifer

Table 3.36
Utah Partners in Flight Priority Species and USFWS Birds of Conservation Concern Species and Habitat

Species	Bird of Conservation Concern	Utah Partners in Flight	1st Breeding Habitat	2nd Breeding Habitat	Winter Habitat
Upland sandpiper	X		Native prairie and other dry grasslands	Cropland	Shortgrass prairie
Veery	X		Lowland riparian	Lowland riparian	Migrant
Virginia's warbler	X	X	Oak	Pinyon-juniper	Migrant
Williamson's sapsucker	X		Sub-alpine conifer	Aspen	Migrant
Willow flycatcher	X		Lowland riparian	Mountain riparian	Migrant
Yellow-billed cuckoo	X	X	Lowland riparian	Agriculture	Migrant

Sources: USFWS 2008; Parrish et al. 2002

Big Game

Big game, including elk (*Cervus canadensis*), mule deer (*Odocoileus hemionus*), pronghorn (*Antilocapra americana*), moose (*Alces alces*), bighorn sheep (*Ovis canadensis*), and bison (*Bison bison*), are among the species that use habitat in the planning area. The following wildlife maps provide big game habitat distributions within the planning area (**Map 3.10-1** through **Map 3.10-4**). These big game species are supported by the diversity of habitat and availability of essential resources throughout the decision area. The success of big game species can be attributed to habitat conditions, the availability of resources, and the level of human disturbance activities. There are critical periods during an animal's life cycle when they are particularly vulnerable to disturbances related to human activities. The State of Utah has divided the big game ranges into two categories, those having substantial value and those having crucial value. Substantial value habitat is defined as habitat used by wildlife species that is not vital for the population's survival, as degradation of lack of substantial value habitat will not result in species decline. Crucial value habitat is defined as that essential to the life history requirements of a wildlife species survival because there are no alternative ranges or habitats available. Degradation or unavailability of crucial habitat will lead to significant declines in carrying capacity and/or numbers of wildlife species in question. An example of this is crucial winter range, where big game migrate to lower elevations and can compete for limited resources, which can limit mule deer populations (UDWR 2005b). Big game are also vulnerable during fawning and calving periods, as mothers tend to their young by providing food resources and protection from predators. Loss of crucial winter range and fawning/calving habitat throughout the decision area prevents the big game herds from achieving UDWR management objectives (UDWR 2006a, 2006b, 2006c, 2006d). Current statewide big game population management goals are to maintain healthy populations, conserve and protect habitat, and provide diverse recreation opportunities for hunting and viewing big game throughout the state.

Conditions in Population Areas

Big game data are provided in tabular format to succinctly describe the acres of important habitat within each GRSG population area. As mentioned above, big game populations are sensitive to disturbances during winter and fawning/calving periods. Therefore, acres of crucial winter and fawning/calving habitat for elk, mule deer, pronghorn (antelope), moose, and bison are provided where possible. Acres of big game habitat that overlap with GRSG occupied, winter, and brood-rearing habitat are also provided where possible. No data were available for bighorn sheep; refer to **Table 3.34** for general habitat descriptions. Bighorn sheep habitat overlaps with a very small portion of GRSG habitat likely in the Panguitch Population Area.

Elk

Elk were historically abundant throughout Utah and a common game animal before Euroamerican settlement of the state. By the late 1800s, most of the elk were extirpated through uncontrolled hunting practices. Major elk reintroduction efforts were initiated in the early part of the 1900s and continued through the 1980s (UDWR 2010b). **Table 3.37** includes the crucial habitat areas in low-elevation sagebrush communities that overlap with GRSG population areas (also see **Map 3.10-1**). The majority of crucial winter habitat for elk in the decision area occurs in the northern half of the state. Uintah and Rich population areas account for the greatest overlap between crucial winter elk habitat and overall GRSG habitat (occupied, winter, and brood rearing). Elk calving habitat that occurs within GRSG occupied habitat in the Wyoming-Uinta population area. Rocky Mountain elk are considered Forest Service Management Indicator Species in the Ashley, Dixie, Fishlake, and Manti-La Sal National Forests.

Mule Deer

Similar to elk, mule deer were common and abundant during the early settlement period in the region (UDWR 2008a). Unregulated hunting forced the state to close mule deer hunting in 1908 until 1934 when limited harvests were permitted. Since that time, mule deer populations have fluctuated, and management efforts have had to adjust harvest permits accordingly. Crucial deer ranges in the state lack the availability of young plants as mature stands of conifer trees and shrubs (including sagebrush) dominate those habitats (UDWR 2008a). Habitat treatment efforts to revert sagebrush communities to young shrub habitat are essential for mule deer to reach their maximum population objectives (UDWR 2008a). Mule deer crucial winter and fawning habitat overlaps with the majority of GRSG habitat population areas (**Table 3.38**; **Map 3.10-2**). The greatest occurrence of mule deer crucial winter habitat and GRSG habitat is in the Parker Mountain and Uintah population areas. Mule deer fawning habitat that overlaps with GRSG habitat is greatest in the Rich and Uintah population areas. Little or no mule deer habitat (crucial winter or fawning) occurs within the Hamlin Valley, Wyoming-Uinta, and Wyoming-Blacks Fork population areas. Mule deer are considered Forest Service Management Indicator Species in the Ashley, Dixie, Fishlake, and Manti-La Sal National Forests.

Pronghorn (antelope)

Historically, pronghorn populations were abundant, and they inhabited much of the western US. As human land use modifications decreased habitat availability, it is estimated that pronghorn populations declined more than 99 percent by the early 1900s (UDWR 2009b). In Utah, pronghorn inhabited Beaver County and Daggett County. Transplant efforts in the state that

Table 3.37
Crucial Winter and Calving Elk Habitat in the Planning Area (acres)

Population Area	Crucial Winter				Calving			
	Population Area (acres)	GRSG Habitat			Population Area	GRSG Habitat		
		Occupied Habitat	Winter	Brood-Rearing		Occupied Habitat	Winter	Brood-Rearing
Uintah	916,500	596,800	233,700	582,300	0	0	0	0
Lucerne	36,900	31,000	40	31,000	0	0	0	0
Carbon	338,600	150,400	75,200	56,100	0	0	0	0
Emery	2,580	150	0	0	0	0	0	0
Parker Mountain	246,300	139,300	31,400	139,300	0	0	0	0
Panguitch	0	0	0	0	0	0	0	0
Bald Hills	0	0	0	0	0	0	0	0
Hamlin Valley	0	0	0	0	0	0	0	0
Sheeprocks	4,400	4,300	4,300	4,300	0	0	0	0
Ibapah	31,900	18,500	18,500	18,500	0	0	0	0
Box Elder	36,500	36,500	19,900	34,600	0	0	0	0
Rich	415,300	275,738	234,000	255,700	0	0	0	0
Strawberry	138,846	95,600	67,100	95,600	0	0	0	0
Wyoming-Uinta	0	0	0	0	22,900	18,000	0	0
Wyoming–Blacks Fork	0	0	0	0	0	0	0	0

Source: UDWR 2012c; WGFD 2012

Table 3.38
Crucial Winter and Fawning Mule Deer Habitat in the Planning Area (acres)

Population Area	Crucial Winter				Fawning			
	Population Area (acres)	GRSG Habitat			Population Area	GRSG Habitat		
		Occupied Habitat	Winter	Brood-Rearing		Occupied Habitat	Winter	Brood-Rearing
Uintah	721,400	481,400	235,800	470,500	612,200	407,100	125,500	400,500
Lucerne	34,600	28,700	9,700	28,700	5,700	5,700	50	5,700
Carbon	351,600	206,200	127,300	106,700	389,000	161,500	134,100	152,400
Emery	160,800	53,200	52,300	53,200	172,800	42,800	32,200	42,800
Parker Mountain	705,500	509,900	155,100	507,800	135,000	86,500	6,300	77,700
Panguitch	280,000	144,000	30,200	109,300	6,200	6,200	900	6,200
Bald Hills	267,500	145,900	5,500	125,200	0	0	0	0
Hamlin Valley	0	0	0	0	0	0	0	0
Sheeprocks	13,500	5,900	5,900	5.900	0	0	0	0
Ibapah	6,400	2,800	2,800	2,800	0	0	0	0
Box Elder	254,400	233,900	105,900	212,500	297,700	228,200	64,400	228,200
Rich	445,500	445,500	352,100	422,000	1,006,200	610,200	463,900	592,800
Strawberry	103,610	73,900	59,100	73,900	6,900	4,500	385	4,500
Wyoming-Uinta	0	0	0	0	0	0	0	0
Wyoming–Blacks Fork	30	30	0	0	0	0	0	0

Source: UDWR 2012c; WGFD 2012

were initiated in the mid-1900s and into the present have increased pronghorn distributions into suitable desert habitats (UDWR 2009b). The availability of pronghorn forage (succulent forbs and grasses), which is lost because of maturing sagebrush habitat, is the main limiting factor concerning pronghorn in Utah (UDWR 2009b). Habitat enhancement and changes in spring grazing management is needed to improve or maintain the carrying capacity of pronghorn. Parker Mountain and Panguitch population areas account for the only pronghorn crucial winter habitat that occurs within GRSG habitat (**Table 3.39**; **Map 3.10-3**). The northeastern population areas, including Uintah, Lucerne, and Carbon, have the greatest pronghorn fawning habitat that overlaps with GRSG habitat. It should be noted that crucial seasonal habitats have not been identified for pronghorn (antelope) throughout the state. **Table 3.39** only shows those areas that have been identified as crucial winter or crucial fawning habitat.

Moose

Moose naturally migrated into Utah in the early 1900s from Idaho and Wyoming. They settled in the Uinta Mountains, and by 1947, a resident herd was established on the North Slope (UDWR 2010c). Moose have expanded their range over the mountainous areas of northern Utah where they tend to live throughout the year. The availability of suitable habitat limits moose in Utah. Winter conditions do not limit moose in Utah, as they are well adapted to tolerate cold temperatures and snow (UDWR 2010c). Crucial winter habitat for moose occurs within the northcentral regions in the Rich and Carbon GRSG population areas (**Table 3.40**; **Map 3.10-4**). The majority of moose calving habitat that occurs in GRSG habitat occurs within the Parker Mountain and Rich population areas.

Bison

Utah bison herds were historically abundant throughout the state then rapidly declined with the early European settlement of the region. In 1845, the last of the Utah Valley bison died in a severe winter storm (Lupo 1996). Bison reintroduction efforts by the Ute Indian Tribe in northern Utah were initiated in 1986 on the Uintah and Ouray Reservation (UDWR 2007). Currently, bison inhabit only the Uintah GRSG population area within the decision area (**Map 3.10-4**). Yearlong bison habitat occurs in 773,400 acres of the Uintah Population Area that overlaps with GRSG occupied habitat (425,300 acres), winter habitat (773,400 acres), and brood-rearing habitat (425,300 acres).

Trends

Migratory Birds

In general, across North America and the Western Hemisphere, avian populations have declined, particularly neotropical migratory birds (Parrish et al. 2002). These declines are largely attributed to the loss of habitat due to fragmentation and other landscape modifications, including urbanization. The majority of human-induced changes in bird populations and distributions have occurred in the recent past. Other primary factors that are associated with migratory bird species declines include natural disasters, loss or alteration of habitat in nonbreeding areas and along migratory routes, and brood parasitism (Parrish et al. 2002).

Table 3.39
Crucial Winter and Fawning Pronghorn (antelope) Habitat in the Planning Area (acres)

Population Area	Crucial Winter				Fawning			
	Population Area (acres)	GRSG Habitat			Population Area	GRSG Habitat		
		Occupied Habitat	Winter	Brood-Rearing		Occupied Habitat	Winter	Brood-Rearing
Uintah	0	0	0	0	293,000	243,800	219,800	241,300
Lucerne	0	0	0	0	28,900	28,800	9,200	28,800
Carbon	0	0	0	0	27,400	19,300	19,300	19,300
Emery	0	0	0	0	0	0	0	0
Parker Mountain	167,700	160,000	95,400	160,000	102,300	102,300	20,200	102,300
Panguitch	6,100	5,600	3,800	5,600	0	0	0	0
Bald Hills	0	0	0	0	0	0	0	0
Hamlin Valley	0	0	0	0	0	0	0	0
Sheeprocks	0	0	0	0	0	0	0	0
Ibapah	0	0	0	0	0	0	0	0
Box Elder	0	0	0	0	0	0	0	0
Rich	0	0	0	0	0	0	0	0
Strawberry	0	0	0	0	0	0	0	0
Wyoming-Uinta	0	0	0	0	0	0	0	0
Wyoming–Blacks Fork	0	0	0	0	100	100	0	0

Source: UDWR 2012c; WGFD 2012

Table 3.40
Crucial Winter and Calving Moose Habitat in the Planning Area (acres)

Population Area	Crucial Winter				Calving			
	Population Area (acres)	GRSG Habitat			Population Area	GRSG Habitat		
		Occupied Habitat	Winter	Brood-Rearing		Occupied Habitat	Winter	Brood-Rearing
Uintah	0	0	0	0	0	0	0	0
Lucerne	4,200	4,200	0	4,200	0	0	0	0
Carbon	382,800	151,000	133,300	143,200	18,600	9,900	9,700	9,600
Emery	210,600	85,400	74,00	85,400	14,200	3,800	3,800	3,800
Parker Mountain	0	0	0	0	105,400	59,800	2,400	58,100
Panguitch	0	0	0	0	0	0	0	0
Bald Hills	0	0	0	0	0	0	0	0
Hamlin Valley	0	0	0	0	0	0	0	0
Sheeprocks	0	0	0	0	0	0	0	0
Ibapah	0	0	0	0	0	0	0	0
Box Elder	0	0	0	0	0	0	0	0
Rich	673,600	433,800	317,200	418,300	58,500	19,600	16,300	9,000
Strawberry	189,305	113,900	56,500	113,900	7,300	20	0	20
Wyoming-Uinta	0	0	0	0	0	0	0	0
Wyoming–Blacks Fork	0	0	0	0	0	0	0	0

Source: UDWR 2012c; WGFD 2012

According to the Utah Avian Conservation Strategy, more than 400 species of birds within Utah have been identified. Of these 400 species, 231 have been recognized as regular breeders in the state and in need of consideration in the Utah Avian Conservation Strategy process. Of these 231 species, 132 (57 percent) are neotropical migratory birds, and 29 (12 percent) are considered state sensitive species, two of which are also federally listed as endangered and four of which are federally listed as threatened (Parrish et al. 2002). Primary and secondary breeding habitat preferences were identified for each of the 231 species. Primary habitat is considered to be the nesting habitat most commonly used by a species; secondary breeding habitat is the second most common. Winter habitat preferences were also identified.

The priority bird species identified by the Utah Partners in Flight Avian Conservation Strategy presented in **Table 3.36** were selected based on evaluating multiple criteria and applying a ranking system (Parrish et al. 2002). These criteria included a number of global and regional metrics as well as population trends from the Breeding Bird Survey database to rate the level of species vulnerability. In general, the population trends for Utah Partners in Flight avian priority species (**Table 3.36**) were ranked above the moderate level of vulnerability (Parrish et al. 2002).

Trends for bald and golden eagles appear to be improving. Nationally, population numbers have increased from 4,000 bald eagles in the 1960s to over 13,000 wintering birds presently (UDWR 2010a). In Utah, bald eagles were extirpated by the early 1980s, but recovery efforts have resulted in a steady increase of bald eagle pairs in the state, which were estimated to be at 11 nests as of 2007 (Center for Biological Diversity 2007). The golden eagle is being considered in Utah by UDWR (2013), and trend data indicate that their populations are increasing in the state because of higher overall precipitation trends (HawkWatch 2010). However, recent trend data suggest that golden eagles may be declining, particularly in the West Desert; the decline is at least partially attributed to the invasion and expansion of cheatgrass and the related increase in wildfire frequency (HawkWatch 2013).

Big Game

Elk are very well established in Utah and inhabit all of the GRSG population areas except for Panguitch, Bald Hills, Hamlin Valley, and Wyoming-Black Fork (**Table 3.37**). Between the mid-1970s to 1990, Utah elk herds grew from an estimated 18,000 elk to 58,000 elk. This rapid population increase was attributed to elk numbers that were well below the carrying capacity and habitat that could support larger populations. More recently, Utah elk numbers have substantially decreased and are at or near the population objective (UDWR 2010b). There are site-specific areas where numbers may exceed objectives. For example, in the Carbon Population Area elk herds currently exceed objectives and, combined with other grazing herbivores (e.g., wild horses and livestock), could affect GRSG. As of 2010, statewide elk populations have been reported at approximately 68,000 animals (UDWR 2010b). The statewide elk population will likely remain at its current level unless management plans increase the population objectives.

In general, Utah mule deer populations have been declining since the late 1970s. Habitat loss is the primary cause for this declining trend, which increases the populations risk to other factors including disease and predation (UDWR 2008a). The recovery of mule deer populations in Utah would require a comprehensive restoration effort that addresses crucial deer habitats (winter

and fawning) and considers climate shifts toward hotter and drier weather in the restoration design. The most recent population estimate for mule deer in Utah was 302,000 deer in 2007, well below the long-term management objective of 426,000 deer (UDWR 2008a). Mule deer inhabit all GRSG population areas except for Hamlin Valley, Wyoming-Uinta, and Wyoming-Black Fork (**Table 3.38**).

Pronghorn habitat that lacks suitable forage (forbs and grasses) is the primary limiting factor as sagebrush ranges and other desert browse habitats mature and lose understory forage. Maintaining or increasing the carrying capacity of suitable habitat for pronghorn would require extensive range improvements and changes to livestock grazing practices (UDWR 2009b). Pronghorn populations statewide were estimated at approximately 12,000 to 14,000 pronghorn areas across Utah (UDWR 2009b). Current management efforts include population augmentation and reintroduction of pronghorn into suitable historic habitats. Some subunits are meeting population objectives, and populations are managed through permitted doe/fawn hunts, trapping, or both (UDWR 2009b). Activities associated with energy development could sever pronghorn migration corridors and affect winter pronghorn distributions on winter ranges. Pronghorn inhabit the Uintah, Lucerne, Carbon, Parker Mountain, Panguitch, and Wyoming-Black Fork population areas (**Table 3.39**). The changes in distribution could change the capacity of those ranges to support pronghorn. Drought would exacerbate the direct and indirect effects from surface disturbances (UDWR 2009b).

Moose are well established in the northern half of Utah, with the majority of the moose existing on nine management units (UDWR 2010c). The most recent statewide population estimate in Utah was 3,200 animals in 2010. Generally, moose populations have been increasing since the late 1950s, with an average annual growth rate of 1.12 percent from 1957 to 1991. From 1992 to 1996, moose populations declined likely because of the severely cold winter of 1992 to 1993 and moose populations exceeding carrying capacity on some management units. During the late 1990s and early 2000s, moose population again grew and reached a record population size of nearly 4,000 moose in 2005. Since 2005, the moose population has been intentionally reduced due to habitat degradation concerns (UDWR 2010c). The main factor that limits moose populations in the state is the quantity and quality of available habitat. Moose occupy habitat in the Uintah, Lucerne, Carbon, Emery, Parker Mountain, Rich, and Strawberry GRSG population areas (**Table 3.40**). Population trends for moose vary considerably, with some herds increasing rapidly whereas others are stable or declining. Herds in northern Utah may be reaching or exceeding carrying capacity, and harvest has been used to stabilize or decrease those populations. In the more southern moose units in Utah, some natural expansion continues to occur, but it is relatively limited (UDWR 2010c).

Rocky Mountain bighorn sheep currently exist in the northern half of the state because of transplant efforts (UDWR 2008b). Bighorn sheep inhabit the Uintah, Carbon, Ibapah, and Box Elder GRSG population areas (**Table 3.41**). The most recent population estimate for Rocky Mountain bighorns in Utah is approximately 1,900 sheep as of 2008. Of those, approximately 450 are found on National Park Service or tribal lands. Desert bighorn sheep are native to Utah and occupy open rocky areas of desert mountain ranges in the southern area of the state. Desert bighorns are also known to inhabit sagebrush, low sage, pinyon-juniper alpine, dwarf-

Table 3.41
Crucial Winter and Lambing Bighorn Sheep Habitat in the Planning Area

Population Area	Crucial Winter (acres)				Lambing (acres)			
	Population Area	GRSG Habitat			Population Area	GRSG Habitat		
		Occupied Habitat	Winter	Brood-Rearing		Occupied Habitat	Winter	Brood-Rearing
Uintah	476,379	110,995	13,233	110,959	0	0	0	0
Lucerne	0	0	0	0	0	0	0	0
Carbon	211,486	63,549	62,014	25,452	0	0	0	0
Emery	0	0	0	0	0	0	0	0
Parker Mountain	0	0	0	0	0	0	0	0
Panguitch	0	0	0	0	0	0	0	0
Bald Hills	0	0	0	0	0	0	0	0
Hamlin Valley	0	0	0	0	0	0	0	0
Sheeprocks	0	0	0	0	0	0	0	0
Ibapah	24,935	13,648	13,648	13,648	0	0	0	0
Box Elder	41,948	34,760	34,760	34,764	0	0	0	0
Rich	0	0	0	0	0	0	0	0
Strawberry	0	0	0	0	0	0	0	0
Wyoming-Uinta	0	0	0	0	0	0	0	0
Wyoming–Blacks Fork	0	0	0	0	0	0	0	0

Source: UDWR 2012c; WGFD 2012

shrub, and a variety of desert habitats (Zeiner et al 1990). California bighorns currently exist in Utah; however, their habitat does not overlap with GRSG habitat. Many diseases and parasites are among the primary concerns for management of bighorn sheep in Utah. Bighorn sheep that are exposed to domestic sheep and goats can severely impact wild sheep populations through disease outbreaks (UDWR 2008b). Predation especially from mountain lions and habitat loss also threaten Rocky Mountain bighorn populations. Rocky Mountain bighorn sheep are also considered a Forest Service Sensitive Species in the Ashley Forest Unit.

In 1996, bison were reintroduced in the Book Cliffs of Uintah and Grand Counties; bison may inhabit the Uintah GRSG population area. The initial reintroduction of six head was followed by other Ute Tribal releases to establish a viable herd (UDWR 2007). Since their reintroduction by the Ute Indian Tribe two decades ago, bison have repopulated the Hill Creek Extension of the Uintah and Ouray Indian Reservation. They have recently begun to naturally extend across historic ranges in the Book Cliffs. As of 2006-2007, the winter Ute bison population is estimated at approximately 580 head (UDWR 2007). Disease transmitted by domestic livestock is the primary threat to Utah bison populations in their limited range (UDWR 2007). Competition for forage and habitat with cattle also impact bison populations.

Climate Trends

Severe droughts have had notable impacts on wildlife populations in the planning area. In 2003, Utah was in the fifth year of an extended drought, and Utah recorded the driest year on record and the hottest month on record (July) in 2002 (UDWR 2008b). The hottest month record was broken again in July of 2003. The result of extended drought conditions was poor fawn production and the degradation and loss to wildfire of many crucial winter ranges. In recent years, weather patterns have moderated in portions of the state and in those areas the deer and other wildlife grazers have slowly increased in number. Climate change data indicate that annual temperatures have increased over the past 100 years and that climate change and the effects of climate change are expected to continue into the future. Drought and other extreme weather effects are also expected to increase in frequency and will likely contribute to impacts on fish and wildlife species and their habitat as climate change continues. See **Section 3.5** for additional details on climate change in the planning area.

3.11 WILD HORSES AND BURROS

The Wild Free-Roaming Horses and Burros Act of 1971 (16 USC 1331 et seq.) gave the BLM and Forest Service the responsibility to protect, manage, and control wild horses and burros as an integral part of the natural system of public lands.

The general management objectives for wild horses and burros are to (1) protect, maintain, and control viable, healthy herds with diverse age structures while retaining their free-roaming nature; (2) provide adequate habitat through the principles of multiple use and environmental protection; (3) maintain a thriving natural ecological balance with other resources; (4) provide opportunities for the public to view wild horses and burros; and (5) protect wild horses and burros from unauthorized capture, branding, harassment, or death.

The 53.8 million acres across the western US where wild horses or burros were found roaming at the time the 1971 Wild Free-Roaming Horses and Burros Act was passed are known as herd areas (HAs). A subset of these areas (approximately 31.6 million acres nationwide in 2012) have

been determined suitable for long-term management of wild horses and burros and are known as HMAs. Wild horses and burros within HMAs are managed with the goal of maintaining sustainable ecological conditions and multiple-use relationships on federal lands. Both HAs and HMAs can include private or state lands, but the BLM has management authority only over public lands. The Forest Service administers 37 wild horse territories in Arizona, California, Nevada, New Mexico, Oregon, and Utah. The Forest Service collaborates with the BLM in the management of adjacent territories as well as the removal of wild horses and burros in excess of the territory capacity.

Wild horse and burro populations are managed within AMLs, the point at which wild horse and burro herd populations are consistent with the land's capacity to support them. The AML is a range of low to maximum levels that allows for population growth over a 4- to 5-year period. In the context of its multiple-use mission, AML is the level at which wild horses and burros can thrive in balance with other public land uses and resources, including vegetation and wildlife. Each HMA has its own AML. When the AML is exceeded, populations of wild horses and burros are examined to determine if population control methods are required.

Methods of herd population control include periodic gathers and removal to short-term holding and adoption or long-term holding, as well as methods of population growth suppression, including treatment with fertility control drugs where approved. The initiation of gathering or other population growth suppression is based on inventory data, herd health, rangeland health, climatic conditions, and occurrence of catastrophic events such as wildland fire and drought.

3.11.1 Conditions Statewide

Data are provided below for Utah. A breakdown of acres on BLM-administered or National Forest System lands is provided as appropriate. Additional details are included for lands within GRSG habitat.

In Utah, close to 2,500 wild horses and over 150 burros roam freely within 19 HMAs, two of which have burros. The areas range from 37,000 to 293,000 acres and animal numbers within the areas vary from 10 to over 450 (**Table 3.42**). Each year the excess animals are offered for adoption at various facilities around the state (**Table 3.43**).

Of the HMAs (2,072,139 acres) in the planning area, portions of seven HMAs (Bible Spring, Chokecherry, Four Mile, Onaqui Mountain Range Creek, Sulphur and Tilly Creek) and a total of 373,000 acres fall within mapped occupied habitat (see **Table 3.42** and **Map 3.11-1**). HMAs are concentrated in a few population areas, notably Hamlin Valley and a portion of Sheeprocks and Carbon population areas.

In addition, there are two Forest Service wild horse territories in the state. The Big Creek Wild Horse Territory (10,000 acres) is administered by the Salt Lake Ranger District, Uinta-Wasatch-Cache National Forest. The North Hills Wild Horse Territory is administered by the Dixie National Forest, Pine Valley Ranger District and consists of approximately 24,029 acres. The North Hills Wild Horse Territory is managed in cooperation with the BLM's adjacent North Hills HMA, which comprises about 49,900 acres of BLM-administered, state, and private lands. Together, the combined area is referred to as the North Hills Wild Horse Management Plan Area. Neither wild horse territory overlaps mapped occupied habitat.

Table 3.42
Wild Horses and Burros Herd Management Areas in the Planning Area

Herd Management Area	Current Herd Size (2014 estimate)		Appropriate Management Level		Total Planning Area (acres)	BLM Acres in Planning Area	BLM Acres within GRSG Population Areas	BLM Acres within Mapped Occupied Habitat	GRSG Population Area(s)
	Horses	Burros	Horses	Burros					
Bible Spring	348	0	60	0	61,900	56,600	10,000	0	Hamlin Valley
Canyon Lands	0	131	0	100	89,400	77,300	0	0	N/A
Cedar Mountain	596	0	390	0	211,600	112,400	0	0	N/A
Chloride Canyon	36	0	30	0	63,700	42,500	0	0	N/A
Chokecherry	43	0	30	0	48,100	39,900	37,300	19,000	Hamlin Valley
Confusion	270	0	115	0	293,700	256,900	0	0	N/A
Conger	130	0	80	0	171,000	151,600	0	0	N/A
Four Mile	85	0	60	0	61,300	53,000	3,000	0	Hamlin Valley
Frisco	122	0	60	0	60,400	48,900	0	0	N/A
Kingtop	10	0	40	0	171,500	161,600	0	0	N/A
Mount Elinor	25	0	25	0	42,700	37,400	0	0	N/A
Muddy Creek	124	0	125	0	283,500	252,100	0	0	N/A
North Hills	58	0	36	0	60,600	50,100	0	0	N/A
Onaqui Mountain	254	0	210	0	240,200	207,700	168,000	98,300	Sheeprocks
Range Creek	182	0	125	0	55,000	43,400	43,000	38,000	Carbon
Sinbad	0	182	0	182	99,200	89,500	0	0	N/A
Sulphur	716	0	250	0	265,700	230,200	109,700	25,300	Hamlin Valley
Swasey	180	0	100	0	135,000	128,200	0	0	N/A
Tilly Creek	66	0	50	0	37,000	33,000	2,100	1,000	Hamlin Valley
Total	**3,270**	**217**	**1,786**	**313**	**2,451,200**	**2,072,100**	**373,000**	**181,600**	**N/A**

Source: BLM 2012d, 2015
N/A = not applicable

Table 3.43
Wild Horses and Burros Gathers in the Planning Area

Herd Management Area/Herd Area	Animals Gathered	Year	Additional Information
Cedar Mountain HMA	348	February 2012	273 animals returned to home range after treatment of mares for fertility control
Chloride HMA	42	October-December 2012	Gather to remove horses that had moved off of HMA to private lands.
Conger and Confusion Mountain HMAs	434	September 2010	Shipped to holding facilities for adoption or long-term pastures.
Frisco HMA	171	November-December 2012	Treated and released 26 mares for fertility control. A total of 107 animals shipped to holding facilities for adoption or long-term pastures.
North Hills HMA	97	December 2010	Shipped to holding facilities for adoption or long-term pastures.
Onaqui Mountain HMA	155	February 2012	120 animals returned to home range after treatment of mares for fertility control.
Sulphur HMA	90	December 2010	60 animals returned to home range after treatment of mares for fertility control.
Winter Ridge Herd Area	109	September 2011	Shipped to holding facilities for adoption or long-term pastures.
Swasey HMA	257	February 2013	Treated and released 44 mares for fertility control. A total of 160 animals shipped to holding facilities for adoption or long-term pastures.

Source: BLM 2012d

It should be noted that wild horse and burros could be found outside of HMAs and wild horse territories. Areas where horses and burros are managed are not fenced, and horses and burros may leave in search of water and forage and enter onto BLM-administered lands, National Forest System lands, or private lands, some that may contain GRSG habitat. One notable area where this is currently occurring is the Sheeprocks Population Area. Other than limited gathers to return horses and burros to managed areas, the BLM and Forest Service do not manage horses outside of the specified areas.

Trends

Wild horse and burro population and habitat monitoring are evaluated periodically through the HMA, Wild Horse Herd Management Plan, or allotment evaluation process and in environmental analysis of specific population control activities. The evaluation process on BLM-administered lands includes an assessment of all applicable BLM Utah Public Land Health. As wild horse and burro populations exceed AMLs, wild horses and burros can be causal factors for failing to meet applicable standards. Due to a lack of predators, in the absence of management action, wild horse and burro populations will continue to increase in size. Overpopulated herds may lead to soil erosion, sedimentation of streams, and damage to wildlife habitat. As a result, the agency must remove animals from the range each year to short-term corrals, long-term

pastures, and through the adoption program in order to control herd sizes. Factors contributing to failure to meet BLM Utah Public Land Health Standards within HMAs commonly include western juniper encroachment, invasive annual grass and other noxious weed infestations, and impacts of livestock and wildlife grazing.

Horse gathers have been conducted in Utah to manage population size. Horses gathered can be sent to holding facilities and put up for adoption. In some cases, mares are treated with fertility control drugs such as Porcine Zona Pellucida (PZP-22) prior to release back into the wild. All wild horse and burro gathers are subject to site-specific NEPA analysis. Information for gathers planned for or completed in recent fiscal years is included in **Table 3.43**.

The BLM is in the process of developing a comprehensive long-term plan and policy for management of wild horses and burros. The aim for this plan is to promote sustainable management of wild horse and burro populations. Similarly, the National Forests in the Intermountain Region of the Forest Service are in the process of amending their LRMPs to develop a comprehensive long-term plan and policy for management of wild horses and burros; however, there are no wild horse ranges on National Forest System lands that overlap GRSG habitat in the planning area.

Dependable summer water sources are a major problem for some HMAs in the planning area (e.g., Onaqui Mountain, Cedar Mountain HMA, and North Hills Wild Horse Management Plan Area). In drought years, natural water sources may dry up, generating the need for water to be trucked in. Hauling water is a financial impact on the BLM and the transportation infrastructure. In times of reducing budgets, there is no certainty that BLM or Forest Service will be able to continue to haul water to wild horses in sufficient quantity to insure the quality of their existence and avoid mortality. During drought, increased stress is also placed on the water sources and adjacent vegetation as horses congregate around troughs whether or not water is in the spring.

Climate change may further impact wild horse and burro as well as rangeland health; AMLs for herds are established based on current conditions, including vegetation and water resources. Should available forage or water resources be reduced due to a change in climate, current AMLs may no longer be appropriate, rangeland conditions may be impacted, and herd health impacted due to a lack of resources.

3.11.2 Regional Context

Table 3.44 displays data compiled in a BER produced by the USGS and BLM (Manier et al. 2013). In the table, data are presented by surface management agency and their occurrence within mapped occupied habitat in the planning area.

Table 3.44
Acres of Wild Horse and Burro Areas within GRSG Habitat in the Planning Area

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat
BLM	II & VII	0
	III	181,600
	IV	0

Table 3.44
Acres of Wild Horse and Burro Areas within GRSG Habitat in the Planning Area

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat
Forest Service	II & VII	0
	III	0
	IV	0
Tribal and Other Federal	II & VII	0
	III	0
	IV	0
Private	II & VII	0
	III	24,100
	IV	0
State	II & VII	0
	III	14,200
	IV	0
Other	II & VII	0
	III	0
	IV	0

Source: Manier et al. 2013

3.12 CULTURAL RESOURCES

Cultural resources encompass a range of archaeological, traditional, and built resources that may include sites, structures, buildings, roads, trails, spiritual/sacred places, districts, and objects that are significant in regard to history, prehistory, architecture, archaeology, engineering, and/or cultural heritage. This term also may apply generally to nontangible cultural practices (e.g., cultural uses of the natural environment). Significant cultural properties can also include Heritage Areas or Traditional Cultural Properties (see also **Section 3.1**, Tribal Interests).

Under the National Historic Preservation Act, significant cultural resources are those "historic properties" that are eligible for nomination to the National Register of Historic Places. To be National Register of Historic Places-eligible, a property must be at least 50 years old (with rare exceptions) and possess integrity of location, design, setting, materials, workmanship, feeling, and association. A site, building, structure, or district may be determined eligible if it meets at least one of four criteria (36 CFR 60.4):

- Criterion A: Associated with events that have made a significant contribution to the broad patterns of our history;
- Criterion B: Associated with the lives of persons significant in our past;
- Criterion C: Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values; or
- Criterion D: Have yielded, or may be likely to yield, information important in prehistory or history.

In addition to the National Historic Preservation Act, the BLM and Forest Service are obligated under the FLPMA, NFMA, NEPA, and agency policy to protect cultural resource values and to consider and mitigate the potential adverse impacts of proposed activities and LUPs.

3.12.1 Conditions Statewide

In this chapter, cultural resources are discussed according to the types of sites (prehistoric and historic) that are most likely to occur within the vegetation communities occupied by GRSG and that are the focus of this planning effort. See **Section 3.8**, Vegetation, for a complete description of these vegetation communities. Within these communities, the following site types are generally found:

- Campsite: Generally, campsites are used seasonally and repeatedly during the annual cycles of hunting and gathering. These sites vary in their landscape position, size, and the archeological materials they contain, reflecting why particular sites were selected during different time periods. Site selection would have depended on factors such as the season, the survival strategy, or the type of work that was to be done (kill site, campsite, plant gathering area, tool workshop, etc.).
- Lithic scatter: A lithic scatter is an archaeological site "where the predominant evidence for human occupation is the presence of lithic [stone] flakes (debitage) produced during tool production and maintenance, and tools or tool fragments" (Jackson 1988; p. 230 as cited in Chartkoff 1995). Although lithic scatters are among the most common sites found, they have drawn limited interest in archaeological analysis and were generally seen as having little significance until recently (Chartkoff 1995; p. 28).
- Fremont village and residential sites: Fremont culture is a pre-Columbian archaeological culture that received its name from the Fremont River in Utah where the first Fremont sites were discovered. Roughly 700 A.D. to 1250 A.D. was the height of Fremont culture, characterized by settled village life focused on corn horticulture (including sophisticated water diversions and irrigation) and consisting of semi-subterranean timber and mud pithouses and aboveground granaries. Artifacts include unique basketry style, special moccasin construction techniques, distinctive art style depicting trapezoidal human figures, and thin-walled grey pottery (Madsen 1989). National Register of Historic Places sites with significant Fremont cultural sites include Desolation Canyon.
- Rock art localities (petroglyphs and pictographs): locations with one or more petroglyphs and/or pictographs. Petroglyphs are a style of rock art in which the design is applied by pecking, chiseling, or otherwise scraping the rock surface. Pictographs are a style of rock art in which the design is applied with pigments obtained from mineral or plant sources. The National Register of Historic Places-listed rock art sites in the GRSG area include Nine Mile Canyon and Parowan Gap.
- National Historic Trails: These trails were networks of overland emigrant, trade, and exploration trails throughout the American West, used by emigrants, traders, and explorers from the eastern and southern US moving into western states starting in the mid-18th century and reaching peak use in the mid- to late-19th

century. The designation as a National Historic Trail is granted by the National Park Service and is for a protected area in the US containing the historic trail traces, ruts, and sites and surrounding areas. In Utah, GRSG vegetation communities have several National Historic Trails, including the Old Spanish National Historic Trail, the California-Oregon National Historic Trail, and the Mormon Pioneer National Historic Trail.

- Historic sites: The historic era in Utah began in the late 18th century with the first European explorers traversing the state, notably the Franciscan missionaries Francisco Atanasio Domínguez and Silvestre Vélez de Escalante. These missionaries unsuccessfully attempted to find a route to California, traversing Utah into the Great Basin near Utah Lake before returning via the Arizona Strip. From this time and throughout the 19th century there was a steady growth in European exploration, trading, mining, logging, and settlement in Utah, resulting in numerous sites on the National Register of Historic Places. One such area is Emigration Canyon, the Mormon emigration route used to settle the Great Salt Lake Valley starting in 1847.
- Civilian Conservation Corps sites: The Civilian Conservation Corps, implemented under President Franklin D. Roosevelt in 1933, was designed to simultaneously solve two of the major problems facing the country: (1) provide financial relief; and (2) help implement conservation projects. For most of the life of the Civilian Conservation Corps, Utah had between 30 and 35 camps at any given time. Most camps consisted of officers' quarters, a mess hall and kitchen, a shower room, a hospital, a recreation hall, and utility buildings. A standard camp had 4 barracks and 200 men. During the Civilian Conservation Corps' 9 years of operation, 116 camps were built throughout Utah, although not all were used at once. The first Civilian Conservation Corps camp to be completed in Utah was located about 10 miles up American Fork Canyon in May 1933. The men were hired from the ranks of unemployed carpenters, farmers, lumbermen, miners, and others who had experience in handling horses, men, and equipment, and who could serve as project leaders for projects. The Forest Service and BLM were the largest users of the corpsmen, who planted more than 3.2 million trees on Utah's mountains and range lands, built several large dams, including the preliminary work on the Deer Creek Dam, built roads, renewed streams and lakes, developed and improved thousands of campgrounds and recreational areas, and constructed several ranger stations that are still in use. The Civilian Conservation Corps brought direct financial benefits to Utah; before this program was terminated, the Civilian Conservation Corps had spent over $52 million in Utah and brought thousands of youth from across the nation to work in the state, helping to keep Utah's economy alive (Baldridge 1994; Reeve 1995).

Trends related to cultural resources measure the rate of change to cultural resources over time. Essentially, trends track impacts that are effectively altering the integrity or physical condition of cultural resources, both beneficially and adversely. Although an important level-of-effect indicator, it is often difficult to estimate. Rate of change is normally assessed during or following project construction.

New cultural resource discoveries have a progressive trend towards more sites being recorded and logged into the Utah State Historic Preservation Office's cultural resource database due to increases in actions permitted by federal agencies. In general, the higher frequency of federal undertakings done in an area leads to a higher number of cultural resources being found. This is a direct result of several federal laws requiring project proponents to inventory their project areas and avoid damaging sites eligible for or listed on the National Register of Historic Places.

The trend generally seen for cultural resource condition in Utah GRSG habitats is regressive, moving from a stable or preserved state to damage or destruction due to factors such as weathering, visitor exposure (which could increase the likelihood of vandalism), and general "wear and tear." However, preservation measures are viewed as mitigation to this downward trend, allowing proponents to avoid (the ideal mitigation) or reduce impacts.

Over the past 100 years, annual temperature and precipitation have increased, and climate models predict that they will continue to increase through the 21st century (National Conference of State Legislatures 2008), resulting in warmer temperatures and lower levels of precipitation. This facilitates the invasion of nonnative species, potentially leading to increased erosion and loss of vegetation cover. All of these factors can contribute to more threats to cultural resources, including increased erosion rates, less protective vegetation cover, and intense, bigger, and more frequent wildfires. Based on the trend, it is anticipated that as the effects of climate change continue and increase, then the threat to cultural resources from climate change will also increase.

3.13 VISUAL RESOURCES

Visual resources refer to the visible features on a landscape (e.g., land, water, vegetation, and structures). These features contribute to the scenic or visual quality and appeal of the landscape. Visual impact is the creation of an intrusion or perceptible contrast that affects the scenic quality of a landscape. A visual impact can be perceived by an individual or group as positive, negative, or neutral, depending on a variety of factors or conditions (e.g., personal experience, time of day, and weather or seasonal conditions).

The BLM visual resource management (VRM) system is a way to identify and evaluate these scenic values in order to determine appropriate levels of management. VRM is a tool to identify and map essential landscape settings to meet public preferences and recreational experiences today and into the future. The VRM system helps to ensure that actions taken on BLM-administered lands today will benefit the visual qualities associated with the landscapes, while protecting these visual resources for years to come.

Visual resource inventory involves identifying the visual resources of an area and assigning them to inventory classes using the BLM's resource inventory process. The process involves rating the visual appeal of a tract of land, measuring public concern for scenic quality, and determining whether the tract of land is visible from travel routes or observation points. The inventory consists of three components: Scenic Quality Evaluation, Sensitivity Level Analysis, and Delineation of Distance Zones. This process is described in detail in BLM Handbook H-8410-1, Visual Resource Inventory.

Based on the three inventory components, lands are placed into one of four visual resource inventory classes. The highest value, Class I, represents those landscapes with the most valued visual resources. The BLM assigns visual resource inventory Classes II, III, and IV to areas with corresponding visual resource qualities, with Class IV having a lower value than Classes II or III. These class assignments are informational and provide the basis for considering visual values during the land use planning process and when evaluating impacts of site-specific projects. They do not establish management direction and are not used as a basis for constraining or limiting surface-disturbing activities but are considered a baseline for existing conditions.

The results of the visual resource inventory become an important component of an RMP, in which the assignments of VRM classes are made. Each VRM class has established objectives, and the goal of VRM is to minimize the visual impacts of all surface-disturbing activities, regardless of the class to which an area is assigned. Objectives for each of the four VRM classes are as follows:

- Class I. The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
- Class II. The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
- Class III. The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
- Class IV. The objective of this class is to provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Each BLM field office in Utah has assigned VRM classes to BLM-administered lands within its jurisdiction. Adopted RMPs identify VRM classes. More recently, six field offices prepared updated visual resource inventories in accordance with BLM Handbook H-8410-1, Visual Resource Inventory, in order to document visual values at a point in time. **Table 3.45** summarizes the distribution of visual resource inventory classes and VRM classes within the planning area.

The Forest Service uses a different system than the BLM to manage visual resources. The Visual Management System, first published in Handbook 462, The Visual Management System, provided direction for the management of scenic resources for over 20 years. The key component of the Visual Management System is the establishment of Visual Quality Objectives.

Table 3.45
Visual Resources in the Planning Area

Visual Resource Inventory Class	Acres
Class I	1,871,500
Class II	2,525,100
Class III	3,869,100
Class IV	6,706,500
VRM Class	**Acres**
Class I	101,800
Class II	295,100
Class III	1,014,800
Class IV	2,477,500

Source: BLM 2012d

In 1996, the Forest Service replaced Handbook 462 with Handbook 701, Landscape Aesthetics: A Handbook for Scenery Management (October 1996). The Scenery Management System is used to inventory and analyze scenery in the national forest, to assist in establishment of overall resource goals and objectives, to monitor the scenic resource, and to ensure high-quality scenery for future generations. Scenic integrity is a continuum over five levels of integrity from very high to very low.

Many national forests still use the Visual Management System as they transition to the newer Scenery Management System, though the Dixie National Forest adopted the Scenery Management System in the Dixie Forest Plan Amendment. **Table 3.46** shows the correspondence between the two systems.

Table 3.46
Scenery Management System and Visual Management System Correspondence

Scenery Management System	Visual Management System
Very High Scenic Integrity (Unaltered)	Preservation – Allows ecological change only
High Scenic Integrity (Appears Unaltered)	Retention – Activities may not be visually evident. Contrasts in form, line, color, and texture must be reduced immediately.
Moderate Scenic Integrity (Slightly Altered)	Partial Retention – Activities must remain visually subordinate to the characteristic landscape. Associated visual impacts in form, line, color, and texture must be reduced as soon after project completion as possible.
Low Scenic Integrity (Moderately Altered)	Modification – Activities may visually dominate the landscape, however, landform and vegetation alterations must blend in with the surrounding landscape character as much as possible.
Very Low Scenic Integrity (Heavily Altered)	Maximum Modification – Activities may dominate the landscape

3.13.1 Conditions Statewide

The existing topographic, vegetation, and geologic conditions throughout the GRSG planning area influence existing visual resources. Two unique physiographic provinces (Basin and Range and Colorado Plateau) influence Utah's physical landscape and result in unique visual environments from location to location. This section uses the most recent BLM visual resource inventories and decisions from LUPs prepared by each BLM field office and Forest planning unit to describe visual resources trends within the population areas.

Existing Visual Resources

Visual resources throughout the GRSG planning area are diverse. For population areas in the western portion of the state, the Basin and Range physiographic province defines existing visual conditions. The eastern portion of the state is within the Colorado Plateau physiographic province and in many areas is visually distinct from the Basin and Range landscapes. Visual resources for each province are discussed below. Throughout all areas there are scattered transportation routes, power lines, mineral extraction activities, and other features. Where these features exist, they influence the surrounding visual environment.

The Basin and Range physiographic province influences visual resource characteristics for the Bald Hills, Box Elder, Hamlin Valley, Ibapah, Sheeprocks, and portions of Emery, and Parker Mountain population areas. Within these population areas, wide, soil-laden valleys separate mountain ranges of varying elevation and steepness. Vegetation in the mountainous areas, especially on the mesic slopes, consists of pinyon-juniper and pine, while sagebrush, grasses, and smaller, more dispersed pinyon-juniper influence the scenic conditions of the valleys and xeric mountain slopes. Depending on location, steep and dramatic ridges in the background rise above the low hills and wide valleys of the foreground. Population areas within the Basin and Range province are generally arid with no major surface water features. Existing surface disturbance on BLM-administered lands consists primarily of scattered mineral development activities and linear ROWs such as paved and unpaved roads and electrical transmission lines. Evidence of past wildfires and presence of invasive species also influence the current visual landscape.

The Colorado Plateau physiographic province influences visual resource characteristics for population areas in the eastern portion of the state. Population areas in the Colorado Plateau province include the Uintah, Panguitch, Wyoming-Blacks Fork, and Wyoming-Uinta, and portions of Carbon, Emery, and Rich. Landscape characteristics in these population areas consist of rugged, fractured topography defined by steep sandstone ridges, high arid mesas, plateaus, and wide arid valleys with scattered washes and small rolling hills. In the high plateaus, such as in the Carbon Population Area, steep escarpments and terraces rise to 11,000 feet in some places. Vegetation regimes include extensive areas of large evergreens in the higher-elevation areas, with grasses, sagebrush, and pinyon-juniper in the lower elevations and across the eastern portion of the population area. In the Panguitch Population Area, eroded red rock spires and mesas covered with pinyon-juniper are prominent visual features. Small perennial lakes and streams and ephemeral water bodies are common. The Green River is the region's most prominent surface water feature and influences existing visual characteristics. Ridges along the river rise sharply from the river channel. Existing surface disturbance on BLM-administered lands consists primarily of paved and unpaved roads, electrical transmission lines, and energy development activity.

BLM management objectives for other resources and uses influence visual resources throughout BLM-administered lands. Based on qualitative information, management activities expected to influence visual resources include recreation, fire management, energy and utility corridor development, authorized travel and transportation management such as road and trail construction, communication site placement, pipeline development, livestock grazing, and oil and gas development.

Other possible trends related to visual resources include the following:

- Changes to the landscape and associated visual quality as a result of climate change, which could include wildfire, vegetation regime shifts, erosion from storm events, and a change in the total area covered by surface water
- Unauthorized linear surface features on BLM-administered lands that can result in erosion, scarring, and deterioration of the scenic landscape

Activities on nonpublic lands may also impact visual resources on federal lands. Urban development, agricultural activities, timber harvesting, and infrastructure development (e.g., roads, fences, and transmission lines) on neighboring lands has the greatest potential to alter the overall visual landscape in the decision area.

On National Forest System lands, the existing landscapes are shaped by human and natural events. Existing landscape character remains in place with some changes resulting from human activities such as timber cutting, road construction, trail construction, oil and gas development, and renewable energy exploration, as well as changes from natural events such as insects, diseases, and wildland fires. Dead and dying trees would present an undesirable appearance to forest visitors when viewed from travel corridors and recreation areas. Changing climatic conditions and an abundance of dense, mature forests have helped to spur an epidemic of insects and diseases larger than any in recorded history.

Trends would be similar to activities occurring on BLM-administered lands with outdoor recreation use continuing to increase, with possible negative effects on the visual resource within the national forests. Timber activities would occur in areas that have beetle-killed trees and would alter the visual quality. Other future threats to visual quality include geothermal, solar, and wind development, utility transmission lines, and increased mining and/or exploration activity.

3.14 WILDLAND FIRE MANAGEMENT

Fire is an inherent component of ecosystems and historically has had an important role in promoting plant succession and the development of plant community characteristics. The introduction of invasive grasses such as cheatgrass and the expansion of juniper into sagebrush systems have resulted in changes in the frequency, size, and severity of wildfires in some communities. Low-elevation Wyoming sagebrush communities in the Great Basin have been especially susceptible to such changes.

The Federal Wildland Fire Management Policy was developed by the secretaries of the Departments of the Interior and Agriculture in 1995 in response to dramatic increases in the

frequency, size, and catastrophic nature of wildland fires in the US. The 2001 review and update of the 1995 Federal Wildland Fire Management Policy consists of findings, guiding principles, policy statements, and implementation actions, and replaces the 1995 Federal Wildland Fire Management Policy. Known as the 2001 Federal Wildland Fire Management Policy (DOI et al. 2001), this update recommends that federal fire management activities and programs are to provide for firefighter and public safety, protect and enhance land management objectives and human welfare, integrate programs and disciplines, require interagency collaboration, emphasize the natural ecological role of fire, and contribute to ecosystem sustainability. The Federal Wildland Fire Management Policy provides nine guiding principles fundamental to the success of the federal wildland fire management program and the implementation of review recommendations. These umbrella principles compel each agency to review its policies to ensure compatibility.

Management practices include the control of wildfires in some areas and the use of fire through prescribed burning to meet land management goals. Wildland fire management is guided by Fire Management Plans, which consider the three elements mentioned above as well as firefighter and public safety and cost effectiveness.

Wildland fires occur from natural causes, such as lightning, or are caused by humans either accidentally or with the intent to cause damage. Prescribed fire is used for beneficial purposes (such as reducing hazardous fuel accumulation) in a controlled manner under a specific prescription and planned effort. Wildfires can be fully suppressed or managed to achieve land management objectives. The response to a wildland fire is based on an evaluation of risks to firefighter and public safety; the circumstances under which the fire has occurred, including weather and fuel conditions; natural and cultural resource management objectives; and resource protection priorities.

Fire is a management tool used to maintain or increase age class diversity within vegetation communities (e.g., big sagebrush/grassland); maintain or increase vegetation productivity, nutrient content, and palatability; and maintain or improve wildlife habitat, rangeland, and watershed condition.

3.14.1 Conditions Statewide

Wildland fire management in Utah is directed by an interagency effort between BLM, Forest Service, and other federal, state, and local agencies. The Utah Master Cooperative Wildland Fire Management agreement was created to improve efficiency of multi-agency resources, equipment and services through coordination of activities, resources, planning, and funds. The agreement is designed to address all levels of wildland fire management from planning through the final phases of implementation. Addressed specifically are Interagency Cooperation, Preparedness, Operations, Use and Reimbursement, and other General Provisions. This document is intended to address the issue of fire suppression across jurisdictional boundaries, and improve wildland fire response within Utah. Signatories to the document are Utah Division of Forestry, Fire, and State Lands, DOI: BLM Utah, Bureau of Indian Affairs (Western, Southwestern, and Navajo Regional Offices), USFWS Mountain-Prairie Office, and the Forest Service Intermountain Region. Tiered to the Master Agreement is the Statewide Annual Operating Plan which further defines working relationships, operational procedures, etc. which were identified in the Master

Agreement. Identified in both plans is the idea of a "closest forces" concept, which allows the closest resource to suppress a wildland fire regardless of jurisdiction. This agreement is used statewide in order to improve wildland fire response and gain efficiency wherever possible. The Master Agreement is updated every 5 years and the Annual Operating Plan is updated every year.

Wildland fire can result in the loss of habitat and loss of a food source for GRSG. It has contributed to conversion of sagebrush communities into marginal or nonhabitat (i.e., cheatgrass or medusahead grasslands) and has been identified as a primary factor associated with GRSG population declines. Direction for fire management in GRSG habitat on BLM-administered lands is provided in IM 2013-128, Sage-grouse Conservation Related to Wildland Fire and Fuels Management. Correlating direction on fire management in GRSG habitat on National Forest System lands is provided in the Forest Service's July 3, 2013, Sage-Grouse Conservation Methods Letter.

The most significant, widespread, and persistent threat is the invasion of cheatgrass into recently burned areas. Spread of invasive species can displace native species and decrease habitat quality for the GRSG. Invasive species, especially cheatgrass, can also alter fire regimes by decreasing fire interval and reducing the ability for shrubs to readily establish following fire (see **Section 3.8**, Vegetation, for further details).

Indicators below describe the current resource condition. Details for each of these factors are included in the current conditions discussion below:

- Fire regime condition class (FRCC)
- Acres of GRSG habitat burned from 1976 to 2012
- Fire size distribution
- Fire danger trends (acres of high-risk habitat)

Fire Regime Condition Class

Indicators of wildland fire ecology and management can be summarized through fire regime and condition class classifications. Fire regimes are used as part of the FRCC discussion to describe fire frequency (average number of years between fires) and fire severity (effect of the fire on the dominant overstory vegetation—low, mixed, or stand replacement). These regimes represent fire intervals prior to Euroamerican settlement and are calculated and classified by analyzing vegetation, known fire cycles, and fire history data. Condition class indicates the degree of departure from the historic fire regime (Hann and Bunnell 2001) (**Table 3.47** and **Table 3.48**). While the fire regime of a particular area is not likely to change except in the very long term, the condition class can be changed through fire management and other vegetation management actions.

Extreme departure from the historic fire regime results in changes to one or more of the following ecological components: vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated disturbances (e.g., insect and disease mortality, grazing, and drought).

Table 3.47
Fire Regime Groups and Descriptions

Group	Frequency	Severity	Severity Description
I	0-35 years	Low/mixed	Generally low-severity fires replacing less than 75 percent of the dominant overstory vegetation; can include mixed-severity fires that replace up to 75 percent of the overstory
II	0-35 years	Replacement	High-severity fires replacing greater than 75 percent of the dominant overstory vegetation
III	35-200 years	Mixed/low	Generally mixed-severity; can also include low-severity fires
IV	35-200 years	Replacement	High-severity fires
V	200+ years	Replacement/any severity	Generally replacement-severity; can include any severity type in this frequency range

Source: Forest Service 2010

Table 3.48
Fire Regime Condition Classes

Fire Regime Condition Classes	Attributes
FRCC 1	Fire regimes are within or near an historical range. The risk of losing key ecosystem components is low. Fire frequencies have departed from historical frequencies by no more than one return interval. Vegetation attributes (species composition and structure) are intact and functioning within an historical range.
FRCC 2	Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components has increased to moderate. Fire frequencies have departed (either increased or decreased) from historical frequencies by more than one return interval. This results in moderate changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns. Vegetation attributes have been moderately altered from their historical range.
FRCC 3	Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals. This results in dramatic changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns. Vegetation attributes have been significantly altered from their historical range.

Source: Forest Service 2010

Vegetative condition class quantifies the amount that current vegetation has departed from the simulated historical vegetation reference conditions. Three condition classes describe low departure (1), moderate departure (2), and high departure (3). Vegetative condition class is calculated based on changes to species composition, structural stage, and canopy closure using

methods described in the Interagency Fire Regime Condition Class Guidebook (Hann et al 2008). LANDFIRE vegetative condition class is based on departure of current vegetation conditions from reference vegetation conditions only, whereas the guidebook approach includes departure of current fire regimes from those of the reference period.

3.14.2 Conditions in Population Areas

Table 3.49 and **Table 3.50** summarize the current condition class of lands within mapped GRSG habitat within the Utah decision area. This information is spatially displayed on **Map 3.14-1** and **Map 3.14-2**.

Table 3.49
Fire Regime Group in Mapped GRSG Occupied Habitat

Fire Regime Group	I		II		III		IV		V	
Population Area	Total	BLM & Forest Service	Total	BLM & Forest Service	Total	BLM & Forest Service	Total	BLM & Forest Service	Total	BLM & Forest Service
Bald Hills	3,700	2,300	0	0	84,800	68,800	215,700	175,900	43,100	20,300
Box Elder	20,500	1,100	0	0	298,600	143,700	455,500	151,300	237,100	113,600
Carbon	60,200	21,800	0	0	139,500	52,200	237,700	72,900	24,000	12,400
Emery	17,300	16,700	0	0	34,400	30,700	39,300	35,800	3,600	3,100
Hamlin Valley	2,100	1,600	0	0	45,000	33,500	94,300	64,300	1,700	1,500
Ibapah	0	0	0	0	29,300	17,500	20,400	12,600	35,200	26,800
Lucerne	830	320	60	0	2,800	320	33,000	0	570	280
Panguitch	38,100	20,600	0	0	64,500	41,700	141,000	100,100	98,600	58,400
Parker Mountain	72,700	57,600	0	0	217,900	158,000	294,800	190,700	197,500	121,200
Rich	17,200	850	0	0	233,800	14,500	946,900	165,000	15,400	610
Sheeprocks	3,700	1,100	0	0	133,300	101,200	562,700	338,200	114,200	72,000
Strawberry	3,300	110	0	0	52,500	4,900	121,900	34,700	2,800	100
Uintah	108,100	33,400	0	0	309,100	117,700	867,900	361,500	196,400	86,300
Wyoming-Blacks Fork	360	360	0	0	1,300	1,300	43,400	43,400	2,300	2,300
Wyoming-Uinta	200	200	0	0	16,900	16,900	2,700	2,700	1,500	1,500

Source: Forest Service 2010
Note: data does not include nonvegetated areas, such as bare ground, rock, and water, or areas with cities or agriculture.

Based on FRCC data, approximately 47 percent of mapped occupied GRSG habitat (3,205,900 acres) is classified as moderately departed from historical fire regime conditions, and 38 percent of land (2,568,800 acres) is classified as highly departed. Approximately 15 percent of mapped occupied habitat (1,053,700 acres) is within or near its historical range. It is important to note that some population areas have a greater percentage of their areas with fire regimes within or near the historical range (22 percent in Box Elder, 22 percent in Uintah, 24 percent in Carbon,

Table 3.50
Fire Regime Condition Class in Mapped GRSG Occupied Habitat

Population Area	Class I		Class II		Class III	
	Total	BLM & Forest Service	Total	BLM & Forest Service	Total	BLM & Forest Service
Bald Hills	17,400	11,700	18,300	15,800	299,900	235,900
Box Elder	212,100	80,000	278,700	108,000	485,700	221,000
Carbon	105,100	52,700	238,600	72,900	94,600	32,600
Emery	14,700	13,600	62,300	55,900	16,700	15,900
Hamlin Valley	7,800	4,800	12,900	9,400	122,000	86,400
Ibapah	6,100	3,300	9,600	7,600	68,000	45,800
Lucerne	20,700	1,300	11,600	610	2,500	370
Panguitch	25,700	19,200	113,500	78,800	187,500	118,300
Parker Mountain	68,100	53,800	431,000	296,200	255,500	169,400
Rich	94,700	10,400	900,600	162,900	121,600	7,200
Sheeprocks	51,700	41,000	325,600	197,500	427,000	272,300
Strawberry	97,700	33,800	72,100	4,900	8,000	320
Uintah	328,200	140,100	675,600	314,200	465,800	168,100
Wyoming-Blacks Fork	1,400	1,400	45,800	45,800	4,900	4,900
Wyoming-Uinta	2,300	2,300	9,700	9,700	9,100	9,100

Source: Forest Service 2010
Note: data does not include nonvegetated areas, such as bare ground, rock, and water, or areas with cities or agriculture.

59 percent in Lucerne, and 55 percent in Strawberry). It is also important to point out that, in general, areas located at lower elevations or that are located in the Great Basin are more likely to be moderately or highly departed from historical fire regime conditions, or have a higher risk of losing key ecosystem component in a wildland fire event (Condition Classes II and III).

Past Fire Activity
Wildland fire has historically occurred within the planning area, and tends to occur between late April and September. Of the fires in the planning area over the past 20 years, approximately 52 percent were related to natural causes, 45 percent were human caused, and 3 percent were of unknown origin.

Table 3.51 displays the size and number of fires by size class in the planning area over the past twenty years (see **Map 3.14-3**). Additional information on specific fires is included in **Table 3.52**.

While nearly 90 percent of wildland fires on BLM-administered lands and 96 percent of wildland fires on National Forest System lands have been less than 100 acres, wildland fires with the greatest potential to result in decreases in GRSG populations are those that affect large areas of the landscape. **Table 3.53** shows the acres of mapped occupied GRSG habitat that have burned since 1976 (regardless of land ownership) and a more recent timeframe of 2005-2014. These are also shown on **Map 3.14-3**. It is important to note that the population areas where fire has had

the largest effect by percent of sagebrush burned in mapped GRSG occupied habitat are those areas located in the Great Basin.

Table 3.51
Fire Size Data within the Planning Area (1994-2013)

Size Class	BLM-Administered Lands (Number of Fires)		National Forest System Lands (Number of Fires)	
	Total	Mapped Occupied Habitat	Total	Mapped Occupied Habitat
A - 0 to .25 acres	6,521	1,019	4,065	278
B - .26 to 9.9 acres	2,899	540	1,283	102
C – 10 to 99 acres	927	164	208	12
D – 100 to 299 acres	293	58	62	5
E – 300 to 999 acres	277	60	62	4
F – 1000 to 4999 acres	237	58	52	6
G – 5000+ acres	103	20	29	2
Not rated	380	70	0	0
Total	**11,637**	**1,989**	**5,761**	**409**

Source: BLM 2015

Table 3.52
Fire Size Data in the Decision Area by Population Areas (1994-2013)

Population Area	A - 0 to .25 acres	B - .26 to 9.9 acres	C – 10 to 99 acres	D – 100 to 299 acres	E – 300 to 999 acres	F – 1000 to 4,999 acres	G – 5000+ acres	Not rated	Total
Bald Hills	155	83	29	10	12	7	7	10	**313**
Box Elder	58	55	30	17	20	22	8	7	**217**
Carbon	209	122	24	8	3	9	3	15	**393**
Emery	108	44	4	5	2	6	1	4	**174**
Hamlin Valley	165	41	7	3	1	1	0	1	**219**
Ibapah	14	8	5	1	0	2	0	1	**31**
Panguitch	260	100	16	10	6	4	0	3	**399**
Parker Mountain	265	68	12	1	5	3	0	8	**362**
Rich	166	56	17	6	14	6	1	8	**274**
Sheeprocks	565	302	67	19	26	29	15	37	**1,060**
Strawberry	82	32	11	2	0	0	0	3	**130**
Uintah	930	399	104	38	18	22	6	57	**1,575**
Wyoming-Blacks Fork	15	7	3	0	0	0	0	0	**25**
Wyoming-Uinta	3	8	0	0	1	0	0	0	**12**

Source: BLM 2015

Table 3.53
Acres of Wildfire within Mapped GRSG Occupied Habitat

Population Area	Total Acres Burned in GRSG Habitat (1976-2014)[1]	Total Acres Burned in GRSG Habitat[1] (2005-2014)	Acres of Sagebrush in GRSG Habitat[2] (2005-2014)		Percent of Sagebrush[2] (2005-2014)	
			Total	Burned	In GRSG Habitat	Burned
Bald Hills	56,142	48,827	198,000	29,273	57%	8%
Box Elder	104,700	75,324	581,000	39,355	57%	4%
Carbon	14,349	10,086	226,100	5,274	46%	1%
Emery	1,177	356	56,400	111	59%	0%
Hamlin Valley	4,370	2,802	99,600	1,200	70%	1%
Ibapah	3,417	1,628	61,800	1,601	73%	2%
Lucerne	0	0	24,400	0	65%	0%
Panguitch	2,027	34	175,300	1	51%	0%
Parker Mountain	8	0	512,300	0	68%	0%
Rich	4,029	1,316	764,800	1,070	65%	0%
Sheeprocks	183,809	21,768	356,600	9,213	45%	1%
Strawberry	0	0	107,700	0	60%	0%
Uintah	49,979	20,782	815,800	8,414	53%	1%
Wyoming-Blacks Fork	0	0	1,977	0	4%	0%
Wyoming-Uinta	0	0	67	0	0%	0%
TOTAL	424,007	**377,261**	**4,030,110**	**183,811**	**56%**	**5%**

Source: BLM 2015
[1]Includes acres burned, regardless of the number of times an area may have burned. If an acre has burned multiple times in the past decade, it is only counted once in this figure.
[2]Sagebrush acres are based on reGAP data, which are based on satellite imagery from 2004. Actions taken since then, such as juniper removal and prescribed fire, are not reflected in the acreage.

Trends

Over the past century, the combination of wildfire suppression and changing land use patterns has altered the natural cycle and role of fire. Some targeted grazing practices have resulted in temporary reduction of fine fuels in site-specific areas, while suppression actions have reduced the frequency of occurrence of wildland fires. Combined, these actions have reduced the frequency of small, low-intensity wildland fires and have resulted in fuels loads becoming dominated by older shrubs and conifers or, in some areas, increasing in quantity. Wildland fires, when they do occur in these areas, will burn with greater intensities, consuming more acres than in the past under these altered landscape conditions (Strand and Launchbaugh 2013). In addition, areas of cheatgrass invasion have resulted in more frequent fires, resulting in decreased fuel loads. Fires in these areas are fast moving and grow large quickly because fuels are continuous, fine, and flashy. In both instances, the change from historic fire regimes typically results in an increase in fire size.

The main structural change in what were historically sagebrush shrub lands is the encroachment of pinyon and juniper, other conifers, and other woody shrubs into the sagebrush. Over time, the encroachment will increase the fuel loading, resulting in increased fire behavior. This leads to an increased resistance to control, decreasing the effectiveness of firefighting resources.

Sagebrush within this habitat is also transitioning to older age class that is more decadent, with high fuel loading that can support higher intensity/severity wildfires. These increased fuel loadings are leading to higher-severity fires that require more post-fire rehabilitation.

Human activities, management practices, and climate change also have resulted in the spread of nonnative species. Incursion of nonnative annual grasses, primarily cheatgrass, can increase wildfire risk. This is primarily an issue in the sagebrush/grass and pinyon-juniper fuel types. Changing climate conditions may also impact the spread of these species.

3.14.3 Regional Context

Table 3.54 and **Table 3.55** display data compiled by the USGS (Manier et al. 2013). **Table 3.55** also uses data from the Forest Service's fire simulator, FSim. FSim generates burn probabilities by simulating fires using historical weather data and current landcover data.

Table 3.54 displays the total acres of land burned in wildland fire over the past 12 years. The majority of fire occurred on private lands. As the tables display, MZ IV has more acres with high probability for wildland fire and more acres burned than the other two MZs.

Table 3.54
Acres of Wildland Fire within GRSG Habitat

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat	
		Within Planning Area[1]	Within Management Zone[1]
BLM	II & VII	7,500	69,500
	III	41,000	216,800
	IV	30,200	2,775,300
Forest Service	II & VII	12,500	21,200
	III	3,600	9,500
	IV	0	195,400
Tribal and Other Federal	II & VII	13,600	144,100
	III	0	600
	IV	0	140,500
Private	II & VII	4,100	87,100
	III	8,900	121,700
	IV	22,600	607,700
State	II & VII	8,500	20,900
	III	7,500	7,500
	IV	4,700	84,000
Other	II & VII	0	0
	III	0	0
	IV	0	800

Source: Manier et al. 2013
[1]Acres calculated from wildland fires occurring between 2000 and 2012

Table 3.55
Acres with High Probability for Wildland Fire within GRSG Habitat

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat	
		Within Planning Area[1]	Within Management Zone[1]
BLM	II & VII	74,900	1,264,600
	III	992,200	6,573,900
	IV	345,000	16,342,300
Forest Service	II & VII	23,000	213,800
	III	155,900	359,500
	IV	400	1,784,500
Tribal and Other Federal	II & VII	3,100	616,000
	III	83,000	126,500
	IV	0	789,100
Private	II & VII	187,800	1,464,500
	III	709,500	1,452,800
	IV	483,100	6,336,600
State	II & VII	44,100	214,300
	III	188,000	191,100
	IV	43,300	1,388,300
Other	II & VII	0	9,700
	III	0	100
	IV	0	88,200

Source: Manier et al. 2013
[1]Derived from Forest Service FSim Burn data

3.15 WILDERNESS CHARACTERISTICS

Inventories for wilderness characteristics were conducted from 1979 to the present and reflect the most up-to-date lands with wilderness characteristics baseline information for this planning area. In addition to the inventories conducted for the purposes of land use planning, lands with wilderness characteristics inventories will be updated for site-specific project NEPA analyses that are conducted in the planning area to determine if a project will have impacts on lands with wilderness characteristics identified through previous or updated inventory efforts.

3.15.1 Conditions Statewide

There are 40 units totaling 138,160 acres of BLM-administered lands in mapped occupied habitat outside of wilderness and WSAs that have been inventoried and found to have wilderness characteristics. Of those, 13 units totaling 52,030 acres are natural areas[2] managed for wilderness characteristics protection in the Uintah Population Area (e.g., some land uses are restricted or prohibited under the Vernal RMP). The remaining 86,130 acres in 27 units are

[2] In Utah, natural areas are lands with wildereness characteristics outside of WSAs that are identified in approved RMPs to be managed to maintain, preserve and protect those characteristics. This is an effort to recognize these discretionary decisions with a better, simpler reference. Wilderness Areas and WSAs are formal designations that are managed in a prescribed manner. To avoid confusing these official designations with discretionary decisions, the BLM Utah uses this term to distinguish between formal designations (e.g., Wilderness Areas) and a discretionary management category (i.e., natural areas).

lands with wilderness characteristics where the BLM has made a determination not to apply specific management to protect the wilderness characteristics, or are areas where no determination has yet been made in an RMP (see **Map 3.15-1**). **Table 3.56** summarizes natural areas and lands with wilderness characteristics that overlap mapped GRSG habitat.

Table 3.56
Lands with Wilderness Characteristics and Natural Areas

Area	Total Unit Acres	Acres in Mapped Occupied Habitat	Population Area
Natural Areas	***98,500***	***52,030***	
Bourdette Draw	13,300	6,230	Uintah
Bull Canyon	2,500	2,460	Uintah
Cold Spring Mountain	8,800	4,550	Uintah
Daniels Canyon	3,000	2,120	Uintah
Dead Horse Pass	7,000	790	Uintah
Diamond Breaks	4,500	490	Uintah
Diamond Mountain	27,200	24,500	Uintah
Lower Flaming Gorge	17,800	1,790	Uintah
Moonshine Draw	4,500	3,650	Uintah
Mountain Home	7,100	3,070	Uintah
Stuntz Draw	2,000	1,960	Uintah
Vivas Cake Hill	300	80	Uintah
Wild Mountain	500	340	Uintah
Lands with Wilderness Characteristics	***488,490***	***86,130***	
Granite Peak	18,200	40	Bald Hills
Pilot Range	34,000	30,100	Box Elder
Big Sulphur Canyon	5,400	2,310	Carbon
Cold Spring Draw East	5,670	5,130	Carbon
Cold Spring Draw West	9,180	5,130	Carbon
Cottonwood Ridge	7,380	6,050	Carbon
Currant Canyon	14,400	2,120	Carbon
Desolation Canyon	170,000	11,200	Carbon
Horse Ridge West Unit 1	5,620	4,460	Carbon
Indian Swale	6,690	4,900	Carbon
Jack Canyon	3,490	2,620	Carbon
Sheep Canyon	12,200	1,540	Carbon
Wildcat Knolls Extension	6,890	40	Emery
Deep Creek Mountains	24,200	1,670	Ibapah
Upper Kanab Creek	48,700	820	Panguitch
Limestone Cliffs Extension	2,040	180	Parker Mountain
Phonolite Hill	7,890	80	Parker Mountain
Pole Canyon	4,610	2,160	Parker Mountain
Archy Bench A	6,730	1,390	Uintah
Cripple Cowboy	13,600	1,250	Uintah
Hideout Canyon	12,700	80	Uintah
Lower Bitter Creek	11,400	250	Uintah
Mexico Point	14,100	290	Uintah
Sweet Water	6,990	2,490	Uintah
Westwater Creek	8,710	410	Uintah
White River	21,300	710	Uintah

Table 3.56
Lands with Wilderness Characteristics and Natural Areas

Area	Total Unit Acres	Acres in Mapped Occupied Habitat	Population Area
Wolf Point	11,800	3,840	Uintah
Total *(Natural Areas and Lands with Wilderness Characteristics)*	***586,990***	***138,160***	

Source: BLM 2012d

3.16 LIVESTOCK GRAZING/RANGE MANAGEMENT

For BLM-administered lands, the foremost authority that provides for public land grazing is the Taylor Grazing Act, which was passed on June 28, 1934, to protect public rangelands and their resources from degradation, to provide an orderly use to improve and develop public rangelands, and to stabilize the livestock industry. Following various homestead acts, the Taylor Grazing Act established a system for allotting grazing privileges. The FLPMA and the Public Rangeland Improvement Act of 1978 also provides authority for managing grazing on public rangelands. Grazing administration exclusive of Alaska is governed by 43 CFR Subpart 4100.

For National Forest System lands, authority to regulate grazing and issue permits was authorized by Congress as early as 1897 with the passage of the Organic Administration Act. With the establishment of the Forest Service in 1905, authority to protect, manage, and administer grazing of lands administered by the agency continued. The Granger-Thye Act of 1950 authorizes the Forest Service to issue grazing permits and use grazing receipts for range improvements and provides direction on establishment of local grazing advisory boards. The Multiple Use-Sustained Yield Act of 1960 and the FLPMA establish the policy and purpose of the National Forests to provide for multiple-use and sustained yield of products and services, including the regulation of grazing fees and permits. The Forest Rangeland Renewable Resources and Planning Act of 1974 and the NFMA authorize long-range planning to ensure the future supply of forest resources, and the availability of lands and their suitability for resource management. The Public Rangelands Improvement Act of 1978 defines the current grazing fee formula and establishes rangeland monitoring and inventory procedures. Forest Service grazing administration is primarily regulated by 36 CFR Part 222, Subpart A.

The BLM grazing administration regulations were revised in 1995 to include Fundamentals of Rangeland Health and Standards and Guidelines for Grazing Administration (43 CFR § 4180). BLM Utah's Standards for Rangeland Health and Guidelines for Grazing Management were developed in accordance with 43 CFR 4180 to provide for conformance with the Fundamentals of Rangeland Health.

Through conformance and attainment of Utah's Standards and Guidelines, the BLM Utah assures that the Fundamentals of Rangeland Health are met. Standards are integrated into the BLM's land management through incorporation into LUPs, as a basis for environmental analysis under NEPA, and as a basis for monitoring. Guidelines are integrated into land management by applying them to livestock grazing authorizations. The standards and guidelines provide a clear statement of agency policy and direction for those who use BLM-administered and National Forest System lands for livestock grazing and for those who are responsible for their management and

accountable for their conditions. If livestock are a significant factor to the nonattainment of a standard, as soon as practical but no later than the next grazing season, management must be implemented to ensure that progress is being made toward attainment of the standard(s). Utah's standards include specific direction for four main categories of assessment, including soil health, riparian and wetlands, desired wildlife species, and water quality.

On National Forest System lands, direction for grazing management is provided in the Forest Land Use Plan standards and guidelines and in allotment-specific decision documents. Forest Service units are required to manage livestock grazing within the standards set forth in these documents. If standards are met, rangeland conditions should provide clean water, habitat for a variety of plant and animal species, sustainable grazing and browsing, and recreation opportunities in keeping with the multi-use mandate. Permits would be reviewed and amended as needed and rangeland conditions assessed during site-specific NEPA analysis based on the Forest Service Allotment NEPA schedule.

On BLM-administered lands, a grazing permit is the document that authorizes livestock grazing use of the lands within an established grazing district, whereas a grazing lease is the document which authorizes livestock grazing use of lands outside an established grazing district (43 CFR § 4100.0-5). The kind and number of livestock, the period of use (seasonal), the allotment to be used, and the amount of use in AUMs are mandatory terms and conditions of every grazing permit or lease (43 CFR § 4130.3). An AUM is the amount of forage necessary for the sustenance of one cow/calf pair or its equivalent for 1 month and an allotment is an area of land designated and managed for grazing of livestock (43 CFR § 4100.0-5). Various animals can graze on BLM-administered and National Forest System lands and have varying forage requirements, as displayed in AUM equivalents (for example, a sheep requires 0.2 AUMs). In Utah, all lands are contained within grazing districts and as a result, all livestock are authorized through grazing permits.

Grazing on National Forest System lands is permitted through term grazing permits that authorize grazing on these lands. The term grazing permit authorizes the number and kind of livestock as well as the period of use and grazing allotment on which livestock are permitted to graze. Grazing permits may be transferred in whole or in part through application by the permit holder and qualified transferee and approval by the Authorized Officer to transfer grazing privileges in whole or part (36 CFR Subpart A 222.1-4, 43 CFR Subpart A 4110.2-3).

3.16.1 Conditions Statewide

In total, there are 567 grazing allotments entirely or partially within mapped GRSG habitat in the planning area comprising approximately 582,546 total permitted AUMs. Of these allotments, approximately 389 allotments and 329,521 AUMs are located on BLM-administered lands, and 178 allotments and 253,025 AUMs are located on National Forest System lands in the planning area (see **Map 3.16-1**). Details by allotment are provided in **Appendix Q**, Livestock Grazing Allotments in Greater Sage-Grouse Occupied Habitat, Livestock Grazing Allotments in Greater Sage-Grouse Occupied Habitat, **Table Q.1** and **Table Q.2**. A summary is provided in **Table 3.57**. Within the planning area, approximately 6,495,425 acres are available for livestock grazing, including 4,543,300 acres on BLM-administered lands and 1,936,000 on National Forest System

Table 3.57
Livestock Grazing Overview

Field Office/ National Forest	Total Number of Allotments	Allotments within Mapped GRSG Habitat*	Permitted AUMs in Allotments within GRSG habitat	Total Billed AUMs	Percentage of Permitted AUMs billed	Applicable Population Area(s)
BLM Allotments - Summary by Field Office						
Cedar City	166	60	73,587	50,604	69%	Hamlin Valley, Bald Hills, Panguitch
Fillmore	167	22	27,081	24,257	90%	Sheeprocks
Grand Staircase-Escalante National Monument	79	7	1,920	1,514	79%	Panguitch
Kanab	118	34	8,991	5,256	59%	Panguitch, Parker Mtn.
Price	184	36	12,795	6,218	49%	Carbon, Emery
Richfield	130	46	15,430	11,162	72%	Emery, Parker Mtn.
Salt Lake	149	78	98,028	80,675	82%	Box Elder, Rich, Ibapah, Sheeprocks
Vernal	149	106	91,689	49,805	54%	Uintah, Lucerne, Strawberry
Forest Service Allotments - Summary by National Forest						
Ashley	N/A	41	43,913	N/A	N/A	Carbon, Uintah
Dixie	N/A	33	34,290	N/A	N/A	Panguitch, Parker Mountain
Fishlake	N/A	25	69,009	N/A	N/A	Parker Mountain, Emery,
Manti-LaSal	N/A	35	54,879	N/A	N/A	Carbon, Emery, Parker Mountain
Uinta-Wasatch-Cache	N/A	44	47,983	N/A	N/A	Rich, Wyoming-Uinta, Wyoming-Blacks Fork, Lucerne, Strawberry, Sheeprocks

Source: BLM 2013, Forest Service 2013
Note that on National Forest System lands, permitted use for allotments is adjusted as needed to reflect actual use. Due to these adjustments, "billed" usage is approximately the same as "permitted usage."
*Note that numbers include all allotments mapped as wholly or partially within mapped occupied habitat. Some allotments may contain negligible amounts of GRSG habitat.

lands. In addition, there are some areas outside of grazing allotments that are not identified as available or unavailable for livestock grazing in the associated LUPs. These areas often lack forage production to support livestock use (e.g., Utah's Lake Bonneville Salt Flats) or are isolated tracks of BLM-administered lands that are not accessible to livestock under current management of the surrounding areas. It is unlikely these areas would be grazed in the future but if applied for would be considered by the BLM for approval or disapproval.

Approximately 4,463,800 acres of authorized grazing on BLM-administered lands and 790,200 acres of authorized grazing on National Forest System lands are located within mapped occupied habitat.

While permits reflect the maximum authorized grazing amount for a given allotment, for BLM-administered lands the amount of use billed for more closely reflects the actual amount of grazing use made on a year-to-year basis in both grazing dates and livestock numbers. The percent of active AUMs that are typically billed varies in a given year due to several factors, such as drought, timing of moisture, wildfire, and market conditions. In the planning area, the average billed usage over the past 10 years was approximately 70 percent of permitted use on BLM-administered allotments (see **Table 3.57** and **Appendix Q**, **Tables Q.1** and **Q.2**). It should be noted that on National Forest System lands, permitted use for allotments is adjusted as needed to reflect actual use. Due to these adjustments, no accurate comparison between "billed" and "permitted" use is available.

Kinds of livestock grazed in the planning area include cattle, sheep, and horses, with the majority of active AUMs for cattle (see **Appendix Q**, **Tables Q.1** and **Q.2**).

Monitoring data is collected across BLM-administered lands on a continual basis to ensure that the BLM Standards and Guidelines for Healthy Rangelands or equivalent Forest Service standards are being met or that significant progress is being made. Where assessment and evaluation information indicates that BLM Utah Public Land Health Standards are not being met on BLM-administered lands, and a determination has been made that livestock are the causal factor, changes/modifications to livestock grazing (e.g., livestock reductions, season of use changes, implementation of grazing management systems, etc.) are completed through the permit renewal process or other appropriate decision process. On National Forest System lands, the number, kind, and class of livestock, period of use, and grazing allotment specified in a permit may be modified when needed for resource protection or to achieve Forest Plan standards and guidelines. Changes can also be made through agency decisions determined through allotment NEPA analyses.

Range improvements are defined authorized physical modifications or treatments which are designed to improve production of forage; change vegetation composition; control patterns of use; provide water; stabilize soil and water conditions; and restore, protect, and improve the condition of rangeland ecosystems. The term includes, but is not limited to, structures, treatment projects, and use of mechanical devices or modifications achieved through mechanical means (43 CFR 4100.0-5). Range improvement projects for livestock management on BLM-administered and National Forest System lands in the planning area occur at varying densities based upon management needs, land ownership patterns, and other factors. These include, but are not limited to, fences, cattleguards, corrals, pipelines, water troughs, wells, and reservoirs.

Fences are used to delineate allotment boundaries and pastures within allotments for administrative and management purposes and to exclude the impacts of livestock grazing from some areas such as recreation and archaeological sites, spring sources, and some riparian areas as well as others. Corrals are smaller fenced areas that are occasionally located on BLM-administered and National Forest System lands for the purposes of gathering, sorting, and handling livestock. Watering developments, often constructed cooperatively by the BLM, Forest Service, and permittee, are used to improve livestock distribution in areas where naturally occurring surface water is not available, and to reduce livestock use of naturally occurring springs and streams. In addition, supplemental salt, mineral, and protein may be provided for livestock grazing on BLM-administered and National Forest System lands.

In general, livestock grazing use within the region has significantly decreased from its peak in the early part of the last century. It should also be noted that billed AUMs are generally considerably lower than permitted AUMs, as the BLM and permittees make annual adjustments to use levels. The historical declines in permitted use are due primarily to efforts to more closely reflect the range's carrying capacity given current land uses and management Present levels of demand for forage resources are anticipated to continue. Other factors that impact livestock grazing management in the planning area include drought and wildfire. Changes in land use on private and BLM-administered and National Forest System lands, such as increased use for recreational purposes, have also influenced livestock grazing. Climate change may impact livestock grazing by changing the amount and type of forage available for livestock or wildlife use in a given area.

3.16.2 Regional Context

Table 3.58 through **Table 3.60** display data compiled in a BER produced by the USGS and BLM (Manier et al. 2013). In each table, data are presented by surface management agency and their occurrence within mapped occupied habitat in the planning area. As the tables show, MZ IV has more total acres of allotments, more acres of allotments not meeting BLM Utah Public Land Health Standards with grazing as the causal factor, and more miles of fences than the other MZs. It should be noted that for **Table 3.59** data were assembled in 2008 from available records, and progress has been made towards meeting standards and guidelines since this time. In addition, this table reflects only those allotments not meeting BLM Utah Public Land Health Standards for Desired Species, one of the four standards for land health. For **Table 3.60**, it should be noted that the data presented for miles of fence is derived from a dataset that identifies pasture and allotment borders on BLM-administered and National Forest System lands as potential fences; therefore, miles of fence presented may be higher than existing fences.

Table 3.58
Acres of Grazing Allotments within GRSG Habitat

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat	
		Within Planning Area	Within Management Zone
BLM	II & VII	711,800	17,862,300
	III	1,346,300	9,473,900
	IV	405,700	18,079,500

Table 3.58
Acres of Grazing Allotments within GRSG Habitat

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat	
		Within Planning Area	Within Management Zone
Forest Service	II & VII	185,800	563,100
	III	604,300	1,530,700
	IV	100	2,617,600

Source: Manier et al. 2013
Note: For Forest Service MZs II and VII, the 185,800 acres of mapped occupied habitat includes 57,900 acres of PGH and 127,900 acres of PPH.

Table 3.59
Acres of Allotments Not Meeting Land Health Standards for Desired Species Habitat with Livestock Grazing as the Causal Factor within GRSG Habitat

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat	
		Within Planning Area	Within Management Zone
BLM	II & VII	10,400	653,000
	III	87,800	1,620,100
	IV	0	3,586,100

Source: Manier et al. 2013 (Includes data compiled in 2008 from available records in Veblen et al. 2011 and Assal et al. 2012)
Note: Forest Service does not use land health standards and cannot provide equivalent data

Table 3.60
Miles of Fences within GRSG Habitat

Surface Management Agency	Management Zone	Miles within Mapped Occupied Habitat	
		Within Planning Area[1]	Within Management Zone[1]
BLM	II & VII	700	18,100
	III	1,500	6,700
	IV	300	23,300
Forest Service	II & VII	800	1,600
	III	700	2,300
	IV	0	4,600
Tribal and Other Federal	II & VII	0	900
	III	0	100
	IV	0	700
Private	II & VII	500	14,100
	III	700	1,500
	IV	300	11,300
State	II & VII	100	2,500
	III	200	300
	IV	0	1,700

Table 3.60
Miles of Fences within GRSG Habitat

Surface Management Agency	Management Zone	Miles within Mapped Occupied Habitat	
		Within Planning Area[1]	Within Management Zone[1]
Other	II & VII	0	100
	III	0	0
	IV	0	0

Source: Manier et al. 2013
[1]Derived from a dataset that identifies pasture and allotment borders on BLM-administered and National Forest System lands as potential fences

3.17 RECREATION

This section describes existing recreation uses in the planning area, provides a set of indicators for analyzing effects on recreation resource uses, and outlines recreation-related trends.

Recreation opportunities in the planning area are abundant. Most recreation users participate in dispersed recreation activities, including hunting, fishing, camping, biking, hiking, horseback riding, rock climbing, boating on area lakes and rivers, pleasure driving, and wildlife viewing. Users often participate in these activities individually or in small groups. Recreation users also participate in permitted activities such as OHV racing, mountain bike racing, and guided hunting excursions. In parts of the planning area where recreation is a primary resource management consideration, the BLM and Forest Service have designated and manage recreation management areas. Management objectives in recreation management areas are to promote positive recreation experiences and outcomes in a specific recreation setting.

The Forest Service offers a variety of recreation opportunities year-round. You can experience the solitude of hiking in the Wilderness, enjoy camping in developed campgrounds, or camp in the backcountry. The planning area is also a prime location for fishing, hunting, horseback riding, mountain biking, OHV opportunities, and winter activities such as cross-country and downhill skiing. There are hundreds of miles of forest roads that offer sightseeing opportunities and access to beautiful country.

The BLM and Forest Service issue permits for certain types of organized recreation like commercial outfitting and guiding or special events.

Recreation Management Areas

Recreation management areas are areas where the BLM and Forest Service recognize recreation and visitor service objectives as a primary resource management consideration and where specific management is required to preserve and promote recreation opportunities. The recreation management area designation is based on recreation demand and issues, recreation setting characteristics, resolving use/user conflicts, compatibility with other resource uses, and resource protection needs.

BLM recreation management areas include special recreation management areas (SRMAs) and extensive recreation management areas (ERMAs).

SRMAs are administrative units where the existing or proposed recreation opportunities and recreation setting characteristics are recognized for their unique value, importance, and distinctiveness, especially compared with other areas used for recreation. In order to foster recreation opportunities and achieve desired outcomes, BLM management objectives in SRMAs are to provide recreation facilities, maps, and other services.

The BLM manages all other lands outside SRMAs in the decision area as ERMAs.

The recreation opportunity spectrum is a widely used planning and management tool used by the Forest Service to delineate and define outdoor recreation settings and related experience opportunities. The recreation opportunity spectrum arrays recreation settings on a spectrum from primitive to urban. A given recreation opportunity spectrum class or category describes the level of development, use, and management that exists or is desired for the area where that class is prescribed. There are six recreation opportunity spectrum classes described in the Forest Plans—primitive, semi-primitive nonmotorized, semi-primitive motorized, roaded natural, rural, and urban. For each of these classes, the Forest Plans also describes maximum use level guidelines, defined in terms of People At One Time per trail mile and per acre. For winter recreation (activities that require snow cover), two general recreation opportunity spectrum classes are used—motorized and nonmotorized.

Recreation Permits

Under the authority of the Federal Lands Recreation Enhancement Act of 2004, the BLM uses SRPs to satisfy recreational demand within allowable use levels in an equitable, safe, and enjoyable manner while, at the same time, minimizing adverse resource impacts and user conflicts. The BLM issues permits for a variety of organized activities, such as hunting, river rafting, OHV racing, mountain bike racing, historic trail reenactments, recreation resorts, relay runs, horseback events, and trail riding.

The Forest Service manages trail, river, and similar recreation opportunities and their recreational access and supports facilities under the principles enumerated in Forest Service Manual 230. In addition, Forest Service authority to require recreation SUPs is limited (see 36 CFR 251.50(c). There is separate authority for wilderness and wild and scenic river permit systems for noncommercial recreation at 36 CFR 293 and 297. There is authority for authorizing use where roads have been closed to motorized use at 36 CFR 212.

The following are recreation special uses that involve facilities:

- Recreation SUPs involving privately owned facilities include resorts, marinas, ski areas, target ranges, organization camps, recreation residences, and other facilities. These permits are typically authorized under term permits and pay a land use fee based on a percent of revenue or appraised value of the land.
- Recreation special uses involving government-owned facilities include concession campgrounds, resorts, organization camps, and some other facilities.
- Recreation special uses involving commercial public services include outfitting and guiding for a broad range of activities, groomed cross-country ski trails, and recreation events (including but not limited to competitive races, eco-challenges,

dog trails, adventure games, and endurance races). These uses are usually authorized under the Recreation Enhancement Act, which allows retention of fees by the administrative unit where they are collected.

Additionally, noncommercial group use permits are required for groups of 75 or more people. These uses do not pay fees.

3.17.1 Conditions Statewide

The intensity and types of recreation activities vary throughout the planning area. In most population areas, recreation activities are dispersed. In these areas, BLM and Forest Service management does not emphasize recreation over other resources or uses. Elsewhere, such as in the Bald Hills, Carbon, Panguitch, and Sheeprocks population areas, recreation uses require more specific management attention due to the opportunity for and intensity of recreation activities. BLM management for recreation in these population areas includes the designation of SRMAs and the issuance of SRPs for commercial, organized, and competitive uses of public lands. See **Table 3.61** and **Map 3.17-1**. Also see **Map 3.17-2** for a spatial representation of areas with developed recreation opportunities. While the BLM issues SRPs for a variety of activities within the planning area, very few of those permits can be directly linked to GRSG habitat. Of the permits that can be linked to GRSG habitat, most of those permits are associated with hunting and OHV activities.

Table 3.61
Special Recreation Management Areas in Population Areas

Special Recreation Management Area	Population Area(s)	Total Acres	Acres in Population Area
Sheeprocks/Tintic OHV Area	Sheeprocks	370,000	144,300
Big Rocks	Parker Mountain	100	100
Blue Mountain	Uintah	42,700	41,600
Browns Park	Uintah	18,500	6,300
Desolation Canyon	Carbon	72,600	3,500
Little Sahara Recreation Area	Sheeprocks	57,400	9,000
Nine Mile Canyon	Carbon	68,200	54,200
North Deep Creek Mountains	Ibapah	25,700	500
Pony Express Route	Ibapah and Sheeprocks	18,200	9,000[1]
Range Creek	Carbon	40,500	1,200
Red Mountain-Dry Fork	Uintah	24,800	24,800
Total		**1,564,700**	**318,100**

Source: BLM 2012d
[1] 1,500 acres in Ibapah; 7,500 in Sheeprocks

In **Chapter 4**, proposed BLM and Forest Service management objectives for resources and resource uses are evaluated against these indicators and compared to current recreation trends as a way to evaluate potential effects on recreation uses in the planning area.

3.17.2 Conditions in Population Areas

Bald Hills and Hamlin Valley Population Areas

Recreation activities in the Bald Hills and Hamlin Valley population areas (within the Cedar City Field Office) include dispersed uses such as hiking, camping, hunting, and OHV riding. Most OHV use in the Bald Hills occurs in association with hunting.

Panguitch Population Area

Grand Staircase-Escalante National Monument is southeast of the Panguitch Population Area. South of the national monument is Lake Powell. Also adjacent to this population area are popular national parks such as Bryce Canyon and Zion. These well-known attractions draw visitors from around the world to recreate. The Panguitch Population Area has similar geologic formations and landscape characteristics as the nearby Grand Staircase-Escalante National Monument, and as a result, is attractive for recreation users. Recreation activities in the population area, which covers the Cedar City and Kanab Field Offices, the Grand Staircase-Escalante National Monument, and the Dixie National Forest, include hiking, mountain biking, rock climbing, photography, equestrian uses, backpacking, camping, canyoneering, cultural tourism related to the National historic Old Spanish trail, and OHV use.

The BLM has completed travel management planning efforts and is managing a designated route network for the population area located in the Kanab Field Office and the Grand Staircase-Escalante National Monument planning areas. Travel management planning efforts are currently underway for the population area within the Cedar City Field Office planning area.

OHV use on BLM-administered lands in the population area is managed as either limited to designated roads and trails, limited to existing roads, or open to cross country travel.

Sheeprocks Population Area

Recreation in the Sheeprocks Population Area includes dispersed activities such as hiking, rock hounding, sightseeing, camping, hunting, fishing, cultural tourism, and historical reenactments related to the National Historic Pony Express trail. Within the population area, the Little Sahara Recreation Site and Sheeprock/Tintic OHV SRMAs provide organized and competitive OHV-based recreation opportunities.

Little Sahara Recreation Area

Within the Sheeprocks Population Area, the BLM manages the Little Sahara Recreation Area SRMA. Of the 57,400 acres of BLM-administered lands in the SRMA, nearly 9,000 acres are within the population area. The SRMA includes a visitor center, three developed campgrounds, one primitive campground, fenced sand-based play areas for children, and numerous OHV opportunities on the Little Sahara sand dunes and surrounding trails. Sand Mountain, White Sand Dunes, The Black Mountains, and adjacent sand dunes include a network of OHV trails and provide extensive OHV riding opportunities. The Little Sahara SRMA is fenced along the northern, western, and southern boundaries. The SRMA is open to cross-country OHV use with the exception of the Rockwell Natural Area along the western boundary of the SRMA. Rockwell Natural Area is a 9,600-acre area representative of the larger surrounding desert ecosystem and is closed year-round to OHV use. A portion of the natural area is within mapped occupied habitat.

Dispersed camping is permitted throughout the Little Sahara SRMA, while four designated camping areas with approximately 258 campsites provide a range of camping amenities for users. All designated campsites are outside of mapped occupied habitat.

BLM management objectives for the SRMA are to preserve and enhance the unique recreational opportunities and overall setting provided by the sand dunes.

Sheeprock/Tintic OHV SRMA

The Sheeprock/Tintic SRMA encompasses approximately 450,000 acres in Central Juab and North Central Millard County. The area is a popular destination for casual OHV recreationists as well as other recreational pursuits, including but not limited to dispersed camping, big game hunting, upland game hunting, and rock hounding. During the peak recreation season, mid-March through mid-October, the area receives approximately 3,500 to 4,000 visitors annually.

OHV racing (motorcycles and quads) is a popular recreation activity within the area, which is located within the Fillmore Field Office. This area is adjacent to the Little Sahara Recreation Area and is set aside in the House Range RMP as a competitive events area.

The Sheeprock/Tintic SRMA offers a variety of ideally suited terrain, which has led to the continuing popularity of this sport at this location. Typically, three to five different race groups propose Utah Sportsman Riders Association-sanctioned races. These races typically occur in the spring but occasionally are applied for in the fall as well. These races are typically proposed for use of previously approved roads and trails in competitive event areas administered by the Fillmore Field Office to conduct motorcycle racing. This complies with the House Range RMP, which designates the Sheeprock/Tintic SRMA as limited to existing roads and trails.

Uintah Population Area

The unique and varied landscapes in the Uintah Population Area are popular for a range of recreation activities such as hiking, hunting, fishing, camping, mountain biking, river recreation, and OHV use.

Within the population area, there are 3,400 acres open to OHV use. OHV use in other portions of the population area is limited to designated roads or trails. Approximately 30,000 acres are closed to OHV travel.

Within the Uintah Population Area, the BLM manages the Blue Mountain SRMA for OHV use, special recreational activities (e.g., hang gliding and rock climbing), and competitive events; the Browns Park SRMA for a wide variety of land and water opportunities; and the Red Mountain-Dry Fork SRMA for opportunities related to OHV and nonmotorized trail recreation.

Carbon Population Area

The landscapes in the Carbon Population Area within the Price and Richfield Field Offices are popular for a range of recreation activities such as hiking, hunting, fishing, camping, cultural tourism, and river recreation.

OHV use on BLM-administered lands in the population area is managed as either limited to designated roads and trails, or as closed to motor vehicles.

Within the Carbon Population Area, the BLM manages the Range Creek SRMA and Nine Mile SRMAs to protect high-value cultural values and scenic quality.

The BLM manages the Desolation Canyon SRMA to protect scenic quality and waterborne recreation activities associated with the Green River.

Ibapah Population Area

Recreation in the Ibapah Population Area within the Salt Lake and Fillmore Field Offices includes dispersed activities such as hiking, sightseeing, camping, hunting, fishing, cultural tourism, and historic trail reenactments related to the historic Pony Express trail.

OHV use on BLM-administered lands in the population area is managed as either limited to existing roads and trails, or as closed to motor vehicles.

Within the Ibapah Population Area, the BLM manages the Pony Express SRMA to protect recreation opportunities related to high-value cultural values and scenic quality. The BLM also manages the North Deep Creek Mountains SRMA to provide opportunities for solitude and nonmotorized recreation.

Parker Mountain Population Area

Recreation in the Parker Mountain Population Area within the Richfield and Kanab Field Offices and Dixie National Forest includes dispersed activities such as hiking, sightseeing, camping, hunting, fishing, rock climbing, cultural tourism, and historic trail reenactments related to the National historic Old Spanish trail. The unique sandstone geology in this portion of southern Utah combined with its proximity to Lake Powell and Grand Staircase-Escalante National Monument makes the region one of the most population recreation areas in the country. Recreation visitation to the Parker Mountain population area is also influenced by nearby National Parks such as Bryce Canyon, Zion, and the Grand Canyon, which attract domestic and international recreation-oriented visitors.

OHV use on BLM-administered and National Forest System lands in the population area is managed as either limited to designated roads and trails, or as open to cross-country travel. The BLM has completed travel management planning efforts resulting in designated travel plans for the entire population area.

Within the population areas, the BLM manages the Big Rocks SRMA as an open OHV riding area for very technical rock-related motorized riding opportunities, including competitive motorized recreational events.

Wyoming–Blacks Fork and Wyoming–Uinta Population Areas

The Wyoming–Blacks Fork Population Area and parts of the Wyoming–Uinta Population Area are in the 201,000-acre Flaming Gorge National Recreation Area. While developed recreation activities and facilities are not common in GRSG habitat, the National Recreation Area includes 43 campgrounds hosting over 700 individual campsites and 27 group sites, spread over nearly 91 water-miles, plus many mountain retreats. There are also primitive camping opportunities and river camps for multi-day river runs.

Other Population Areas

Recreation uses throughout the remainder of the population areas are dispersed and do not receive the same level of focused management.

Trends

BLM and Forest Service

Recreation is expected to be influenced by a number of competing management areas. Management activities expected to influence recreation include energy and utility corridor development, road and trail designations and construction, and oil and gas development.

Likely trends or threats related to recreation include the following:

- Popular and unique recreation opportunities on BLM-administered and National Forest System lands in Utah will continue to draw visitors from outside the state.
- Climate change could alter recreational opportunities through vegetation regime shifts, erosion from extreme storm events, and changes in the levels of permanent surface water bodies where recreation activities take place.
- Increased recreational use, especially outside of areas where recreation is a management focus, could result in conflicts with other resources and uses.
- Advances in technology that either improve the ability to participate in an existing recreation activity or lead to the creation of a new form of recreation activity.
- Administration of updated travel management policy, rules, and planning and design guidelines will change both motorized and nonmotorized recreation opportunities across BLM-administered and National Forest System lands.

Activities on state and private lands may also impact recreation opportunities on BLM-administered and National Forest System lands. For example, urban development in the Salt Lake City metropolitan region will increase demand for recreation opportunities on adjacent BLM-administered and National Forest System lands. Increased visitation at Zion National Park, Grand Staircase-Escalante National Monument, and Lake Powell in southern Utah will continue to draw recreation users to the region, including BLM-administered and National Forest System lands near these natural attractions.

3.18 COMPREHENSIVE TRAVEL AND TRANSPORTATION MANAGEMENT

Travel management is integral to many activities on BLM-administered and National Forest System lands. A comprehensive consideration of travel and transportation involves all aspects of road and trail system planning and management. It takes into account access via roads and trails, system users, and other natural resource management objectives.

The transportation system throughout the planning area consists of major highways and arterial roadways, numerous paved and unpaved local roads, and unpaved primitive roads and trails.

3.18.1 Conditions Statewide

In general, transportation routes are concentrated around urban areas, in recreation management areas, or where surface activities such as oil and gas development require access. On National Forest System lands, transportation routes are primarily in rural, remote areas. The remoteness and rugged terrain throughout many of the BLM-administered lands in population areas limits the overall distribution of travel routes.

Travel on BLM-administered and National Forest System lands is a fundamental management issue for the BLM and Forest Service. The combined effect of population increases throughout the state, growth in the use of OHVs, and advances in off-road technology has the potential to increase conflicts with other road and trail users on BLM-administered and National Forest System lands, as well as impact other resources and uses.

OHV Use

An OHV is any vehicle capable of, or designed for, travel on or immediately over land, water, or other natural terrain. OHVs include dirt motorcycles, dune buggies, jeeps, four-wheel drive vehicles, and snowmobiles (43 CFR 8340.0-5(a)).

Executive Order 11644 and 43 CFR 8342.1 requires the BLM to designate BLM-administered lands as Open, Limited, or Closed to OHV travel. BLM-administered lands within the planning area have been designated as follows:

- **Open -** areas where there are no special restrictions, or where there are no compelling resource protection needs, user conflicts, or public safety issues to warrant limiting cross-country travel.
- **Limited -** areas where travel must be restricted in order to meet specific management objectives. For areas classified as Limited, the BLM must consider a full range of possibilities, including travel that will be limited to types or modes of travel (such as foot, equestrian, bicycle, motorized, etc.); existing roads and trails; time or season of use; certain types of vehicles (i.e., wheeled versus nonwheeled); licensed or permitted vehicles or users; or BLM administrative use only.
- **Closed -** areas where the BLM restricts all motorized travel and transportation for all or a portion of the year. The BLM designates areas as Closed where a prohibition on motorized travel is necessary to protect resources, promote visitor safety, or reduce use conflicts.

The Forest Service travel management program is guided by the 2005 Travel Management Rule (36 CFR 212, Subpart B). This rule requires each national forest or ranger district to designate those roads, trails, and areas open to motor vehicles. Designation include class of vehicle and, if appropriate, time of year for motor vehicle use. A given route, for example, could be designated for use by motorcycles, all-terrain vehicles, or street-legal vehicles. Once designation is complete, the rule prohibits motor vehicle use off the designated system or inconsistent with the designations. Designation decisions are made locally, with public input and in coordination with state, local, and tribal governments. Designations are shown on a motor vehicle use map, and use inconsistent with the designations is prohibited. Within the planning area, the Forest Service has completed travel management planning for National Forest System lands across all

relevant population areas. Each national forest in Utah has a motor vehicle use map showing designated route systems. National forests in the Intermountain Region are in various stages of amending their travel management plan according to the 2005 ruling; some national forests have completed the process, while others are still underway with analysis.

Table 3.62 summarizes the areas open, limited, and closed to OHV use in the population areas for BLM-administered lands. These areas are shown on **Map 2.54**; the majority of the closed areas are located in the Desolation Canyon and Winter Ridge WSAs. The Forest Service does not use similar OHV management categories. OHV use on National Forest System lands within the planning area is limited to roads, trails, and areas that have been designated through a transportation planning process.

Table 3.62
BLM OHV Designations

	Open	Limited to Designated	Limited to Existing	Closed
Population Areas	1,319,400	1,901,400	549,000	130,100
Decision Area	797,000	1,217,700	437,400	32,200

Source: BLM 2012d
Note: The Forest Service does not use similar OHV management categories. OHV use on National Forest System lands within the planning area is limited to roads, trails, and areas that have been designated through a transportation planning process.

In **Chapter 4**, proposed BLM and Forest Service management objectives for resources and uses are evaluated against these indicators and compared to current travel and transportation trends as a way to evaluate potential effects on comprehensive travel and transportation management in the future.

3.18.2 Conditions in Population Areas

Sheeprocks Population Area

Travel management is a central BLM management issue in the Sheeprocks Population Area. Open travel designations in portions of the population area allow cross-country motorized vehicle travel to take place year-round. While the dunes environment of the Little Sahara Recreation Area SRMA offers an open sand dune riding environment, there is also a dense, heavily used network of OHV routes in the Sheeprock/Tintic SRMA, which is adjacent to the Little Sahara SRMA. Travel within the Sheeprock/Tintic SRMA is currently restricted to existing roads and trails. The Sheep Rock Mountains, Tintic Mountains, Desert Mountain, adjoining foothills, and desert flats, in conjunction with the open areas within the Little Sahara Recreation Area SRMA, provide a base for the largest and longest motorcycle races in Utah.

Other Population Areas

In contrast to the recreation-based travel objectives in the Sheeprocks Population Area, travel management in other population areas supports the management goals and objectives for other resource programs, such as oil and gas development in the Uintah and Carbon population areas. Recreation-based travel objectives are also a central part of the Parker Mountain and Bald Hills population areas, although loss of habitat or habitat fragmentation due to recreational travel was

not identified as a key threat in these areas. Remote population areas such as Box Elder, Ibapah, and Hamlin Valley have less dense travel networks because of less recreation use and permitted access needs. All population areas have some degree of route network and varying levels of use.

Trends

BLM

Access to and level of use within the population areas are expected to increase. Trends driving this change include the following:

- Increases in motorized recreation in population areas, particularly in the Sheeprocks Population Area where BLM travel management supports OHV use, with the facilities to encourage and support motorized travel.
- Increases in nonmotorized forms of travel such as mountain biking and hiking, especially in parts of the decision area close to urbanized areas.
- Increase in the number and use of routes in the route network for authorized and permitted uses.

In addition, there is increasing potential for resource and user conflict as OHV use increases and becomes more concentrated.

Forest Service

On National Forest System lands, the overall extent (measured in terms of miles) of the transportation network has shrunk over the last decade. This is partially due to a purposeful effort to decommission and reclaim roads that have served their purpose and are no longer needed. This is due to the persistent challenge of maintaining a large system of roads and trails with limited resources. The road system is likely to continue to shrink moderately due to aging drainage structures and bridges and shifting Forest priorities and funding levels. The number and extent of Forest trails is likely to remain stable or increase moderately over the next 10 years. Snowmobiling as a winter recreational activity has increased considerably over the past 15 years.

3.18.3 Regional Context

Table 3.63 displays data compiled in a BER produced by the USGS and BLM (Manier et al. 2013). In each table, data are presented by surface management agency and their occurrence within mapped occupied habitat in the planning area and MZs that overlap the planning area. As the table shows, MZs II and VII have more miles of roads for most surface management agencies (the exception being Forest Service and Other lands, where MZ IV has more miles of roads than other surface management agencies).

3.19 LANDS AND REALTY

The lands and realty program administers public lands within a framework of laws, regulations, and guidance. It consists of (1) land use authorizations/special use authorizations, including ROWs; (2) land tenure adjustments/landownership adjustments, including disposals and acquisitions of lands; and (3) withdrawals. The lands and realty program also processes renewable energy applications related to wind, solar, geothermal, and biomass energy. However, these topics are discussed in detail in **Section 3.20**, Renewable Energy.

Table 3.63
Roads within GRSG Habitat

Surface Management Agency	Management Zone	Miles of Roads		Acres of Roads	
		Total within Mapped Occupied Habitat[1]	Total within Management Zone[1]	Total within Mapped Occupied Habitat[1]	Total within Management Zone[1]
BLM	II & VII	1,400	37,100	14,300	398,300
	III	2,700	15,700	29,900	172,600
	IV	400	25,400	4,000	268,000
Forest Service	II & VII	300	800	3,700	8,500
	III	1,300	2,300	13,600	25,400
	IV	0	3,100	0	33,100
Tribal and Other Federal	II & VII	300	4,300	3,200	45,700
	III	700	900	7,400	9,400
	IV	0	1,700	0	19,300
Private	II & VII	1,900	35,100	21,500	407,500
	III	3,800	5,200	43,600	66,600
	IV	600	15,900	7,200	184,400
State	II & VII	400	4,900	3,900	53,600
	III	900	800	9,100	9,500
	IV	100	3,000	600	32,900
Other	II & VII	0	100	0	1,100
	III	0	0	0	0
	IV	0	200	0	2,000

Source: Manier et al. 2013
[1]Assumes footprint of 73.2 meters (240 feet) for interstate highways, 25.6 meters (84 feet) for primary and secondary highways, and 12.4 meters (41 feet) for other roads.

Forest Service LRMP prescriptions are similar to BLM ROW exclusion and avoidance areas. Prescriptions can restrict or prohibit certain uses in a planning area. It should also be noted that the Forest Service issues Special Use Authorizations (SUAs), while the BLM issues ROW grants, permits, easements and leases on their respective agency lands. Lastly, the Forest Service completes landownership adjustments, while the BLM conducts land tenure adjustments.

3.19.1 Conditions Statewide

Mapped occupied habitat in Utah covers primarily BLM-administered (34 percent) and private (41 percent) lands. The remaining 25 percent of mapped GRSG habitat is located on National Forest System lands (10 percent), Utah state-owned land (10 percent), and Ute Tribal land (5 percent). National Park Service and military reservations cover less than 1 percent each.

Land Use Authorizations/Special Use Authorizations

Land use authorizations/SUAs include granting ROWs, permits, leases, and easements. An ROW/SUA is authorized by a grant. On BLM-administered lands, permits are short term (generally not to exceed 3 years) revocable authorizations to use the lands for specified purposes. Permits can be reauthorized at the discretion of the authorized officer. Short-term authorizations are used by the BLM and Forest Service during construction, maintenance, and

other seasonal or short-duration uses involving minimal improvement and investment. Leases, ROWs, and long-term SUAs ensure a stability of tenure and are appropriate for facilities constructed for long-term use. They are not appropriate for temporary facilities or uses and are generally limited to a 30-year term. Leases are usually long-term authorizations requiring a significant capital investment. A lease generally grants less than the interest granted by an easement and provides for more direct control by the authorized officer.

Granting Rights-of-Way/Special Use Authorizations

Broad policy concerning the granting of ROWs/SUAs for roads and trails across BLM-administered and National Forest System land is to provide access to requesters when the applicant currently does not have access to the private property, cannot gain access across nonfederal land, and cannot exercise existing rights of access across nonfederal land. ROW grants and SUAs are used for oil and gas and water pipelines, electric transmission and distribution lines, roads, and communication lines such as telephone or cable. Generally, ROWs/SUAs are granted for a term appropriate to the life of a project. An ROW/SUA authorizes the holder to construct, operate, maintain, and/or terminate a new or existing facility over, under, upon, or through BLM-administered and National Forest System lands. The majority of ROWs/SUAs granted are authorized under Title V of the FLPMA (90 Stat. 2743; 43 USC 1715, 1761-1771) and the Mineral Leasing Act (Section 28 of the Mineral Leasing Act of 1920, as amended, 43 USC 185). It is the policy of the BLM and Forest Service to authorize ROW/SUA applications at the discretion of the authorized officer in a responsible, efficient, and economically feasible manner.

Table 3.64 lists the lengths of existing pipelines and transmission on all lands within the respective population area (**Map 3.19-1**). Statewide, there is a combined 2,447,310 miles of pipelines and transmission lines, including 1,317,100 miles in population areas and 130,100 miles in mapped occupied habitat.

ROW Avoidance and Exclusion Areas

Areas identified as unsuitable for surface disturbance or occupancy are generally identified as avoidance or exclusion areas for ROWs. Restrictions and mitigation measures could be modified on a case-by-case basis for avoidance areas, depending on impacts on resources, while exclusion areas are strictly prohibited from ROW development. **Table 3.65** identifies current exclusion and avoidance areas within mapped occupied habitat and within the larger population areas, which includes occupied habitat and nonhabitat areas.

Forest Service plan prescriptions are similar to BLM exclusion and avoidance areas, though the two are not necessarily interchangeable. In general, a BLM avoidance/exclusion would be a Forest Service plan prescription, but the BLM also include objectives and management actions beyond avoidance and exclusion stipulations that must be complied with when considering and designing ROWs. Similarly, a Forest Plan prescription can restrict or prohibit certain uses in a planning area, though every Forest Plan prescription would not automatically be considered avoidance or exclusion areas.

Table 3.64
Existing Pipelines and Transmission Lines in GRSG Population Areas and Occupied Habitat

Population Area	Length/Size in Miles	Miles of Mapped Occupied Habitat
Pipelines		
Bald Hills	80	50
Box Elder	10	0
Carbon	140	40
Emery	20	10
Panguitch	10	0
Rich	1,200	350
Sheeprocks	30	20
Strawberry	10	10
Uintah	400	330
Wyoming - Blacks Fork	10	10
Wyoming - Uinta	10	10
Total	1,920	830
Transmission Lines		
Bald Hills	140	80
Box Elder	80	50
Carbon	230	140
Emery	20	10
Panguitch	120	80
Parker Mountain	90	80
Rich	270	230
Sheeprocks	150	110
Uintah	160	110
Wyoming - Blacks Fork	0	0
Total	1,260	890

Source: BLM 2012d

Table 3.65
ROW Avoidance and Exclusion Areas

	Total Acres (Population Areas)	Acres of Mapped Occupied Habitat
ROW Exclusion	102,500	27,600
ROW Avoidance	118,000	67,200

Source: BLM 2012d

Energy Corridors

Statewide, there are 14 Federal Energy Corridors designated under Section 368 of the Energy Policy Act of 2005 (Public Law 109-58). The corridors are identified in the West-Wide Energy Corridor Programmatic EIS. These corridors cover 370,400 acres statewide. Collectively, Section 368 energy corridors and other corridors designated in existing BLM and Forest Service LUPs cover 266,600 acres in mapped occupied habitat.

Permits, Leases, and Easements

Issuance of leases, permits, and easements is a discretionary action. These authorizations may include but are not limited to airport leases, apiary permits, film permits, recreation and public purposes leases, and leases under 43 CFR 2740 through 2920 and 36 CFR Part 251. The Recreation and Public Purposes Act provides for the transfer, at reduced or no cost, of BLM-administered lands to a state, state agency, political subdivision of a state, or a qualified nonprofit organization for recreation such as a park, or a public purpose such as a fire station. Several acts of Congress authorize occupancy and use of National Forest System lands and interests in lands administered by the Forest Service. The applicable statutory authority determines the appropriate SUA. For example, some permits and temporary permits are issued under the provisions of the Organic Administration Act of June 4, 1897 (16 USC 477-482, 551), while some easements and leases and other types of permits are issued under the provisions of Title V of the FLPMA (43 USC 1761-1771) or the Forest Roads and Trails Act of 1964.

Communication Sites

The BLM and Forest Service typically issue leases for communications facilities through communications use leases. There are approximately 500 existing communication sites within mapped occupied habitat areas (see **Table 3.66**).

Table 3.66
Communication Sites

Population Area	Population Area Total	Facilities in Mapped Occupied Habitat
Bald Hills	20	10
Box Elder	40	20
Carbon	110	50
Emory	20	10
Ibapah	0	0
Lucerne	0	0
Panguitch	40	10
Parker Mountain	40	30
Rich	310	200
Sheeprocks	40	30
Strawberry	30	10
Uintah	160	130
Wyoming-Uinta	0	0
Total	**810**	**500**

Source: BLM 2012d

Land Tenure/Landownership Adjustments

Land tenure/landownership adjustments refer to actions that result in the disposal of BLM-administered and National Forest System lands or the acquisition of nonfederal land or interests. BLM land tenure adjustments include disposals donations, exchanges easements, and acquisitions. Forest Service landownership adjustments include exchange, purchase, donation, and ROW acquisitions. Sections 205, 206, and 208 of the FLPMA authorize the Secretary of the Interior to acquire lands and interests in lands, enter into land exchanges, and dispose of lands, provided in part there is a public benefit through the land tenure adjustment. Section 205 of the

FLPMA (90 Stat. 2743, as amended; 43 USC 1701) authorizes the Secretary of Agriculture to acquire access (lands or interest therein) over nonfederal lands to units of the National Forest System by purchase, exchange, donation, or eminent domain.

Disposals

Disposals are transfers of land out of federal ownership. BLM-administered and National Forest System lands selected for disposal typically meet the following criteria:

- Isolated and fragmented from larger tracts of BLM-administered and National Forest System lands
- Adjacent to urbanizing private and state lands subject to future development
- Currently leased under the Recreation and Public Purposes Act and eligible to be patented
- Present an economic and management challenge to retain under public ownership
- Not within designated wildlife corridors
- Not occupied by species listed or proposed as threatened or endangered under the ESA
- Not designated or proposed critical habitat for listed or proposed threatened or endangered species
- Not supporting listed or proposed threatened or endangered species if such transfer would conflict with recovery of the listed or proposed species
- Not supporting federal candidate species if such action would contribute to the need to list the species as threatened or endangered.

Under the authority of FLPMA, the BLM can sell public lands through both direct and competitive sales and exchange lands with other land management agencies and private landowners. The BLM may also convey interest in underground estate in lands where there are no known mineral values or in those instances where maintaining the underground mineral rights interferes with or precludes appropriate nonmineral development and such development is a more beneficial use of the land than mineral development. There are 24,383 acres available for disposal in mapped occupied habitat on BLM-administered lands.

Acquisitions

The BLM can acquire lands through purchases, exchanges, easements, donations, and other land transfers. Acquired land is generally designated for retention. Purchases, easements, exchanges, and directed sales are completed based on appraised market value. Competitive sales are completed based on a minimum of appraised fair market value, but may exceed that value based on competitive bidding. The BLM has acquired 61 acres in mapped occupied habitat.

National Forest System lands are exchanged to achieve a desired national forest landownership pattern that supports forest land and resource goals and objectives, addresses fragmentation, reduces future management costs, and responds to urban and community needs. Lands are purchased through the Land and Water Conservation Fund to protect critical resource areas

and to provide increased public recreation opportunities. Land donations are accepted to consolidate National Forest System lands and to protect critical resource areas. The legal public use of National Forest System lands are improved by acquiring ROWs for roads and trails.

Withdrawals

Withdrawals are formal lands actions that set aside, withhold, or reserve federal land by statute or administrative public land order for public purposes. A withdrawal is an action that restricts the disposal of BLM-administered and National Forest System lands and that holds them for a specific purpose. It is the withholding of an area of federal land from settlement, sale, location, or entry under the mining law, or withdrawal from some or all of the general land laws, for the purpose of limiting activities under those laws in order to maintain other public values in the area or to reserve the area for a particular public purpose or program.

Withdrawals are established for a wide variety of purposes such as Federal Energy Regulatory Commission power site reserves; Department of Defense military reservations; administrative sites; recreation sites; National Parks; National Forests; Bureau of Reclamation projects such as reservoirs; wild and scenic rivers; and wilderness areas. Withdrawals are most often used to preserve sensitive environmental values and major federal investments in facilities or other improvements, to support national security, or to provide for public health and safety. Withdrawals can be designated by Congress through statute, or processed by the BLM administratively through FLPMA and 43 CFR 2300 and in accordance with Departmental Manual 603.1 (2005).

Classification of lands is the process of determining whether the lands are more valuable or suitable for transfer or use under particular or various public land laws than for retention in federal ownership for management purposes. The segregation of lands is an action such as a withdrawal or allowed application (e.g., Recreation and Public Purposes) that suspends the operation to entry under all or portions of the public land laws, which includes the mining and mineral leasing laws.

Existing withdrawals where the BLM does not retain any management authority are limited to military purposes. The BLM retains specific management responsibilities, such as fire management or grazing, based on the specific legislation guiding withdrawals to other federal agencies such as the Bureau of Reclamation and the Army Corps of Engineers for dams, reservoirs, and canals, or USFWS for wildlife-management purposes.

Lands within Congressionally designated wilderness areas also are withdrawn from all forms of appropriation under the mining laws and from disposition under mineral leasing laws. Prior existing claims or leases with valid existing rights may be developed, though mineral development within wilderness areas is rare.

3.19.2 Regional Context

Table 3.67 through **Table 3.71** display data compiled in a BER produced by the USGS and BLM (Manier et al. 2013). In each table, data are presented by surface management agency and their occurrence within mapped occupied habitat in the planning area and across the entire MZs. As the tables show, there are more acres within city limits, more communication towers,

and more miles of transmission lines and utility corridors and railroads within mapped occupied habitat in MZ II than in the other MZs.

The conversion of sagebrush habitat to agricultural land or urban areas can result in GRSG habitat becoming fragmented and in an increase in domestic predators such as cats and dogs (Knick and Rotenberry 1995). **Table 3.67** illustrates the locations where agricultural or urban development could occur given the location within a city boundary. Of the 6,400 acres of land within city limits in MZ III, 63 percent are within mapped occupied habitat in Utah. None of the National Forest System land in Utah is within city limits. Statewide, the largest area of mapped occupied habitat (50,400 acres) within city limits is on private land within MZ III. Mapped occupied habitat on private land within city limits in the Utah portion of MZ III accounts for 79 percent of those areas in MZ III.

Table 3.67
Acres of GRSG Habitat within City Limits

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat	
		Within Planning Area	Within Management Zone
BLM	II & VII	0	143,600
	III	4,000	6,400
	IV	0	20,700
Forest Service	II & VII	0	24,600
	III	0	0
	IV	0	700
Tribal and Other Federal	II & VII	800	34,900
	III	100	100
	IV	0	100
Private	II & VII	13,600	288,400
	III	50,400	63,800
	IV	0	47,500
State	II & VII	500	17,600
	III	1,500	1,500
	IV	0	2,800
Other	II & VII	0	0
	III	0	0
	IV	0	0

Source: Manier et al. 2013

Communication towers, transmission lines, and other vertical structures that provide additional perching opportunities for ravens and other birds of prey can result in habitat fragmentation, habitat avoidance, and increased vehicle traffic during maintenance operations (USFWS 2013a). **Table 3.68** demonstrates that of the approximately 1,500 communication towers on BLM-administered and National Forest System land in MZs II, III, IV, and VII, approximately 6 percent are within mapped occupied habitat in Utah. The majority (218) of the communication towers within mapped occupied habitat in Utah are located on private land in MZ III.

Table 3.68
Number of Communication Towers within GRSG Habitat

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat	
		Within Planning Area[1]	Within Management Zone[1]
BLM	II & VII	38	900
	III	39	200
	IV	5	300
Forest Service	II & VII	0	38
	III	0	41
	IV	0	58
Tribal and Other Federal	II & VII	0	100
	III	0	3
	IV	0	62
Private	II & VII	72	1,800
	III	219	300
	IV	20	400
State	II & VII	55	200
	III	0	13
	IV	0	40
Other	II & VII	0	3
	III	0	0
	IV	0	3

Source: Manier et al. 2013
[1]Displays the number of Federal Communication Commission communication towers

Table 3.69 demonstrates that the portion of transmission lines in mapped occupied habitat in Utah is the greatest for BLM-administered and National Forest System lands in MZ III (28 percent and 40 percent, respectively). In MZ III, all of the 800 transmission line miles in occupied habitat on tribal and other federal land are in Utah, while less than 1 percent of all miles on those lands in MZs II, IV, and VII are in Utah.

Utility corridors are a planning tool that enables the BLM and Forest Service to identify desired locations for future infrastructure. **Table 3.70** provides the miles and acres of Section 368 Energy corridors for mapped occupied habitat. Of the 797,200 acres of corridors in mapped occupied habitat on BLM, Forest Service, tribal, and other federal lands in MZs II, III, IV, and VII, 11 percent are in Utah.

Railroads can fragment GRSG habitat (Knick and Rotenberry 1995). **Table 3.71** indicates that 87 percent of railroad miles and acres in mapped occupied habitat in Utah are within MZ III. Additionally, Utah contains all railroad miles and acres on Forest Service, tribal, other federal, and state lands in mapped occupied habitat for MZ III. BLM-administered lands in Utah contain 57 percent of all railroad miles in mapped occupied habitat within MZ III, but only 1 percent of the total miles for MZs II, IV, and VII.

Table 3.69
Acres of Transmission Lines within GRSG Habitat

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat	
		Within Planning Area[1]	Within Management Zone[1]
BLM	II & VII	9,100	302,800
	III	14,800	52,400
	IV	3,700	125,600
Forest Service	II & VII	2,400	5,800
	III	1,200	3,000
	IV	0	9,300
Tribal and Other Federal	II & VII	500	41,300
	III	800	800
	IV	0	15,300
Private	II & VII	15,800	325,500
	III	40,600	47,100
	IV	3,700	104,900
State	II & VII	3,000	40,000
	III	6,500	6,500
	IV	200	17,600
Other	II & VII	0	1,100
	III	0	0
	IV	0	3,600

Source: Manier et al. 2013
[1]Includes transmission lines greater than 115 kVs and assumes a 656-foot-wide footprint (200 meters)

Table 3.70
Utility Corridors within GRSG Habitat

Surface Management Agency	Management Zone	Miles of Utility Corridors within Mapped Occupied Habitat		Acres of Utility Corridors within Mapped Occupied Habitat	
		Within Planning Area[1]	Within Management Zone[1]	Within Planning Area[2]	Within Management Zone[2]
BLM	II & VII	38	500	29,100	420,500
	III	76	200	56,300	140,700
	IV	0	400	0	222,000
Forest Service	II & VII	0	4	2,300	4,100
	III	1	1	400	1,200
	IV	0	5	0	1,200
Tribal and Other Federal	II & VII	0	7	0	6,500
	III	0	0	300	300
	IV	0	0	0	700

Source: Manier et al. 2013
[1]Includes Section 368 energy corridors
[2]Acreages calculated by buffering corridor centerlines with varying widths based on the corridor width itself. Although a utility corridor centerline might not be present on one surface management agency, the buffer around that centerline may overlap onto a different surface management agency.

Table 3.71
Railroads within GRSG Habitat

Surface Management Agency	Management Zone	Miles of Railroads within Mapped Occupied Habitat		Acres of Railroads within Mapped Occupied Habitat	
		Within Planning Area	Within Management Zone	Within Planning Area[1]	Within Management Zone[1]
BLM	II & VII	7	300	28	1,121
	III	61	109	230	407
	IV	0	257	0	960
Forest Service	II & VII	0	0	0	0
	III	4	4	15	15
	IV	0	9	0	34
Tribal and Other Federal	II & VII	0	52	0	194
	III	60	60	225	225
	IV	0	33	0	123
Private	II & VII	34	953	126	3,562
	III	126	147	471	548
	IV	0	358	0	1,340
State	II & VII	0	74	0	278
	III	26	26	97	97
	IV	0	24	0	90
Other	II & VII	0	1	0	5
	III	0	0	0	0
	IV	0	0	0	0

Source: Manier et al. 2013
[1]Assumes footprint of 9.4 meters (31 feet)

3.20 RENEWABLE ENERGY

The DOI, the BLM, and the Forest Service are working with local communities, state regulators, industry, and other federal agencies in building a clean energy future by providing sites for environmentally sound development of renewable energy on BLM-administered and National Forest System lands. Renewable energy projects on BLM-administered and National Forest System lands include wind, solar, geothermal, and biomass projects and the siting of transmission facilities needed to deliver this power to the consumer. As demand has increased for clean and viable energy to power the nation, streamlined environmentally sensitive permitting of renewable energy generation projects on BLM-administered and National Forest System lands has become an administrative and land management planning priority.

The Solar Programmatic EIS specifically excluded from development identified GRSG habitat (occupied, brood rearing, and winter habitat) on BLM-administered lands in Utah and Nevada that have been identified by the US Department of Energy as having the capacity to support utility-scale solar facilities of 20 megawatts (MW) or larger.

As of 2010, the BLM's renewable energy policy is directed by the following regulations and executive orders:

- The Energy Policy Act of 2005 (Title II, Sec. 211), which requires the DOI to approve at least 10,000 MW of renewable energy capacity on BLM-administered and National Forest System lands by 2015
- The Energy Policy Act of 2005 (Title II, Sec. 222(d)), which requires that all future Forest Service LRMPs and BLM RMPs in areas of geothermal resource potential consider geothermal leasing and development
- The Energy Policy Act of 2005 (Title II, Sec. 223), which gives the Secretary of the Interior authority to identify areas that could be leased exclusively for direct use of geothermal resources
- Executive Order 13212, Actions to Expedite Energy-Related Projects, which requires federal agencies to expedite review of energy project applications
- Secretarial Order 3285, which requires the DOI to identify and prioritize specific locations best suited for large-scale renewable energy production

Additionally, the BLM has specific guidance for certain types of renewable energy. The main IMs are summarized here:

- IM 2006-216, Wind Energy Development Policy provides guidance on implementing the ROD for the Programmatic EIS on Wind Energy Development and processing ROW applications for wind energy projects on BLM-administered lands.
- IM 2009-043, Wind Energy Development Policy, provides updated guidance on processing ROW applications for wind energy projects on BLM-administered lands.
- IM 2011-059, NEPA Compliance for Utility-Scale Renewable Energy ROW Authorization Policy for analyzing externally generated, utility-scale renewable energy ROW applications.
- IM 2011-061, Solar and Wind Energy Applications – Pre-Application and Screening Policy, provides guidance to facilitate environmentally responsible development of solar and wind energy projects on BLM-administered and National Forest System lands, in accordance with Secretarial Order 3285A1. Such development must also be consistent with protection of areas and resources of national interest, including BLM's National Conservation Lands, units of the National Park System, National Forest System, national wildlife refuges, and other specially designated areas that protect wildlife, visual, cultural, historic, or paleontological resource values.
- IM 2004-227, Biomass Utilization Strategy, updated in July 2005, provides sets of goals to help focus and increase utilization of biomass from BLM-administered lands. In June 2005, the final rule in the *Federal Register* revised the authority of 48 CFR Part 1452 by adding 1452.237-71, which is a new contract clause for removal and utilization of woody biomass generated as a result of land management service contracts whenever ecologically and lawfully appropriate. The BLM issued IM 2009-

120 in May 2009, which updated the contract clause for utilization for woody biomass.

Wind projects are authorized via the ROW process. ROW applications for development on BLM-administered lands must be accompanied by a processing fee as set forth in 43 CFR 7 2804.14. ROW applications are generally accepted and processed on a first-come, first-served basis. The ROW regulations (43 CFR 2804.23[c]) provide authority for offering BLM-administered and National Forest System lands under competitive bidding procedures for ROW authorizations. The BLM initiates a competitive process if a land use planning decision has specifically identified an area for competitive leasing. The BLM may also consider other public interest and technical factors in determining whether to offer lands for competitive leasing. Competitive bidding follows procedures required by 43 13 CFR 2804.23(c).

Forest Service renewable energy generation and transmission includes wind and geothermal energy facilities. Section 501(a)(4) of the FLPMA, 43 USC 1761(a)(4) (Forest Service Manual 2701.1, para. 15) authorizes the Forest Service to issue ROWs for the use and occupancy of National Forest System lands for generation, transmission, and distribution of electric energy. The Energy Policy Act of 2005 recognizes the Forest Service's role in meeting the renewable energy goals of the US. Consistent with agency policies and procedures, the use and occupancy of National Forest System lands for alternative energy production, such as wind energy development, are appropriate and will help meet the energy needs of the US. Permits for geothermal energy power facilities are issued only if feasibility studies have determined that it is not feasible to transmit geothermal water to a power-generating facility on non-National Forest System lands and if adverse impacts can be minimized.

3.20.1 Conditions Statewide

Utah has a vast and uniquely diverse renewable energy resource potential that rivals that of most of its neighboring states. However, unlike many other states in the region, Utah does not have a mandatory renewable portfolio standard. In order to encourage renewable energy development, the state provides an array of tax incentives, rebates, and programs to help residents and commercial and industrial entities provide clean energy to the state's grid.

The major renewable energy resources in Utah are solar, wind and geothermal. What follows is a summary of renewable energy interest in Utah.

Solar Energy

The Solar Programmatic EIS reasonably foreseeable development (RFD) scenario estimated that 1,219 MWs of utility-scale solar energy project development could occur on 10,971-acres of BLM administered lands by 2030 (BLM and US Department of Energy 2012). The Solar Programmatic EIS ROD specifically excluded from development identified GRSG habitat (occupied, brooding, and winter habitat) on BLM-administered lands in Utah (and Nevada) that have been identified by the US Department of Energy as having solar energy capacity to support utility-scale facilities of 20 MW or larger. Therefore, utility-scale solar energy development will not be subject to any new decisions in this LUPA and will not be addressed or included in the analysis of this LUPA. For ROW applications to support non-utility-scale solar facilities (i.e., less than 20 MW), the BLM will consider such project requests on a case-by-case basis, which may require an LUPA to analyze an otherwise nonconforming proposal.

Wind Energy

Utah has over 327 MW of developed wind, including commercial-scale and small wind projects. Utah has the technical potential to contribute nearly 2,500 MW of wind-generated power; this excludes sensitive lands, national parks, and areas unsuited for wind development. This amount of wind would provide enough energy for over 660,000 average Utah homes (Utah Energy Atlas 2012). See **Map 3.20-1** and **Map 3.20-2** for an overview of wind potential and existing development within the sub-region.

Below is a summary of Utah's wind projects:

- Camp Williams, Utah National Guard (Utah County) – 1 MW, 2 turbines
- Tooele Army Depot (Tooele County) - 1.5 MW, 1 turbine
- Spanish Fork Wind Power Project (Utah County) – 18.9 MW, 9 turbines
- Utah Wind for Schools Projects, 4 turbines
- Milford Wind Project, Phase I (Beaver County)- 203.5 MW, 97 turbines
- Milford Wind Project, Phase II (Beaver and Millard Counties) - 102 MW, 68 turbines

Geothermal Energy

Geothermal resources are plentiful in the middle and northwest portions of the state, although a lack of transmission capacity may hinder electricity development in the northwest corner. Geothermal resources in Utah have the potential to supply 15,000 MW of electricity. The current installed capacity of Utah's two geothermal power plants is 42 MW (see **Map 3.20-3**). There are several additional geothermal prospects undergoing evaluation and exploration across the state (Geothermal Energy Association 2011). Below is a summary of Utah's geothermal power plants:

- In 2008, the Blundell plant in the Roosevelt Hot Springs area was expanded from 26 MW (gross) by the addition of an 11 MW binary power generation unit.
- In the Thermo Hot Springs geothermal area southwest of Minersville, in Beaver County, Raser Technology developed the 10 MW Hatch geothermal power plant. This plant was subsequently replaced by a 10 MW binary-cycle power plant constructed by Raser Technology, who was reorganized as Cyrq Energy after a bankruptcy.
- Enel has completed additional Sulphurdale/Cove Fort Geothermal Field production/injection wells and a 25 MW (gross) air-cooled binary-cycle power plant, which went on-line in October 2013.

Currently, there are no geothermal energy production facilities within population areas in Utah.

There currently is no significant commercial energy economy for biomass in Utah, other than for incidental use as a firewood fuel. An emerging market may exist within 5 to 10 years as the following occur:

- Field portable energy concentrating technology becomes available

- Longer-term and larger-area (volume) land treatment contracts are established that would provide a commercially reliable source of feedstock
- The establishment of an adequate land treatment and biomass transportation service industry
- The creation of a sustained biomass feedstock demand to support commercially viable stationary plant or field mobile bioenergy generation facilities

A potential competing market for energy generation from biomass is the emergence of other beneficial uses and associated markets using biomass as a feedstock. For example, wood biochar can be used as a soil amendment to improve disturbed land reclamation success.

3.20.2 Conditions in Population Areas

Wind Energy

During the past 5 years, there has been steady interest in wind site testing and monitoring activities and energy project development on BLM-administered and National Forest System lands in Utah. The Salt Lake, Cedar City, Fillmore, and St. George Field Offices have each issued ROWs for wind site testing and monitoring, and limited inquiries for site testing and monitoring have been made in the Vernal, Price, Richfield, and Monticello Field Offices. .

Since 2003, the BLM Utah has received 66 wind meteorological (met) tower testing ROW applications. Most wind test ROWs are located in the southern half of Utah's West Desert within the Salt Lake, Fillmore, Cedar City, and St. George Field Offices. Of the 66 applications received, 64 have been administratively processed, with 2 pending completion at the time of this writing. These ROWs have an authorized term of 3 years. A total of 49 of the prior processed ROWs have now been closed or expired where project proponents have completed their wind performance assessments or withdrawn their applications before approval. Currently, there are five wind test ROWs active (authorized). Approved test ROWs have resulted in the installation of over 215 met towers or associated ground-based sensing units. When added together, the processed wind test ROWs encompass approximately 1,335,000 acres of BLM-administered lands.

Utah has received 12 wind energy (turbine) development project ROW applications. The Salt Lake Field Office rejected one application due to proximity conflicts with a national historic trail, an associated National Park Service monument (City of Rocks, Idaho), and a dated BLM LUP that lacks wind development planning. Seven applications have been closed or expired due to conclusion of operation, economics, bankruptcy, or changes in plans.

Two project ROWs were approved by the Cedar City and Fillmore Field Offices, resulting in the development of Phase I and II of the large Milford Wind Corridor Project area straddling the Beaver and Millard county-line north of Milford, Utah (305.5 MW, 165 turbines). The Milford Wind Corridor Project had four proposed phases, for a total of 605 turbines providing over a 1,000 MWs to Los Angeles Department of Water and Power. Phases I and II came into service in 2009, while Phase III planned for state and private land and Phase IV planned on BLM, state, and private land have now been cancelled.

The BLM currently has two pending wind development ROWs applications undergoing Department of Defense impact consultations. These pending applications include the 160 MW Long Ridge Wind Energy Project in the Fillmore Field Office located within the Sevier B and D Military Operating Areas of the Utah Test and Training Range and the 80 MW Enterprise Wind Energy Project in the Cedar City Field Office located adjacent to the Nevada Test and Training Range administered by the Nellis Air Force Base in Nevada.

Neither the Milford Wind Corridor Project nor any other wind energy project currently impact occupied population areas within the planning area. Therefore, they will not be discussed individually any further.

There are several areas on National Forest System lands in GRSG habitat that have potential for developable wind energy resources. Interest has been expressed in portions of the Uinta-Wasatch-Cache National Forest in the Rich Population Area and in the Ashley National Forest in the Carbon Population Area. However, no SUAs have been requested, as the terrain and lack of accessibility to the grid makes it generally unsuitable for development.

Table 3.72 describes the wind potential throughout Utah and how it overlaps with mapped occupied habitat and population areas.

Table 3.72
Wind Potential in the Planning Area

Wind Speed (meters per second)	Acres within Planning Area	Acres of Mapped Occupied Habitat	Acres of GRSG Population Areas
7 to 8.5 (Developable)	187,600	35,500	48,100
5.5 to 7	9,943,000	1,302,700	1,960,200
less than 5.5	37,925,900	5,824,200	9,282,600

Source: US Department of Energy 2012

Geothermal Energy

The BLM Utah currently has 27 authorized geothermal leases encompassing 60,051 acres within the Fillmore and Cedar City Field Office areas of the southern half of Utah's West Desert.

As of early 2015, there are 41 geothermal wells in all of Utah, none of which is found in population areas or GRSG habitat.

Two of the three geothermal power plants in Utah mentioned above are located partially on BLM-administered lands: the Blundell power plant and the Cove-Fort Sulphurdale power plant.

The Drum Mountain complex in the northern half of the Fillmore Field Office had exploration activity from 2007 to 2009 from private industry and from the Utah Geological Survey. The Utah Geological Survey has also been active in conducting and completing geophysical operations in the Pavant Butte/Black Rock Desert area within the eastern portion of the Fillmore Field Office as well as south of Wendover, Utah in the western portion of the Salt Lake Field Office.

Currently, there are no geothermal energy production facilities within GRSG habitat in the planning area. Future development of geothermal resources within GRSG habitat in the planning area is also highly unlikely.

Trends

Utah established a goal for municipal utilities, investor-owned utilities, and rural electric cooperatives to produce or buy 20 percent renewable energy of their adjusted retail electric sales by 2025, to the extent that it is cost effective to do so.

Within the planning area, greater pressure to develop renewable energy resources on the BLM-administered and National Forest System lands will occur because of public energy policy coming from individual states or the federal government. The development of more energy-efficient technologies for geothermal, wind, and biomass power will continue to grow with increasing regulation and price of fossil fuels and the increasing demand for energy products. The development of these resources can diversify and improve the area's energy reliability and increase the demand for more ROWs and facility authorizations.

The demand for alternative energy-related ROWs will likely increase nationally. The most likely trend for using wind and biomass energy resources will be to continue to develop more of these types of alternative sources and to develop ways to make all of them more efficient to take the pressure off the fossil fuel resource and to be less dependent on nonrenewable energy sources.

The relatively low cost and significant ongoing and planned expansion of combined cycle natural gas generated electricity in Utah as well as the expiration of the federal production tax credit for wind energy has slowed short-term large-scale wind energy development in Utah. The Milford Wind Corridor Project Phases III and IV have been cancelled due to these factors, and short-term renewable energy development in Utah has shifted to solar photovoltaic projects.

In late 2014, Rocky Mountain Power announced their intention to increase their purchase of Utah-generated renewable energy power. Rocky Mountain Power will buy the output of the planned 20 MW "Seven Sisters" solar energy projects located in the West Desert of Utah under its obligation from the federal Public Utility Regulatory Policies Act. First Wind, which developed and operates the 306 MW Milford Wind Corridor Project, has created a solar division that is developing the Seven Sisters projects. These projects include seven small separate solar photovoltaic projects, four of which are to be sited in Beaver County and three to be located in Iron County, Utah. Major construction was slated to begin in late 2014, with a target completion date of July 2015. Six of the seven projects will be 3 MW (AC), and the seventh will be 2 MW (AC). The projects are the first in Utah to be developed by First Wind's new solar division, First Wind Solar Group. These projects illustrate the emergence of smaller distributed solar projects in the West Desert of Utah.

Two significant utility-scale solar energy projects currently under development in southern portion of the West Desert include the 104 MW Red Hills photovoltaic solar plant located on 650-acres of private land west of Parowan, Utah (planned inservice late 2015) and the 80 MW Iron Springs photovoltaic solar project located on private land.

There are several proposed transmission lines under NEPA review in Utah (e.g., TransWest Express, Energy Gateway South, Zephyr, and Tropic to Hatch). Improvements in energy transmission would increase the feasibility of renewable energy development along these routes where transmission has been nonexistent. It is important to note that while Utah as a whole should experience an increase in renewable energy development over the coming years, this development is highly unlikely to occur in mapped occupied habitat. This is due to the lack of renewable energy potential within these occupied areas when compared with surrounding areas.

3.20.3 Regional Context

Table 3.73 through **Table 3.76** below display data compiled in a BER produced by the USGS and BLM (Manier et al. 2013). In each table, data are presented by surface management agency and their occurrence within mapped occupied habitat in the planning area and MZs that overlap the planning area. As the tables show, there are more acres of wind energy ROWs and more wind turbines in MZ IV. The tables also show more acres of geothermal resource potential in MZs II and VII, but more acres of geothermal leases in MZ IV. **Maps 3.20-2** and **3.20-3** depict corresponding information.

Table 3.73
Acres of Wind Energy Rights-of-Way within GRSG Habitat

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat	
		Within Planning Area	Within Management Zone
BLM	II & VII	30,700	748,300
	III	71,200	203,600
	IV	10,800	877,000
Forest Service	II & VII	0	0
	III	0	400
	IV	0	0
Tribal and Other Federal	II & VII	0	1,300
	III	0	0
	IV	0	1,900
Private	II & VII	1,100	3,800
	III	100	9,300
	IV	1,500	16,200
State	II & VII	200	1,100
	III	74	74
	IV	0	400
Other	II & VII	0	27
	III	0	0
	IV	0	0

Source: Manier et al. 2013

Table 3.74
Wind Turbines within GRSG Habitat

Surface Management Agency	Management Zone	Number of Wind Turbines within Mapped Occupied Habitat		Acres of Wind Turbines within Mapped Occupied Habitat	
		In the Planning Area[1]	In Management Zone[1]	In the Planning Area[2]	In Management Zone[2]
BLM	II & VII	15	100	45	300
	III	32	55	95	160
	IV	3	95	9	280
Forest Service	II & VII	19	134	57	400
	III	14	66	42	200
	IV	18	189	54	560
Tribal and Other Federal	II & VII	30	54	90	160
	III	42	36	130	110
	IV	15	44	45	130
Private	II & VII	27	125	81	370
	III	27	49	81	150
	IV	5	102	15	300
State	II & VII	6	91	18	270
	III	4	35	12	100
	IV	0	87	0	260
Other	II & VII	7	87	21	260
	III	5	9	15	27
	IV	5	47	15	140

Source: Manier et al. 2013
[1]Derived from Federal Aviation Administration data on vertical structures
[2]Assumes footprint of 62 square meters (203 square feet) per wind turbine

Table 3.75
Acres of Geothermal Resource Potential within GRSG Habitat

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat	
		Within Planning Area[1]	Within Management Zone[1]
BLM	II & VII	66,600	12,214,800
	III	1,046,300	9,190,900
	IV	413,000	18,638,700
Forest Service	II & VII	117,000	385,400
	III	185,500	1,138,100
	IV	400	2,725,600
Tribal and Other Federal	II & VII	600	1,386,700
	III	54,200	147,700
	IV	0	1,156,100
Private	II & VII	33,600	8,079,900
	III	426,900	1,351,300
	IV	553,600	8,305,000

Table 3.75
Acres of Geothermal Resource Potential within GRSG Habitat

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat	
		Within Planning Area[1]	Within Management Zone[1]
State	II & VII	29,000	1,091,000
	III	146,100	151,900
	IV	56,000	1,855,200
Other	II & VII	0	25,500
	III	0	100
	IV	0	94,300

Source: Manier et al. 2013
[1]Derived from areas identified by Idaho National Engineering and Environmental Laboratory as favorable for the discovery and shallow depth of thermal water of sufficient temperature for direct-heat applications

Table 3.76
Acres of Geothermal Leases within GRSG Habitat

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat	
		Within Planning Area	Within Management Zone
BLM	II & VII	0	124,700
	III	500	73,000
	IV	0	41,700
Forest Service	II & VII	0	7
	III	0	0
	IV	0	0
Tribal and Other Federal	II & VII	0	0
	III	0	100
	IV	0	0
Private	II & VII	0	800
	III	0	2,700
	IV	0	900
State	II & VII	0	0
	III	0	100
	IV	0	0
Other	II & VII	0	0
	III	0	0
	IV	0	0

Source: Manier et al. 2013

3.21 MINERALS

Mineral production on BLM-administered and National Forest System lands in Utah involves three distinct categories: leasable, locatable, and salable minerals.

- **Leasable minerals** are governed by the Mineral Leasing Act of 1920, as amended, which authorized specific minerals to be disposed of through a leasing system. For

the following discussion, leasable minerals will be discussed under three subheadings: fluid minerals (oil and gas, oil shale, and tar sands), nonenergy leasable minerals, and coal.

- **Locatable minerals** can be located and claimed under the General Mining Law of 1872, as amended. Locatable minerals on National Forest System lands are also governed by the 1955 Multiple Surface Use Mining Act, which gives the Forest Service the authority to manage surface resources. Locatable minerals include but are not limited to uranium, vanadium, gold, alabaster/gypsum, copper, silver, tungsten, gem minerals (amethyst, fluorite), and zeolite.
- **Salable minerals (mineral materials)** are sold or permitted under the Materials Act of 1947. Common varieties of salable minerals include construction materials and aggregates such as sand, gravel, cinders, roadbed, and ballast material.

The BLM manages all federally owned minerals that lie beneath both federal and nonfederal lands. While the BLM manages 29,855,000 acres of federal minerals within the planning area, the decision area is limited to 4,008,600 acres of federal mineral estate within population areas. Additionally, for this plan amendment, the BLM and Forest Service are not making decisions on federal minerals beneath surfaces managed by other federal agencies; therefore, only federal minerals beneath BLM, Forest Service, private, and state surface are discussed in **Chapters 3** and **4** as being part of the decision area.

Table 3.77 provides the acres of federal mineral estate within the decision area (see **Map 3.21-1**).

Table 3.77
Federal Mineral Estate in the Decision Area

Land Status	Acres
BLM Surface/Federal Minerals	2,500,200
Forest Service Surface/Federal Minerals	814,300
Private Surface/Federal Minerals	506,600
State Surface/Federal Minerals	144,200
Tribal Surface/Federal Minerals	43,300
Total	**4,008,600**

Source: BLM 2012d

3.21.1 Oil and Gas

Fluid leasable minerals include oil, gas, and geothermal heat. While geothermal heat is considered a fluid leasable mineral, it is discussed as a renewable resource in this document (see **Section 3.20**, Renewable Energy). In general, leasable minerals are governed by the Mineral Leasing Act of 1920, as amended, which authorized specific minerals to be disposed of through a leasing system. At the time leases are issued, stipulations (i.e., NSO, CSU, and TLs) may be added to the leases for protection of other resources. The BLM and Forest Service also reserve the right to require additional mitigation measures, in the form of COAs, after a lease is issued (e.g., at APD approval) if doing so is necessary for protection of other resources.

Conditions Statewide

Of the 48,213,400 acres in the planning area, 7,509,500 acres (16 percent) have high oil and gas occurrence potential (**Table 3.78** and **Map 3.21-2**). The majority of the planning area (34,404,200 acres, or 71 percent) has low or no known oil and gas occurrence potential. Of the high potential acres within the planning area, 791,000 acres (11 percent) are within the decision area. These acres make up 20 percent of the decision area. Most acres in the decision area (2,310,400 acres, or 58 percent) have low or no known oil and gas occurrence potential. It should be noted that there are some existing leases in areas identified as having low potential for oil and gas occurrence. However, these areas, if reclassified as high potential, account for less than one percent of the decision area with high potential for oil and gas occurrence.

Table 3.78
Oil and Gas Occurrence Potential

Habitat Type	Occurrence Potential			
	High	Moderate	Low/No Known	Total
Planning Area (All lands, regardless of ownership)	7,509,500	6,299,700	34,404,200	48,213,400
Population Areas (All lands, regardless of ownership)	2,913,300	2,310,300	6,158,300	11,381,800
Federal Mineral Estate	*1,286,900*	*1,521,900*	*3,955,900*	*6,764,600*
Decision Area	791,000	884,900	2,310,400	3,986,300

Source: BLM 2012d

There are 4,636,200 acres of existing leases (federal and nonfederal) in the planning area, of which 651,000 acres (14 percent) are federal leases within the decision area (**Table 3.79** and **Map 3.21-3**). Of the existing leases, 1,835,900 acres (40 percent) in the planning area are held by production and 248,700 acres (38 percent) in the decision area are held by production. There are 19,300 wells (federal and nonfederal) in the planning area, 1,300 of which (7 percent) are federal wells within the decision area (**Map 3.21-4**).

Table 3.79
Oil and Gas Activity in the Decision Area

	Planning Area (federal and nonfederal leases)	Decision Area (federal leases)
Existing Oil and Gas Leases	4,636,200 acres	651,000 acres
Leases Held by Production	1,835,900 acres	248,700 acres
Number of Existing Wells	19,300 wells	1,300 wells

Sources: BLM 2012e, 2015; Utah Department of Natural Resources 2012a; Wyoming Oil and Gas Conservation Commission 2012

The BLM and Forest Service each apply stipulations (including NSO, CSU, and TLs) to oil and gas leases to protect various resources. See the glossary for descriptions of what each type of stipulation entails. **Table 3.80** breaks down the acres within the decision area by whether they are open or closed to leasing and what stipulations apply. Because acres are often subject to both TLs and CSU stipulations, these two leasing categories are combined for the purposes of this analysis.

As shown in **Table 3.80**, 1,333,400 acres (33 percent) of federal mineral estate in the decision area are open to leasing subject to standard terms and conditions. Another 1,300,400 acres (33 percent) of federal mineral estate in the decision area are subject to NSO stipulations.

Table 3.80
Oil and Gas Leasing Categories in the Decision Area

Category	Population Areas[1]	Decision Area[2]
Open to leasing, subject to standard terms and conditions	2,226,500	1,333,400
CSU and/or TL	1,881,100	1,300,400
NSO	1,077,600	483,500
Closed to Leasing	335,300	138,500

Source: BLM 2012d
[1]Does not include 820,300 acres that have no planning decision mapped. These areas may be in various leasing categories, but the acreage in each category is unknown.
[2]Does not include 585,800 acres that have no planning decision mapped. These areas may be in various leasing categories, but the acreage in each category is unknown.

A total of 187,000 acres within the decision area have no fluid minerals planning decision. If the BLM or Forest Service received an expression of interest in leasing within these areas, additional leasing-specific NEPA analysis would need to be completed before leasing could occur.

Most of the oil and gas activity within the decision area is concentrated in the Uintah, Carbon, Emery, and Rich population areas. The decision area within these population areas contains 747,900 acres of federal mineral estate with high potential (95 percent of federal mineral estate with high potential in the decision area) and an additional 215,800 acres with moderate potential (24 percent of federal mineral estate with moderate potential in the decision area). Because these population areas have more mineral resources than the other population areas, they will be disproportionately affected by decisions being made through this plan amendment. As such, a more detailed discussion of oil and gas resources and activity in each of these four population areas is provided below.

Conditions in Population Areas

Uintah Population Area

The Uintah Population Area contains portions of the Uintah Basin energy zone (see **Section 1.8.3**, State Plans). Of the 1,287,900 acres of federal mineral estate within the Uintah Population Area, 646,600 acres have high oil and gas development potential (**Table 3.81**). Of these high potential acres, 406,100 acres (63 percent) are in the decision area. Of the 71,600 acres of

Table 3.81
Oil and Gas Occurrence Potential on Federal Minerals in the Uintah Population Area

Development Potential	Acres of Federal Mineral Estate	
	Population Area	Decision Area
High	646,600	406,100
Moderate	71,600	27,600
Low/No Known	569,700	344,900
Total	**1,287,900**	**778,600**

Source: BLM 2012d

federal mineral estate with moderate development potential in the population area, 27,600 acres (39 percent) are within the decision area. There are 569,700 acres of federal mineral estate in the population area with low or no known development potential, of which 344,900 acres (61 percent) are within the decision area.

The largest lobe of this population area (extending from central Duchesne County to the northeastern corner of Utah) contains dense oil and gas resources within a portion of mapped occupied habitat. Most federal leases in this population area are in the northeast corner of Utah along the Wyoming border. Oil wells are present in the central lobe of the area, and widespread APDs indicate that drilling will continue here.

There are 648,400 acres of existing federal oil and gas leases in the Uintah Population Area, of which 286,300 acres (44 percent) are within the decision area (**Table 3.82**). Of existing leases in the population area, 389,600 acres are held by production. A total of 166,500 acres (43 percent) of leases held by production are within the decision area. There are 1,900 wells on federal mineral estate in the population area, 700 of which (37 percent) are within the decision area.

Table 3.82
Oil and Gas Leases and Wells in the Uintah Population Area

Category	Population Area	Decision Area
Existing Oil and Gas Leases	648,400 acres	286,300 acres
Leases Held by Production	389,600 acres	166,500 acres
Number of Existing Wells	1,900 wells	700 wells

Sources: BLM 2012e, 2015; Utah Department of Natural Resources 2012a; Wyoming Oil and Gas Conservation Commission 2012

Table 3.83 breaks down the acres within the population area by whether they are open or closed to leasing and what stipulations apply. A total of 222,100 acres of federal mineral estate in the population area (148,200 acres within the decision area) is open to leasing subject to standard terms and conditions. Approximately 561,210 acres of federal mineral estate in the population area are open to leasing subject to CSU stipulations and/or TLs, of which 366,610 acres are within the decision area. In the decision area within this population area, 61 percent of federal mineral estate is subject to CSU and/or TL stipulations. A total of 25 percent of the decision area within this population area is open to leasing subject to standard terms and conditions.

Table 3.83
Oil and Gas Leasing Categories in the Uintah Population Area

Category	Acres of Total Federal Mineral Estate	
	Population Area	Decision Area
Open to leasing, subject to standard terms and conditions	222,100	148,200
CSU and/or TL	561,200	366,600
NSO	20,700	14,000
Closed to Leasing	162,800	68,800

Source: BLM 2012d

Carbon Population Area

Of the 794,800 acres of federal mineral estate within the Carbon Population Area, 270,700 acres (34 percent) have high oil and gas development potential (**Table 3.84**). Of these high potential acres, 112,900 acres (42 percent) are in the decision area. Of the 388,900 acres with moderate development potential, 140,700 acres (36 percent) are within the decision area. There are 135,200 acres with low/no known development potential, of which 54,300 acres (40 percent) are within the decision area.

Table 3.84
Oil and Gas Occurrence Potential on Federal Minerals in the Carbon Population Area

Development Potential	Acres of Federal Mineral Estate	
	Population Area	Decision Area
High	270,700	112,900
Moderate	388,900	140,700
Low/No Known	135,200	54,300
Total	794,800	307,900

Source: BLM 2012d

There are 429,300 acres of existing leases in the Carbon Population Area, of which 145,300 acres (34 percent) are within the decision area (**Table 3.85**). Of existing leases in the population area, 154,500 acres (36 percent) are held by production. A total of 61,500 acres (40 percent) of leases held by production are within the decision area. Most of the leasing and production has occurred in the eastern portion of this population area. There are 1,300 wells in the population area, 500 of which (38 percent) are within the decision area.

Table 3.85
Oil and Gas Leases and Wells in the Carbon Population Area

Category	Population Area	Decision Area
Existing Oil and Gas Leases	429,300 acres	145,300 acres
Leases Held by Production	154,500 acres	61,500 acres
Number of Existing Wells	1,300 wells	500 wells

Sources: BLM 2012e, 2015; Utah Department of Natural Resources 2012a; Wyoming Oil and Gas Conservation Commission 2012

Table 3.86 breaks down the acres within the population area by whether they are open or closed to leasing and what stipulations apply. A total of 154,600 acres of federal mineral estate in the population area (31,400 acres within the decision area) is open to leasing subject to standard terms and conditions. Approximately 179,100 acres of federal mineral estate in the population area are open to leasing subject to CSU stipulations and/or TLs, of which 77,900 acres are within the decision area. About 140,400 acres of federal mineral estate in the population area (30,800 acres within the decision area) are subject to an NSO stipulation. The remaining 62,900 acres (27,500 acres within the decision area) are closed to leasing. In the decision area within this population area, 46 percent of federal mineral estate is subject to CSU and/or TL stipulations. A total of 19 percent of the decision area within this population area is open to leasing subject to standard terms and conditions.

Table 3.86
Oil and Gas Leasing Categories in the Carbon Population Area

Category	Acres of Total Federal Mineral Estate	
	Population Area	Decision Area
Open to leasing, subject to standard terms and conditions	154,600	31,400
CSU and/or TL	179,100	77,900
NSO	140,400	30,800
Closed to Leasing	62,900	27,500

Source: BLM 2012d

Emery Population Area

Of the 318,300 acres of federal mineral estate within the Emery Population Area, 27,100 acres (9 percent) have high oil and gas development potential (**Table 3.87**). Of these high potential acres, 5,000 acres (18 percent) are in the decision area. Of the 106,600 acres with moderate development potential, 33,230 acres (21 percent) are within the decision area. There are 184,600 acres of federal mineral estate with low or no known development potential in the population area, of which 54,710 acres (30 percent) are within the decision area.

Table 3.87
Oil and Gas Occurrence Potential on Federal Minerals in the Emery Population Area

Development Potential	Acres of Federal Mineral Estate	
	Population Area	Decision Area
High	27,100	5,000
Moderate	106,600	33,230
Low/No Known	184,600	54,710
Total	**318,300**	**92,940**

Source: BLM 2012d

Although much of the population area has moderate oil and gas occurrence potential, the potential for development is much lower, as much of the area is made up of the steep, rugged eastern slope of the Wasatch Plateau. The western portion of the population area is on top of

the plateau, where topography is less rugged but resources are still difficult to access. Oil and gas resources in this area are also very deep, which increases well costs.

There are 40,000 acres of existing leases in the Emery Population Area, of which 15,200 acres (38 percent) are within the decision area (**Table 3.88**). Of existing leases in the population area, 18,100 acres are held by production. A total of 3,600 acres (20 percent) of leases held by production are within the decision area. There are 11 wells in the population area, none of which is within the decision area.

Table 3.88
Oil and Gas Leases and Wells in the Emery Population Area

Category	Population Area	Decision Area
Existing Oil and Gas Leases	40,000 acres	15,200 acres
Leases Held by Production	18,100 acres	3,600 acres
Number of Existing Wells	11 wells	0 wells

Sources: BLM 2012e, 2015, Utah Department of Natural Resources 2012a; Wyoming Oil and Gas Conservation Commission 2012

Table 3.89 breaks down the acres within the population area by whether they are open or closed to leasing and what stipulations apply. A total of 125,800 acres of federal mineral estate in the population area (57,900 acres within the decision area) is open to leasing subject to standard terms and conditions. Approximately 70,700 acres of federal mineral estate in the population area are open to leasing subject to CSU stipulations and/or TLs, of which 15,500 acres are within the decision area. About 115,800 acres of federal mineral estate in the population area (19,600 acres within the decision area) are subject to an NSO stipulation. The remaining 1,000 acres (0 acres within the decision area) are closed to leasing. Within the decision area, 62 percent of federal mineral estate is open to leasing subject to standard terms and conditions. A total of 21 percent of federal mineral estate is subject to NSO stipulations.

Table 3.89
Oil and Gas Leasing Categories in the Emery Population Area

Category	Acres of Federal Mineral Estate	
	Population Area	Decision Area
Open to leasing, subject to standard terms and conditions	125,800	57,900
CSU and/or TL	70,700	15,500
NSO	115,800	19,600
Closed to Leasing	1,000	0

Source: BLM 2012d

Rich Population Area

Of the 529,200 acres of federal mineral estate within the Rich Population Area, 312,700 acres (59 percent) have high oil and gas development potential (**Table 3.90**). Of these high potential acres, 233,900 acres (75 percent) are in the decision area. Of the 56,200 acres with moderate development potential, 18,200 acres (32 percent) are within the decision area. There are

Table 3.90
Oil and Gas Occurrence Potential on Federal Minerals in the Rich Population Area

Development Potential	Acres of Federal Mineral Estate	
	Population Area	Decision Area
High	312,700	233,900
Moderate	56,200	18,200
Low/No Known	160,300	70,600
Total	**529,200**	**322,680**

Source: BLM 2012d

160,300 acres with low or no known development potential, of which 322,700 acres (44 percent) are within the decision area.

There are 31,000 acres of existing leases in the Rich Population Area, of which 14,000 acres (52 percent) are within the decision area (**Table 3.91**). Of existing leases in the population area, 2,200 acres (2 percent) are held by production. 2,100 acres (95 percent) of which are within the decision area. There are 76 wells on federal mineral estate in the population area, 11 of which (10 percent) are within the decision area.

Table 3.91
Oil and Gas Leases and Wells in the Rich Population Area

Category	Population Area	Decision Area
Existing Oil and Gas Leases	31,000 acres	14,000 acres
Leases Held by Production	2,200 acres	2,100 acres
Number of Existing Wells	76 wells	11 wells

Sources: BLM 2012e, 2015; Utah Department of Natural Resources 2012a; Wyoming Oil and Gas Conservation Commission 2012

Most federal mineral estate in the Rich Population Area is already under lease, and many oil and gas fields have already been depleted. Some fields are still producing small amounts of oil and gas, but little new drilling has occurred recently. Future well development in this population area is expected to be limited.

Table 3.92 breaks down the acres within the population area by whether they are open or closed to leasing and what stipulations apply. No acres of federal mineral estate in the population area are open to leasing subject to standard terms and conditions. Approximately 173,700 acres of federal mineral estate in the population area are open to leasing subject to CSU stipulations and/or TLs, of which 166,200 acres are within the decision area. About 180 acres of federal mineral estate in the population area are subject to an NSO stipulation, all of which are within the decision area. No acres in the Rich Population Area are closed to leasing. Within the decision area, over 99 percent of federal mineral estate is subject to CSU and/or TL stipulations. The remaining federal mineral estate (less than 1 percent) is subject to NSO stipulations.

Table 3.92
Oil and Gas Leasing Categories in the Rich Population Area

Category	Acres of Total Federal Mineral Estate	
	Population Area	Decision Area
Open to leasing, subject to standard terms and conditions	0	0
CSU and/or TL	173,700	166,200
NSO	180	180
Closed to Leasing	0	0

Source: BLM 2012d

3.21.2 Nonenergy Leasable Minerals

Conditions Statewide

Similar to fluid leasable minerals (discussed above), nonenergy leasable minerals are governed by the Mineral Leasing Act of 1920, as amended, which authorized specific minerals to be disposed of through a leasing system. There are three different ways to obtain a mineral lease for nonenergy solid leasable minerals:

1. Competitive lease: A competitive lease can be issued where there is an existence of a valuable mineral deposit. The BLM and Forest Service can designate such lands as Known Leasing Areas.
2. Preference Right Lease: This is a noncompetitive lease. A prospecting permit is applied for and an exploration plan is approved. The plan must show how the existence and workability of a valuable deposit will be determined. If a valuable mineral deposit has been discovered, and other mineral-specific determinations are made in the positive, the BLM or Forest Service may issue a Preference Right Lease.
3. Fringe Acreage Lease: This is a noncompetitive lease. A Fringe Acreage Lease can be applied for if the applicant has control over adjacent lands. The leased area must meet certain requirements, including demonstration that the deposit continues from the lands controlled by the applicant and that the mineral deposit is not in an area of competitive interest.

The discussion of nonenergy leasable mineral resources in the planning area focuses on gilsonite, phosphate, and sodium. Although the discussion for these minerals is statewide, each of these resources exists primarily in one general location, described in detail below.

Gilsonite

Gilsonite is solid hydrocarbon formed in veins or dikes that is mined primarily underground. Gilsonite is a unique industrial mineral found only in the Uinta Basin in Eastern Utah. The main markets for gilsonite are the oilfield and printing ink industries. In the oilfield industry, gilsonite is used as a fluid loss control agent and shale stabilizer for oil-based drilling fluids and water-based drilling fluids. It is also used as a loss circulation material and slurry density reducer for cementing fluids. **Table 3.93** displays the breakdown of acreage in high, moderate, and low development potential areas.

Table 3.93
Gilsonite Development Potential

Development Potential	Acres of Federal Mineral Estate		
	Planning Area	Uintah Population Area	Decision Area
High	61,000	14,100	12,400
Moderate	257,400	72,300	54,800
Low	135,700	7,300	6,800
Total	**454,100**	**93,700**	**74,000**

Source: BLM 2012d

There are 454,100 acres with gilsonite development potential in the planning area. Approximately 61,000 acres (13 percent) have high, 257,400 acres (57 percent) have moderate, and 135,700 acres (30 percent) have low gilsonite development potential. Areas with high development potential were delineated by identifying where known gilsonite veins are present; moderate areas were in between the veins; and low areas are the surrounding area.

All development potential for gilsonite in the US is within the planning area, and significant portions overlap the Uintah Population Area (**Map 3.21-5**). Most gilsonite development activity is in the middle lobe of the population area, occurring on private and federal minerals. **Table 3.93** illustrates the amount of federal mineral estate with gilsonite development potential that falls within the Uintah Population Area and, more specifically, within the decision area portion of the Uintah Population Area.

There are 14,100 acres of federal mineral estate with high potential for gilsonite development in the Uintah Population Area (3 percent of all acres with high potential in the planning area), of which 12,400 acres (88 percent) are within the decision area portion of the population area. There are 72,300 acres of federal mineral estate with moderate potential for gilsonite development (28 percent of all acres with moderate potential in the planning area), of which 54,800 acres (76 percent) are within the decision area portion of the population area. There are 7,300 acres of federal mineral estate with low potential for gilsonite development (5 percent of all acres with low potential in the planning area), of which 6,800 acres (93 percent) are within the decision area portion of the population area.

Approximately 21,100 acres are currently leased (federal and nonfederal leases) for gilsonite development in the planning area, 5,270 acres of which are on federal leases within the decision area.

Phosphate

Phosphates are the naturally occurring form of the element phosphorus, found in many phosphate minerals. Utah is one of four states currently mining phosphate rock ore (along with Idaho, Florida, and North Carolina). The phosphate resources in Utah are part of the Western Phosphate Field, an area of 350,000 square km that also includes portions of Idaho, Wyoming, and Montana. The Western Phosphate Field reserves account for 3 percent of world phosphate reserves and 30 percent of US reserves (USGS 2002). In 2011, more than 95 percent of the US phosphate rock mined was used to manufacture wet-process phosphoric acid and superphosphoric acid, which were used as intermediate feedstocks in the manufacture of

granular and liquid ammonium phosphate fertilizers and animal feed supplements (USGS 2012b). Mining for phosphate occurs both underground and on the surface. All phosphate mining in Utah to date has been by surface mining methods.

All large-scale, commercially viable deposits in Utah are in the northern portion of the state (**Map 3.21-5**). **Table 3.94** shows acreage of high, moderate, and low development potential in the planning and decision areas.

Table 3.94
Phosphate Development Potential

	High	Moderate	Low	Total
Total in Planning Area	67,900	61,500	1,292,000	**1,421,400**
Total in Decision Area (Uintah Population Area only)	42,700	19,300	149,600	**211,600**

Source: BLM 2012d

There are 1,421,400 acres with phosphate development potential in the planning area. Approximately 67,900 acres have high, 61,500 acres have moderate, and 1,292,000 acres have low phosphate development potential. The decision area has 42,700 acres of high, 19,300 acres of moderate, and 149,600 acres of low phosphate development potential. Approximately 43,800 of the high potential acres in the planning area are within the Ashley-Brush Creek Known Phosphate Leasing Area. Approximately 25,900 acres (59 percent) of this Known Phosphate Leasing Area are federal mineral estate.

As illustrated above, significant portions of development potential for phosphate overlap the Uintah Population Area. **Table 3.95** illustrates the amount of federal mineral estate with phosphate development potential that falls within the Uintah Population Area and more specifically, within the decision area portion of the population area.

Table 3.95
Phosphate Development Potential in the Uintah Population Area

Development Potential	Acres of Federal Mineral Estate	
	Population Area	Decision Area
Ashley-Brush Creek Known Phosphate Leasing Area	43,800	25,900
High	67,900	42,700
Moderate	38,800	19,300
Low	205,000	149,600
Total	**311,700**	**311,600**

Source: BLM 2012d

There are 67,900 acres of federal mineral estate with high potential for phosphate development in the Uintah Population Area (this represents all acres with high potential in the planning area), of which 42,700 acres (63 percent) are within the decision area portion of the population area. Approximately 43,800 of these high potential acres are within the Ashley-Brush Creek Known Phosphate Leasing Area. There are 38,800 acres of federal mineral estate with moderate

potential for phosphate development (63 percent of all acres with moderate potential in the planning area), of which 19,300 acres (50 percent) are within the decision area portion of the population area. There are 205,000 acres of federal mineral estate with low potential for phosphate development (16 percent of all acres with low potential in the planning area), of which 149,600 acres (73 percent) are within mapped occupied habitat. The Rich and Strawberry population areas have moderate and low potential for phosphate.

The largest phosphate development activity in the decision area is occurring in the Ashley-Brush Creek Known Phosphate Leasing Area within the Uintah Population Area on a mine operated by the J.R. Simplot Company. The company is currently operating on 3,500 of leases owned by SITLA. Utah Phosphate Company has obtained a large block of leases on state lands in Township 2 North, Range 21 East in the known phosphate leasing area. They are currently in the exploration phase. There are currently 7,400 acres of authorized and 1,700 acres of pending federal phosphate leases in the decision area. In addition, 8,700 acres within the decision area are the subject of pending prospecting permit applications or expressions of interest for competitive leasing for phosphate.

Sodium

In Utah, sodium (salt) is currently produced by evaporation of brines from the Great Salt Lake, ancient lake playas, and freshwater injection. Mining of rock salt is also a major source. Sodium chloride has a large and diverse range of uses. It is spread over roads to melt ice by lowering the melting point of the ice. It is used in medicines and livestock feed. In addition, salt caverns are used to store chemicals such as petroleum and natural gas. **Table 3.96** shows sodium occurrence on federal mineral estate in the population areas and within the decision area (**Map 3.21-6**).

Table 3.96
Sodium Occurrence

Development Potential	Total Federal Mineral Estate
Population Areas	175,200
Box Elder Population Area	16,300
Rich Population Area	158,900
Decision Area	161,500
Box Elder Population Area	2,500
Rich Population Area	158,900

Source: BLM 2012d

There are approximately 175,200 acres of federal mineral estate in the population areas on which sodium occurs. All sodium deposits in the population areas are within the Rich and Box Elder population areas. The Rich Population Area has 158,900 acres with sodium deposits, all of which is within the decision area. The Box Elder Population Area has 16,300 acres of federal mineral estate on which sodium occurs, of which 2,500 acres (16 percent) is within the decision area. There are no federal sodium leases in the planning area.

Leasable Hardrock Minerals

Section 402 of the Reorganization Plan No. 3 of 1946 transferred the functions of the Secretary of Agriculture for the leasing or other disposal of minerals to the Secretary of the Interior for lands acquired under specific acts. In Utah, these acquired lands are mainly managed by the Forest Service. Hardrock (gold, silver, uranium, platinum etc.) minerals would normally be located per the General Mining Law of 1872, as amended, on public domain lands, but since they occur on acquired lands they are leasable under the Mineral Leasing Act of 1920, as amended.

3.21.3 Coal

Conditions Statewide

The BLM and Forest Service manage coal through the solid leasable mineral program. Leasable minerals are governed by the Mineral Leasing Act of 1920, as amended, which authorized specific minerals to be used through a leasing system.

Summary information on coal resources within the planning area can be found in the Affected Environment chapter of each of the BLM Field Offices' guiding RMPs, in accompanying Mineral Potential Reports or Coal Reports, and in the LRMPs of the Manti-La Sal and Fishlake National Forests.

Coal resources occur throughout Utah, although there are no coal deposits in several counties. As a whole, Utah is estimated to contain nearly 15 billion tons of recoverable coal. At least 98 percent of this coal is within the planning area (Utah Geological Survey 2011a).

The most important coal-bearing formation in the planning area is the Blackhawk Formation in central and eastern Utah, a lower middle unit of the Mesaverde Group. Coal beds in this formation are up to 25 feet thick, with most mined seams in the 6- to 13-foot range. The coal in this formation is bituminous and typically has relatively high heat content and low sulfur content; therefore, it is high quality. The Ferron Sandstone member of the Mancos Shale in central and eastern Utah also contains coal beds. Coal in the Ferron Sandstone member is bituminous like that in the Blackhawk Formation, but it generally has higher sulfur and ash contents and slightly lower heat content than coal in the Blackhawk Formation. Much of the coal in central Utah has been extracted, and the remaining coal resources in this area are more difficult to access or extract and some is of lower quality than the coal that has already been extracted.

The Dakota Formation in southern Utah contains coal beds up to 27 feet thick with subbituminous coal. These coal beds are somewhat higher in sulfur and ash contents and lower in heat content than coal beds mined in the Blackhawk Formation.

Table 3.97 shows the levels of coal development potential (high, moderate, and low) in the planning area and the decision area (**Map 3.21-7**).

The majority of the acres of federal mineral estate with coal development potential in the planning area (7,112,000 acres or 70 percent) currently have low economic development potential. Approximately 1,089,700 acres (11 percent) with coal development potential identified in the planning area have high potential.

Table 3.97
Coal Development Potential

Development Potential	Planning Area (acres)[1]	Decision Area (acres)
Utah Sub-region		
High	1,089,700	185,500
Moderate	1,936,200	246,600
Low	7,112,000	703,800
Carbon Population Area		
High	78,100	74,500
Moderate	73,200	62,200
Low	337,700	147,600
Emery Population Area		
High	241,600	70,000
Moderate	30,300	6,700
Low	1,300	0
Panguitch Population Area		
High	29,400	9,300
Moderate	17,300	17,300
Low	0	0

Source: BLM 2012d

The majority of the federal mineral estate with coal development potential in the decision area (703,800 acres or 62 percent) has low development potential. Approximately 185,500 acres (16 percent) with coal development potential identified in the decision area have high potential.

The BLM manages approximately 22,900 acres of federal mineral estate with coal occurrence in the decision area as unacceptable for coal leasing consideration. These acres are within WSAs and the Grand Staircase-Escalante National Monument. Although no RMP decision has specified that these areas are unacceptable, they are required to be managed as such by the BLM Manual 6330, Management of Wilderness Study Areas, and the presidential proclamation establishing the Grand Staircase-Escalante National Monument (Proclamation No. 6920). All other acres (3,982,900 acres of federal mineral estate) in the decision area are acceptable for further consideration for leasing and suitable for surface mining. However, 271,300 acres (7 percent) of federal mineral estate beneath National Forest System lands in the decision area are unsuitable for surface mining with the exception of surface operations incident to underground mines. "Acceptable for leasing" means that an area can be leased for coal development. "Suitable for surface mining" means that an area can be leased for coal development using surface mining methods. All areas that are suitable for surface mining are acceptable for leasing, but not all areas that are acceptable for leasing are suitable for surface mining.

All mining in the population areas is currently underground, and no potential for surface mining exists in the population areas except for within the Panguitch Population Area.

Conditions in Population Areas

Carbon Population Area

The Carbon Population Area contains the majority of the coal operations in the planning area. Most mines in the population area are deep underground mines, primarily in the Wasatch Plateau and Book Cliffs region. A portion of the acres with coal development potential in the decision area within the Carbon Population Area are within a WSA and are unacceptable for coal leasing consideration as described above. The remainder of the decision area within the population area is acceptable for further consideration for leasing. Approximately 640 acres (5 percent) of federal mineral estate with high development potential in the population area are unsuitable for surface mining beneath National Forest System lands. The remaining federal mineral estate with coal development potential in the population area is suitable for surface mining.

Table 3.97 shows the levels of coal development potential (high, moderate, and low) in the Carbon Population Area. Within the population area, the decision area contains 74,500 acres with high development potential for coal, or 40 percent of the acres with high coal potential in the total decision area. As shown in **Table 3.97**, most areas with high or moderate potential in the population area are not within the decision area.

Emery Population Area

The Emery Population Area contains some of the largest coal operations in the planning area, all of which are currently underground mining operations. All of the decision area within the Emery Population Area is acceptable for further consideration for leasing. However, 66,400 acres (over 99 percent) of federal mineral estate with high development potential and all federal mineral estate with moderate potential in the Emery Population Area are unacceptable for surface mining beneath National Forest System lands.

Table 3.97 shows the levels of coal development potential (high, moderate, and low) in the Emery Population Area. Within the population area, the decision area contains 70,000 acres with high development potential for coal, or 38 percent of the acres with high coal potential in the total decision area. As shown in **Table 3.97**, most areas with high or moderate coal development potential in the population area are not within the decision area.

Panguitch Population Area

The Panguitch Population Area contains the only existing surface mining operation in the planning area—the Alton Coal mine. This mine is located on private minerals; however, a proposed Lease by Application would expand the mine to federal minerals. A decision on the Alton Lease by Application is expected during 2014. Once, or possibly as, the surface coal is removed and reclaimed, the Alton Coal mine would move to an underground mining operation. Most of the decision area within the Panguitch Population Area is acceptable for further consideration for leasing. Approximately 1,800 acres (90 percent) of federal mineral estate with moderate development potential in the population area beneath National Forest System lands are unsuitable for surface mining.

Table 3.97 shows the levels of coal development potential (high, moderate, and low) in the Panguitch Population Area. Within the population area, the decision area contains 9,300 acres

with high development potential for coal, or 5 percent of the acres with high coal potential in the total decision area. As shown in **Table 3.97**, most areas with high coal development potential in the population area are not within the decision area.

3.21.4 Locatable Minerals

Conditions Statewide

Mineral exploration and the development of locatable mineral deposits are allowed under the General Mining Law of 1872, as amended, unless they are withdrawn from mineral entry by Secretarial Public Land Order or an act of Congress. All operations under a notice or plan of operations on BLM-administered lands are required to follow the performance standards in 43 CFR 3809.420. All operations on National Forest System lands are required to comply with 36 CFR 228A. Additional mitigating measures are derived from site-specific environmental assessments or EISs written to evaluate the proposed mining activity's impact on the environment. To restrict locatable mineral development, the BLM and Forest Service must petition the Secretary of the Interior for withdrawal actions, with subsequent validity exams for existing claims.

Throughout the planning area, locatable mineral occurrence potential ranges from moderate to high (see **Table 3.98**; **Map 3.21-8**). High-potential areas were identified by combining areas with mining claims, existing mining operations, and mining districts, as well as uranium/vanadium occurrence. Remaining portions of the state were identified as having moderate potential due to the abundant number of commodities thought to be present across the state. Locatable minerals found in the planning area include precious and base metals such as gold, silver, copper, lead, iron, molybdenum, beryllium, uranium, and vanadium, and industrial minerals such as limestone, bentonite, high-alumina clay, and gypsum.

Table 3.98
Locatable Mineral Occurrence Potential

Area	Occurrence Potential		
	High	Moderate	Total
Population Areas	859,000	10,467,600	11,326,600
Decision Area	362,000	3,646,600	4,008,600

Source: BLM 2012d

In the planning area, there are approximately 7,105,900 acres of federal mineral estate with high locatable mineral occurrence potential and 41,084,600 acres with moderate potential. There are 223 mining districts in the planning area, of which 56 intersect or are within population areas and 44 intersect or are within the decision area (**Map 3.21-9**). In the decision area, there are approximately 362,000 acres of federal mineral estate with high locatable mineral occurrence potential and 3,646,600 acres with moderate potential.

As mentioned above, mineral exploration and the development of locatable mineral deposits are allowed unless they are withdrawn from mineral entry by Secretarial Public Land Order or an

act of Congress. In the population areas, 1,046,416 acres[3] of federal mineral estate are withdrawn from further location of mining claims or sites, of which 498,127 acres are within the decision area.

There are 6,103 mining claims within population areas, of which 2,575 (42 percent) are within the decision area (**Table 3.99**). The areas with the highest concentration of mining claims in mapped occupied habitat are within the following population areas: Bald Hills, Box Elder, Panguitch, Parker Mountain, Sheeprocks, and Uintah.

Table 3.99
Locatable Mineral Claims

Habitat Type	Number of Claims
Population Areas	6,103
Decision Area	2,575

Source: BLM 2012d

There are approximately 101 mining operations within the population areas. Of these 101 operations, 49 occur on federal mineral estate and 39 occur within the decision area.

3.21.5 Mineral Materials

Conditions Statewide

Mineral materials include sand and gravel and construction materials that are sold or permitted by the BLM under the Material Sale Act of 1947. The Multiple Use Mining Act (Public Law 167) of 1955 gives the Forest Service Authorized Officer complete discretion for disposal of mineral materials on National Forest System lands. The law is implemented through the regulations at 36 CFR 228C. Mineral materials are sold at a fair market value or may be disposed of by free use permits to governmental agencies. Individuals may also obtain free use permits for small amounts of mineral materials for personal use. Local government agencies and nonprofit organizations may obtain these materials free of cost for community purposes. County and state road construction divisions are significant users of gravel and sand resources.

Sand and gravel, as construction aggregate, is an extremely important resource. The extraction of the resource varies directly with the amount of development nearby – road building and maintenance, and urban development – as sand and gravel is necessary for that infrastructure development. Even more so than other resources, however, the proximity of both transportation and markets are key elements in the development of a deposit.

Utah is a producer of significant quantities of construction sand and gravel, portland cement, crushed stone, dimension stone, and common clays. Occurrence potential for these resources and other mineral materials spans the state of Utah, with heavier concentrations on the western half of the state (**Map 3.21-10**). Across the planning area, there are approximately 19,719,400

[3] Acreage includes withdrawals from all types of minerals (e.g., locatable minerals, fluid minerals etc.), but they are not all locatable mineral withdrawals.

acres with mineral material occurrence. As illustrated in **Table 3.100**, 1,884,300 acres (47 percent) of federal mineral estate within population areas has mineral material occurrence. Of that total, 1,305,800 acres are within the decision area, representing approximately 33 percent of the decision area.

Table 3.100
Mineral Material Occurrence in Population Areas

Habitat Type	Federal Mineral Estate
Population Areas	1,884,300
Decision Area	1,305,800

Source: BLM 2012d

There are currently 131 permits and community pits for mineral materials in the decision area, most of which are community pits (64) and free use permits (59); there are only eight sales contracts for commercial use. It is important to note that the amount of surface disturbance in an area is not the same as the size of the permit or common use area.

3.21.6 Oil Shale and Tar Sands

The Mineral Leasing Act of 1920, as amended, authorizes the leasing of federal lands for the development of oil shale and tar sands. The Energy Policy Act of 2005 authorizes a BLM program to accelerate development of oil shale and tar sands in Utah, Colorado, and Wyoming. Pursuant to Section 369 of that Act, the BLM issued a Final PEIS in 2008 amending 10 RMPs in Utah, Colorado, and Wyoming to make approximately 2 million acres of public lands potentially available for commercial oil shale leasing and development and 430,000 acres potentially available for tar sands leasing and development. Because of litigation, the BLM released another Final PEIS/Proposed RMP Amendment in November 2012 and accompanying ROD in March 2013. The ROD reduced the areas available in Utah, Colorado, and Wyoming for potential development of federal oil shale and tar sands to approximately 678,000 acres and 132,000 acres, respectively. Areas open to oil shale leasing are open only to research, development, and demonstration leases. The BLM would issue a commercial lease only when the lessee satisfies the conditions of its research, development, and demonstration leases and applicable regulations. Preference right acreage in addition to the research, development, and demonstration lease acreage may be included in the commercial lease if specified in the research, development, and demonstration lease. The ROD removed all federal mineral estate within GRSG habitat in Utah from potential oil shale and tar sands leasing, subject to valid existing rights.

Conditions Statewide

The planning area contains one oil shale preference right leasing area and one special tar sands area. These are the only portions of the planning area where oil shale and tar sands development is allowed on federal mineral estate. The White River Oil Shale Research, Development, and Demonstration site is a 160-acre lease with another 4,960 contiguous acres of preference right leasing area on federal mineral estate in Uintah County in northeastern Utah. Approximately 2,320 acres of the preference right leasing area overlaps with occupied GRSG habitat in the Uintah Population Area. Another 16,200 acres of state lands within the Special Tar Sands Area are leased, and an existing tar sands strip mine and processing plant are located on

private land in the Special Tar Sands Area. The leased area and the existing mine and processing plant are all within occupied GRSG habitat.

3.21.7 Trends

Oil and Gas

The following information is a summary of the Oil and Gas Reasonably Foreseeable Development Scenario for Greater Sage-Grouse Occupied Habitat in Utah Sub-region (**Appendix R**, Oil and Gas Reasonably Foreseeable Future Development Scenario for Greater Sage-Grouse Occupied Habitat in Utah Sub-Region). It should be noted that future development is not limited under the RFD scenario.

Energy production on Utah's BLM-administered and National Forest System lands plays an important role in meeting the energy demands of the region. Utah is a net exporter of both coal and natural gas. Last year, Utah produced 304 billion cubic feet of natural gas, enough to heat 4 million homes for 1 year. Along with historically energy-producing areas located on the eastern side of the state, other areas in the state are showing new promise for potential reserves. Under current conditions, it is projected that 2,416 new federal wells will be developed on federal mineral estate in mapped occupied GRSG habitat. A total of 2,383 of these wellpads are projected to be within the Uintah, Carbon, Emery, and Rich population areas.

Future drilling is expected to occur in the southern and western portions of the Uintah Population Area; however, little future drilling is projected in the northeastern corner of the population area, where most current federal leases exist. While large drilling projects have been proposed in the population area, three of the largest project areas include little or no mapped occupied habitat. Interest in development is likely to continue in the western part of mapped occupied habitat.

Coal bed natural gas resources in the Carbon Population Area are likely to continue to be developed in the future, though existing units in the area are approaching full development. In the next 15 years, drilling may also occur in the extreme northern part of the population area where development on Ute Tribal lands may spread onto federal mineral estate in mapped occupied habitat. Overall, new federal well pad development on federal mineral estate in the next 15 years in the population area is projected to be 447 wells.

Due to the rugged topography and difficult-to-access resources within the Emery Population Area, little future development is projected in this area. Approximately 31 new federal well pads are projected to be developed in the next 15 years.

Because much of the oil and gas resources in the Rich Population Area has already been developed, little future drilling is expected in this area. Approximately 13 new federal well pads are projected to be developed in the next 15 years.

Nonenergy Leasable Minerals

Under current management, production rates for gilsonite and phosphate are expected to remain steady for the life of the LUPs covered by this plan amendment. However, total phosphate production in the planning area may increase with the possible opening of a new

phosphate mine in the state. In 2011, domestic production and consumption of phosphate rock increased from that of 2010 owing to increased phosphoric acid and fertilizer production (USGS 2012b). As gilsonite is mined out of the private minerals in the middle lobe of the Uintah Population Area, activity is likely to transfer to the more southern lobe of the population area.

Coal

As discussed above, much of the coal in central Utah has already been extracted, and the remaining coal in this area is generally more difficult to access or extract and some is of lower quality. It is expected that the existing operations in this area have about 4 to 15 years' worth of coal reserves left at current production rates. Additional leasing could extend the life of the central Utah coal fields by 40 to 50 years depending on market conditions. As the coal reserves in central Utah are depleted, mining could expand to other coal fields in Utah, including additional mining in southern Utah including the Alton Coal Field.

Locatable Minerals

Locatable mineral occurrence potential in the planning area was based on historical use (mining claims, and mining districts, as well as uranium/vanadium occurrence). It is reasonable to assume that development is most likely to continue in areas identified as having high potential (**Map 3.21-8**). It is also reasonable to expect that new exploration, coupled with modern mining and milling methods, could result in new efforts to extract locatable minerals from mines in Utah.

Salable Minerals (Mineral Materials)

Future demand for mineral materials will vary depending upon market conditions, which differ according to economic conditions and construction activity. Construction projects within approximately 50 miles of mineral materials deposits may lead to development of these deposits. One driver of construction activity in the planning area is road construction for oil and gas exploration and development. As new oil and gas development in the planning area continues to occur, it is expected that mineral materials activity will continue at roughly the same level for the life of the LUPs. However, it is important to note that mineral material development is discretionary; while an operator may request use of mineral materials, the surface management agency has no obligation to provide mineral materials for commercial operations.

Oil Shale and Tar Sands

Companies have shown interest in extracting oil shale and tar sands resources in Utah; however, current activity is still in research, demonstration, and development phases. Therefore, trends in oil shale and tar sands development statewide cannot be predicted at this time. In the decision area, all oil shale and tar sands resources are closed to development except the White River Oil Shale Research, Demonstration, and Development site and Preference Right Leasing Area and the pending Asphalt Ridge Tar Sands lease. No development of federal oil shale and tar sands resources in the decision area would occur outside these two leases.

3.21.8 Regional Context

Fluid Minerals

Table 3.101 through **Table 3.104** display data compiled in a BER produced by the USGS and BLM (Manier et al. 2013). In each table, data are presented by surface management agency and their occurrence within mapped habitat in the planning area and MZs that overlap the planning

area. As the tables show, the number and ratio of acres open and closed to oil and gas leasing varies by surface management agency across the different MZs.

Table 3.101
Acres Open and Closed to Oil and Gas Leasing within GRSG Habitat

Surface Management Agency	Management Zone	Acres Closed to Oil and Gas Leasing within Mapped Occupied Habitat		Acres Open to Oil and Gas Leasing within Mapped Occupied Habitat	
		Within Planning Area	Within Management Zone	Within Planning Area	Within Management Zone
BLM	II & VII	93,000	1,784,300	660,000	15,888,900
	III	26,500	390,400	1,304,400	9,099,300
	IV	0	1,565,700	278,700	17,010,800
Forest Service	II & VII	100	48,500	171,400	516,200
	III	0	184,200	610,900	610,900
	IV	0	74,200	300	474,400
Tribal and Other Federal	II & VII	21,100	65,500	11,600	467,300
	III	0	200	19,900	19,900
	IV	0	1,079,600	0	10,900
Private	II & VII	100	562,900	149,900	3,410,400
	III	300	13,400	191,200	191,500
	IV	0	36,300	95,600	449,000
State	II & VII	0	136,100	13,600	262,700
	III	0	17	46,200	46,200
	IV	0	30,900	5,400	29,000
Other	II & VII	0	4	0	17,100
	III	0	0	0	0
	IV	0	45	0	0

Source: Manier et al. 2013

Table 3.102
Acres of Oil and Gas Leases within GRSG Habitat

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat	
		Within Planning Area	Within Management Zone
BLM	II & VII	195,600	4,132,600
	III	358,800	1,675,000
	IV	200	290,200
Forest Service	II & VII	1,000	18,400
	III	54,200	52,100
	IV	0	5,500
Tribal and Other Federal	II & VII	500	42,600
	III	0	52
	IV	0	900

Table 3.102
Acres of Oil and Gas Leases within GRSG Habitat

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat	
		Within Planning Area	Within Management Zone
Private	II & VII	17,800	703,300
	III	21,500	43,800
	IV	0	49,500
State	II & VII	300	59,000
	III	2,000	2,000
	IV	0	40
Other	II & VII	0	1,600
	III	0	0
	IV	0	0

Source: Manier et al. 2013

Table 3.103
Acres of Oil and Gas Leases Held by Production within GRSG Habitat

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat	
		Within Planning Area	Within Management Zone
BLM	II & VII	130,200	2,506,600
	III	15,400	19,700
	IV	0	0
Forest Service	II & VII	7,900	15,600
	III	13,200	13,200
	IV	0	0
Tribal and Other Federal	II & VII	1,500	44,700
	III	0	0
	IV	0	0
Private	II & VII	3,300	231,100
	III	7,300	7,300
	IV	0	0
State	II & VII	1,800	15,600
	III	0	0
	IV	0	0
Other	II & VII	0	600
	III	0	0
	IV	0	0

Source: Manier et al. 2013

Table 3.104
Acres of Oil and Gas Wells within GRSG Habitat

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat	
		Within Planning Area[1]	Within Management Zone[1]
BLM	II & VII	2,700	59,700
	III	700	1,300
	IV	6	200
Forest Service	II & VII	0	200
	III	100	100
	IV	0	9
Tribal and Other Federal	II & VII	300	4,400
	III	400	400
	IV	0	3
Private	II & VII	700	34,600
	III	1,300	1,300
	IV	9	200
State	II & VII	600	6,500
	III	400	400
	IV	0	14
Other	II & VII	0	38
	III	0	0
	IV	0	0

Source: Manier et al. 2013; [1]Assumes footprint of approximately three acres per well

Nonenergy Leasable Minerals

Table 3.105 displays data compiled a BER produced by the USGS and BLM (Manier et al. 2013). In the table, data are presented by surface management agency and their occurrence within mapped occupied habitat in the planning area and the MZs that overlap the planning area. As the table shows, the majority of nonenergy leasable mineral permits are located in MZs II and VII.

Table 3.105
Acres of Nonenergy Leasable Mineral Permits within GRSG Habitat[1]

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat	
		Within Planning Area	Within Management Zone
BLM	II & VII	12,000	569,100
	III	0	56,200
	IV	0	5,500
Forest Service	II & VII	39,300	39,400
	III	0	0
	IV	0	0
Tribal and Other Federal	II & VII	0	15,300
	III	0	0
	IV	0	0

Table 3.105
Acres of Nonenergy Leasable Mineral Permits within GRSG Habitat[1]

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat	
		Within Planning Area	Within Management Zone
Private	II & VII	3,000	290,200
	III	0	1,300
	IV	0	3,300
State	II & VII	100	20,900
	III	0	0
	IV	0	3,200
Other	II & VII	0	0
	III	0	0
	IV	0	0

Source: Manier et al. 2013
[1]The BER inaccurately reports that there are 51,300 acres of federal prospecting permits in the Utah Sub-region. No federal prospecting permits exist in the planning area.

Locatable Minerals

Table 3.106 displays data compiled a BER produced by the USGS and BLM (Manier et al. 2013). In the table, data are presented by surface management agency and their occurrence within mapped occupied habitat in the planning area. As the table shows, the MZ with the most acres of locatable mineral claims varies by surface management agency.

Table 3.106
Acres of Locatable Mineral Claims within GRSG Habitat

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat	
		Within Planning Area	Within Management Zone
BLM	II & VII	4,500	807,800
	III	67,400	1,120,800
	IV	15,200	543,400
Forest Service	II & VII	2,400	3,100
	III	2,800	86,600
	IV	0	169,200
Tribal and Other Federal	II & VII	0	2,100
	III	100	79
	IV	0	0
Private	II & VII	800	141,600
	III	8,600	162,400
	IV	13,200	207,200
State	II & VII	200	29,800
	III	3,400	3,400
	IV	1,500	6,500
Other	II & VII	0	59
	III	0	0
	IV	0	84

Source: Manier et al. 2013

Mineral Materials

Table 3.107 displays data compiled a BER produced by the USGS and BLM (Manier et al. 2013). Data are presented by surface management agency and their occurrence within mapped occupied habitat in the planning area and MZs that overlap the planning area. As the table shows, the MZ with the most acres of mineral material disposal sites varies by surface management agency.

Table 3.107
Acres of Mineral Material Disposal Sites within GRSG Habitat

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat	
		Within Planning Area	Within Management Zone
BLM	II & VII	12,900	846,500
	III	73,700	1,140,100
	IV	25,900	652,000
Forest Service	II & VII	2,400	3,100
	III	2,800	86,600
	IV	0	170,200
Tribal and Other Federal	II & VII	0	2,300
	III	100	100
	IV	0	900
Private	II & VII	900	145,600
	III	8,900	163,200
	IV	15,200	219,400
State	II & VII	200	29,900
	III	3,400	3,400
	IV	1,500	7,000
Other	II & VII	0	59
	III	0	0
	IV	0	84

Source: Manier et al. 2013

3.22 SPECIAL DESIGNATIONS

3.22.1 Conditions Statewide

Areas of Critical Environmental Concern (ACEC)

An ACEC is defined in the FLPMA, Section 103(a), as an area on BLM-administered lands where special management attention is required to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes, or to protect life and ensure safety from natural hazards. BLM regulations for implementing the ACEC provisions of the FLPMA are found in 43 CFR 1610.7-2(b).

ACECs differ from some other special management designations in that designation by itself does not automatically prohibit or restrict other uses in the area. The special management attention is designed specifically for the relevant and important values and, therefore, varies from area to area. Restrictions that arise from an ACEC designation are determined at the time the designation is made and are designed to protect the values or serve the purposes for which

the designation was made. The BLM identifies goals, standards, and objectives for each proposed ACEC as well as general management practices and uses, including necessary constraints and mitigation measures. In addition, ACECs are protected by the provisions of 43 CFR 3809.1-4(b)(3), which requires an approved plan of operations for activities resulting in more than five acres of disturbance under the mining laws.

Research natural areas are areas where natural processes are allowed to predominate, and that are preserved for the primary purposes of research and education. Under current BLM policy, research natural areas must meet the relevance and importance criteria of ACECs and are, therefore, designated as ACECs. Under current guidelines, ACEC procedures also are used to designate outstanding natural areas.

There are portions of seven ACECs in the planning area that overlap mapped occupied habitat (see **Map 3.22-1**). Refer to **Table 3.108**, which summarizes the acres of ACECs within GRSG habitat and the identified relevant and important values for each. An additional 85,310 acres in all or portions of eight ACECs, including those within mapped occupied habitat, are adjacent to mapped occupied habitat in the Box Elder, Carbon, Rich County, and Uintah population areas (see **Map 3.22-1**). None of the ACECs were designated for the purpose of protecting GRSG habitat.

Table 3.108
Areas of Critical Environmental Concern

Name	Total Acres	Acres in Mapped Occupied Habitat	GRSG Population Area	Relevant and Important Value(s)
Central Pacific Railroad Grade	4,870	460	Box Elder	Historic
Donner Creek/ Bettridge Creek	1,460	1,460	Box Elder	Fish
Nine Mile	70,300	5,360	Carbon	Cultural, Visual, Special Status Plants
Laketown Canyon	8,350	7,220	Rich	Scenic, Wildlife
Browns Park	18,500	6,310	Uintah	Visual, Wildlife, Cultural, Historic
Red Creek	24,600	17,300	Uintah	Watershed
Red Mountain-Dry Fork	24,900	12,800	Uintah	Relict plant communities, Archaeological, Paleontological, Watershed, Wildlife
Total	**154,350**	**50,910**		

Source: BLM 2012d

As part of this effort, the BLM called for and received nominations for ACECs to protect GRSG. A BLM interdisciplinary team reviewed nominations to determine which areas met the relevance and importance criteria, as defined by 43 CFR 1610.7-2(a)(1) and 43 CFR 1610.7-2(a)(2), and guidance in BLM Manual 1613, Areas of Critical Environmental Concern. Details of the process

and information on those areas found to meet the relevance and importance criteria can be found in **Appendix S**, BLM ACEC Evaluation and Forest Service Zoological Areas.

Zoological Areas

The Forest Service designates zoological areas according to Forest Service Manual 2372. A zoological area is a unit of land that contains animal specimens, animal groups, or animal communities that are significant because of their occurrence, habitat, location, life history, ecology, rarity, or other features.

There are currently no designated zoological areas in the planning area.

Wilderness and Wilderness Study Areas (WSAs)

Section 603 of the FLPMA required that by 1991, the Secretary, through the BLM, would provide Congress with recommendations as to suitability or unsuitability of those roadless areas of 5,000 acres or more and roadless islands of BLM-administered and National Forest System lands for wilderness designation. While Congress considers whether to designate a WSA as wilderness, the BLM is required to manage the WSA in a manner so as not to impair the suitability of such areas for preservation as wilderness. Only Congress can decide which areas, if any, will be designated as wilderness and added to the National Wilderness Preservation System. Until Congress acts on the recommendations, and either designates them as wilderness or releases them for other uses, these areas are managed according to BLM Manual 6330, Management of Wilderness Study Areas, to preserve their wilderness values. Activities that would impair wilderness suitability are prohibited in WSAs. This nonimpairment standard applies to all uses and activities, except those specifically exempted from this standard by the FLPMA (grandfathered uses and valid existing rights). BLM Manual 6330 provides specific policy and guidance for management of most resource values and uses within WSAs. By November 1980, the BLM Utah completed field inventories and designated about 3.2 million acres of WSAs.

In 1991, the BLM Utah issued a ROD that included wilderness recommendations for 95 WSAs throughout Utah. The recommendations were based upon the findings of the wilderness study process. Recommendations included each area's resource values; present and projected future uses, and manageability, as wilderness; the environmental consequences of designating or not designating the areas as wilderness; mineral surveys; and public input. There are 73 WSAs totaling 2,785,300 acres within the planning area (see **Map 3.22-2**). Of those, only a portion of 11 WSAs totaling 28,700 acres are within mapped occupied GRSG habitat (see **Table 3.109**).

There are 125,900 acres of designated wilderness on BLM-administered land in the planning area and 671,500 acres of designated wilderness on National Forest System land in the planning area. None of these areas overlap mapped occupied habitat (see **Map 3.22-2**).

Table 3.109
Wilderness Study Areas

Name	Total Acres	Acres in Mapped Occupied Habitat	GRSG Population Area
Desolation Canyon	293,900	14,700	Carbon, Uintah
Jack Canyon	7,200	5,350	Carbon
White Rock Range	3,800	720	Hamlin Valley
Deep Creek Mountains	79,000	170	Ibapah
Book Cliffs Mountain Browse ISA	400	270	Uintah
Bull Canyon	600	590	Uintah
Daniels Canyon	2,500	2,140	Uintah
Diamond Breaks	3,900	450	Uintah
Flume Canyon	50,600	30	Uintah
West Cold Springs	3,300	1,460	Uintah
Winter Ridge	43,300	2,820	Uintah
Total	**497,800**	**28,700**	

Source: BLM 2012

Other Special Designations

National Trails

The National Trails System Act of 1968 (Public Law 90-543, as amended) authorized the creation of a National Trail System composed of National Scenic Trails, National Historic Trails, and National Recreation Trails. Only Congress can designate National Scenic Trails and National Historic Trails. National Recreation Trails are designated by the Secretary of the Interior or the Secretary of Agriculture. Designation identifies and protects historic routes, historic remnants, and artifacts for public use and enjoyment.

There are four national historic trails in the planning area—California National Historic Trail, Mormon Pioneer National Historic Trail, Pony Express National Historic Trail, and the Old Spanish National Historic Trail. Management of the California, Mormon Pioneer, and Pony Express National Historic Trails is outlined in the Comprehensive Management and Use Plan for the California, Mormon Pioneer, Pony Express, and Oregon National Historic Trails (National Park Service 1999). A Comprehensive Management Plan is currently being developed for the Old Spanish Trail by the BLM and NPS.

The California National Historic Trail was established in 1992. Over 250,000 emigrants traveled from Missouri to California during the 1840s and 1850s on what is now known as the California National Historic Trail. Congress designated nearly 2,000 miles of historic trail that was once the primary "road" taken by farmers, enterprising business managers, gold seekers, and fortune hunters who chose to make a new life on the California frontier (National Park Service 2013). More than 1,000 miles of trail ruts and traces can still be seen across 10 states.

The Mormon Pioneer National Historic Trail was established in 1978. The trail once carried tens of thousands of Mormon emigrants to the Great Basin. In 1847, Mormon Church leader

Brigham Young led pioneers west toward the Great Salt Lake Valley, across about 1,200 miles of extreme climate and terrain. Today, the historic route and sites along the way offer a glimpse into the Mormon settlement history. Approximately 930 miles of the Mormon Pioneer National Historic Trail fall within the planning area, none of which overlaps GRSG mapped occupied habitat administered by the BLM or Forest Service.

The Pony Express National Historic Trail was established in 1992. It was used to carry the nation's mail from Missouri to California on horseback in the unprecedented time of only 10 days. The relay system became the nations most direct and practical means of east-west communications before the telegraph, and it played a vital role in aligning California with the Union in the years just before the Civil War.

The Old Spanish National Historic Trail was designated on December 4, 2002, by the Old Spanish Trail Recognition Act of 2002 (Public Law 107-325). Approximately 590 miles of the Old Spanish National Historic Trail are within the planning area, including 190 miles on BLM-administered lands and 120 miles on National Forest System lands. The BLM and National Park Service jointly administer the trail in collaboration with the Old Spanish Trail Association, which serves as the primary nonfederal partner. A long-term strategy for managing and interpreting the Old Spanish National Historic Trail is being developed by the national trail administrators.

Table 3.110 displays the miles of each trail within mapped occupied habitat by population area. It is not known how many of these miles have been inventoried and determined to be high potential historic sites or route segments.

Table 3.110
National Historic Trails

	National Historic Trail	Total Miles in Planning Area	Miles in Mapped Occupied Habitat[1]
Population Area	California	1,234.7	7.2
	Box Elder	*368.7*	*7.2*
	Rich	*846.3*	*0*
	None	*19.7*	*0*
	Old Spanish	592.0	176.5
	Emery	*76.2*	*0*
	Panguitch	*184.1*	*48.5*
	Parker Mountain	*306.3*	*128.0*
	None	*25.4*	
	Pony Express	602.1	81.7
	Ibapah	*30.6*	*10.2*
	Rich	*343.8*	*0*
	Sheeprocks	*199.0*	*71.5*
	None	*28.7*	*0*
	Total	***2,428.8***	***265.4***

Source: BLM 2012d
[1]Miles are on BLM-administered and National Forest System lands

Forest Service Research Natural Areas

The Forest Service research natural area network protects some of the finest examples of natural ecosystems for the purposes of scientific study and education and for maintenance of biological diversity. Research natural areas are permanently protected and maintained in natural conditions, for the purposes of conserving biological diversity, conducting nonmanipulative research and monitoring, and fostering education. Included in this network are high-quality examples of widespread ecosystems, unique ecosystems or ecological features, and rare or sensitive species of plants and animals and their habitat. These research natural areas help protect biological diversity at the genetic, species, ecosystem, and landscape scales.

Research natural areas that are representative of common ecosystems in natural condition serve as baseline or reference areas. To help answer resource management questions, the baseline areas of research natural areas can be compared with similar ecosystems undergoing silvicultural or other land management prescriptions. In this way, research natural areas make an important contribution to ecosystem management.

Research natural areas are managed to maintain the natural features for which they were established, and to maintain natural processes. Because of the emphasis on natural conditions, they are excellent areas for studying ecosystems or their component parts and for monitoring succession and other long-term ecological change. Non-manipulative research and monitoring activities are encouraged in research natural areas and can be compared with manipulative studies conducted in other areas.

A portion of one Forest Service research natural area, Mollens Hollow (410 acres), is within occupied GRSG habitat in the Rich Population Area (see **Map 3.22-1**). Stands of Douglas fir and curlleaf mountain mahogany cover large parts of the research natural area. Communities of subalpine fir, bigtooth maple, mountain big sagebrush, and low sagebrush are also present. The area also contains extensive stands of single-leaf pinyon pine that are widely disjunct from the main occurrences of this species in the Great Basin (Forest Service undated a).

In addition, 3,800 acres in all or portions of six research natural areas are adjacent to occupied habitat in the Uintah, Strawberry, Carbon, and Emery population areas (see **Map 3.22-1**).

Grand Staircase-Escalante National Monument

Grand Staircase-Escalante National Monument was established in 1996 by Presidential Proclamation 6920 under the Antiquities Act of 1906 (34 Stat. 225, 16 USC 431) to protect a spectacular array of historic, biological, geological, paleontological, and archeological objects. This is the first national monument the BLM was charged with managing and is included in BLM's National Conservation Lands. It lies in the southern portion of the planning area in the heart of the Colorado Plateau and includes the Escalante Canyons, Kaiparowits Plateau, and the Grand Staircase physiographic regions. The Escalante Canyons and the Grand Staircase regions are especially popular for recreational use with more than 750,000 visits in 2012. Lands within the monument range from desert shrub (around 3,870 feet) to Ponderosa pine/Douglas-fir forest (around 8,630 feet). The area exhibits varied topography, geology, soil, and flora and fauna components, including desert shrub, riparian, sagebrush grasslands, blackbrush shrublands, pinyon-juniper woodlands, oak woodlands, and ponderosa pine/Douglas-fir forests. It is also rich

with world-class paleontological resources of the late Cretaceous Era and archaeological and historical resources from the early archaic times through the pioneer and settlement era.

Flaming Gorge National Recreation Area

The Flaming Gorge National Recreation Area was established by Congress on October 1, 1968. The area contains 207,363 acres of land and water, almost equally divided between Utah and Wyoming. Flaming Gorge Reservoir is the most popular attraction. Five full-service marinas offer launching, storage, and maintenance facilities. The reservoir surface water is cool even during the heat of summer, which means the reservoir provides excellent habitat for trout, and it is invigoratingly cool for water skiers.

Rising 502 feet above bedrock, Flaming Gorge Dam impounds waters of the Green River to form the reservoir, which extends as far as 91 miles to the north. The reservoir has a total capacity of 3,788,900 acre-feet. At full elevation of 6,045 feet, it has a surface area of 42,020 acres. The reservoir provides varied recreational activities such as power boating, waterskiing, camping, parasailing, rafting, swimming, and fishing from boats or shore. The lake is famous for its trophy trout fishing (up to 40 pounds/18 kilograms) and for the beautiful red rock mountains rising around it. Below the lake, the Green River is renowned for trout fishing and rafting. Neither a permit nor a commercial guide is required for rafting, and rented rafts are available nearby. The recreation area also offers many campgrounds and hiking areas. The trails wind through meadows, tree-covered slopes, and mountain peaks above timberline. The five-mile Canyon Rim Trail is accessible from the Greendale Overlook, Skull Creek Campground, or Greens Lake Campground.

3.22.2 Regional Context

Table 3.111 displays data compiled in a BER produced by the USGS and BLM (Manier et al. 2013). Data are presented by surface management agency and their occurrence within mapped occupied habitat in the planning area and the MZs that overlap the planning area. As the table shows, the MZ with the most acres of conservation areas varies by surface management agency.

Table 3.111
Conservation Areas within GRSG Habitat

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat	
		Within Planning Area[1]	Within Management Zone[1]
BLM	II & VII	50,100	752,300
	III	25,900	301,700
	IV	1,800	2,252,100
Forest Service	II & VII	100	49,300
	III	100	150,200
	IV	0	29,600
Tribal and Other Federal	II & VII	12,200	199,000
	III	900	14,700
	IV	0	330,800
Private	II & VII	19,400	576,100
	III	12,200	13,500
	IV	600	289,100

Table 3.111
Conservation Areas within GRSG Habitat

Surface Management Agency	Management Zone	Acres within Mapped Occupied Habitat	
		Within Planning Area[1]	Within Management Zone[1]
State	II & VII	300	85,400
	III	1,600	7,100
	IV	0	39,000
Other	II & VII	0	30,900
	III	0	0
	IV	0	1,500

Source: Manier et al. 2013
[1]Includes ACECs, USFWS wildlife refuges, national conservation easements, National Park System units, BLM's National Conservation Lands, conservation areas on private and state property, and federally designated wilderness.

3.23 SOCIAL AND ECONOMIC CONDITIONS (INCLUDING ENVIRONMENTAL JUSTICE)

Due to the nature of social, economic, and environmental justice conditions, the social and economic analysis is based on a different area for analysis than is used for other resources. The socioeconomic study area is made up of counties within the Utah sub-region that contain GRSG habitat and within which social and economic conditions might reasonably be expected to change based on alternative management actions. The BLM and Forest Service also reviewed the need to include additional counties that may not contain habitat but are closely linked economically or socially to counties that do contain habitat. These additional counties include what are sometimes called "service area" counties, or counties from which businesses operate that regularly provide critical economic services, such as recreational outfitting or support services for the minerals (including oil and gas) or livestock grazing sector, to people and businesses in counties that contain habitat (METI Corp/Economic Insights of Colorado 2012). Including service area counties is important because a change in economic activity in a county containing habitat may result in changes in economic activity within service area counties as well.

The socioeconomic study area contains 22 counties in Utah—Beaver, Box Elder, Cache, Carbon, Daggett, Duchesne, Emery, Garfield, Grand, Iron, Juab, Kane, Morgan, Piute, Rich, Sanpete, Sevier, Summit, Tooele, Uintah, Wasatch, and Wayne. Each of these counties contains mapped occupied habitat. An additional five counties—Millard, Weber, Davis, Salt Lake, and Utah—are included as a secondary study area. Millard and Weber counties contain very few acres of GRSG habitat. Utah County is a populous county relative to the presence of GRSG habitat. It was included in the secondary rather than the primary study area to avoid heavily steering the impact analysis of the primary study area. Davis and Salt Lake Counties contain no GRSG habitat but are linked to surrounding counties with GRSG habitat by commuting ties (Office of Management and Budget 2009).

Table 3.112 shows the share of workers employed in a given county of the primary and secondary socioeconomic study areas and that reside in the same county. The table also shows other counties that provide labor to the selected primary or secondary study area. Salt Lake County provides a considerable share of the workers employed in Tooele and Summit Counties.

Table 3.112
Commuter Patterns in the Socioeconomic Study Area, 2010

Geographic Area of Employment	Live in Same Area of Employment	Other Counties Where Considerable Share of Workers Live
Primary Socioeconomic Study Area		
Beaver County	75.8%	Iron (7.5%), Washington (2.7%), Salt Lake (2.4%)
Box Elder County	57.3%	Weber (13.2%), Cache (11.6%), Salt Lake (5.2%), Davis (4.2%), Utah (2.0%)
Cache County	70.7%	Salt Lake (5.4%), Box Elder (4.0 %), Weber (3.5%), Utah (3.4%), Davis (3.2%), Franklin (2.9%)
Carbon County	62.2%	Emery (8.3%), Salt Lake (5.5%), Utah (4.3%), Uintah (3.4%), Sanpete (2.3%), Sevier (2.1%)
Daggett County	67.1%	Uintah (5.8%), Sweetwater (5.4%), Duchesne (4.7%), Utah (4.7%), Salt Lake (3.4%)
Duchesne County	66.3%	Uintah (15.7%), Salt Lake (4.0%), Utah (2.5%)
Emery County	63.1%	Carbon (14.9%), Salt Lake (3.3%), Utah (3.2%), Sanpete (2.0%)
Garfield County	68.0%	Washington (5.5%), Iron (5.1%), Salt Lake (3.0%), Kane (2.7%)
Grand County	74.7%	San Juan (5.0%), Salt Lake (4.1%)
Iron County	71.6%	Washington (11%), Utah (4.1%)
Juab County	58.7%	Utah (16.3%), Sanpete (6.6%), Salt Lake (6.3%), Millard (3.0%)
Kane County	66.9%	Coconino, Arizona (11.7%), Washington (6.2%), Iron (2.8%)
Morgan County	59.0%	Weber (14.8%), Davis (11.1%), Salt Lake (5.0%), Summit (3.4%)
Piute County	63.8%	Sevier (12.5%), Iron (3.4%), Washington (3.4%), Sanpete (3.0%)
Rich County	50.2%	Cache (15.8%), Bear Lake (9.6%), Weber (6.2%), Salt Lake (3.5%), Box Elder (2.8%), Uintah (2.0%)
Sanpete County	68.7%	Utah (7.0%), Sevier (6.4%), Salt Lake (3.4%)
Sevier County	66.6%	Sanpete (6.3%), Washington (3.9%), Salt Lake (3.1%), Utah (2.9%), Iron (2.4%)
Summit County	48.3%	Salt Lake (23.2%), Wasatch (10.2%), Utah (5.1%), Davis (3.2%)
Tooele County	59.6%	Salt Lake (18.1%), Utah (7.0%), Davis (3.6%), Weber (2.4%)
Uintah County	73.3%	Duchesne (7.7%), Salt Lake (5.1%), Utah (3.2%)
Wasatch County	55.7%	Salt Lake (12.0%), Utah (12.0%), Summit (5.2%), Davis (2.0%)
Wayne County	73.7%	Sevier (7.3%), Salt Lake (3.7%)
Secondary Socioeconomic Study Area		
Millard County	77.5%	Utah (3.4%), Salt Lake (3.3%), Washington (2.2%)
Weber County	57.2%	Davis (18.8%), Salt Lake (7.9%), Box Elder (4.3%), Utah (3.2%), Cache (2.8%)
Utah County	73.4%	Salt Lake (13.2%), Davis (2.2%)
Davis County	50.9%	Weber (18.1%); Salt Lake (17.3%); Utah (4.1%); Cache (2.0%)
Salt Lake County	70.0%	Davis (8.8%); Utah (8.6%); Weber (3.3%); Tooele (2.0%)

Source: US Census Bureau 2012b

Although this chapter focuses primarily on the social and economic conditions of the socioeconomic study area, the impact analysis in the next chapter will document potential effects on both the socioeconomic study area and the secondary study area.

Table 3.113 shows the LUPs that may be altered by the Utah Greater Sage-Grouse LUPA/EIS and the counties containing GRSG habitat within the area encompassed by those plans.

Because of the nature of the socioeconomic study area, the socioeconomic resources section has a slightly different format than the other resource analyses in the EIS. Rather than proceeding by field office and national forest, the section provides information for the entire socioeconomic study area except where the relevant information or data are tabulated for the specific geographic area of field office or national forest. In addition, the analysis presents information about existing conditions and trends within the same section, because that is the common practice for analysis of social and economic conditions.

3.23.1 Conditions Statewide

Social Conditions

Social conditions concern human communities, including towns, cities, and rural areas, the custom, culture, and history of the area as it relates to human settlement, and current social values.

Population and Demographics

Table 3.114 shows current and historic populations in the socioeconomic study area.

Since 1990, the population in Utah has increased by 60 percent, a change that is 36 percentage points higher than the US as a whole. Utah grew in both decades, though it experienced higher growth between 1990 and 2000 (30 percent) than between 2000 and 2010 (24 percent). From 1990 to 2010, natural increase (births minus deaths) accounted for approximately 66 percent of Utah's growth, while net migration accounted for approximately 34 percent of the growth (Utah Office of Planning and Budget 2012). Similar to Utah, the socioeconomic study area's population growth (64 percent) more than doubled compared to US growth as a whole. All counties in the study area grew faster than the nation as a whole, with the exception of Carbon, Emery, and Piute Counties.

The "Communities of Place" section below provides more information about additional cities and towns in the socioeconomic study area, as well as the character and history of the counties. **Table 3.115** shows age and gender characteristics of the population in each county of the socioeconomic study area.

The socioeconomic study area, Utah, and the US as a whole all have relatively similar trends in gender, with approximately half the population being female. Utah and the socioeconomic study area have a younger population than the US; both have a higher percentage of residents under the age of 20 than the US as a whole.

Table 3.113
BLM and Forest Service Plans, Management Units, and Counties in the Socioeconomic Study Area

Plan or Document	Management Unit	Counties[1]
	BLM	
Box Elder RMP (1986)	Salt Lake Field Office	Box Elder
Pinyon Management Framework Plan (1983)	Cedar City Field Office	Iron
Cedar City, Beaver, Garfield, Antimony RMP (1986)	Cedar City Field Office	Iron, Beaver, Garfield
Grand Staircase-Escalante National Monument Monument Management Plan (2000)	Grand Staircase-Escalante National Monument	Kane, Garfield
House Range RMP (1987)	Fillmore Field Office	Juab, Millard (northern part)
Kanab RMP (2008)	Kanab Field Office	Kane, Garfield
Moab RMP (2008)	Moab Field Office	Grand, San Juan (northern part)
Park City Management Framework Plan (1975)	Salt Lake Field Office	Summit, Wasatch
Pony Express RMP (1990)	Salt Lake Field Office	Salt Lake, Tooele, Utah
Price RMP (2008)	Price Field Office	Carbon, Emery
Randolph Management Framework Plan (1980)	Salt Lake Field Office	Rich
Richfield RMP (2008)	Richfield Field Office	Piute, Sanpete, Sevier, Wayne, Garfield (eastern only)
Salt Lake District Isolated Tracts Planning Analysis (1985)	Salt Lake Field Office	Cache, Morgan, Summit, Salt Lake, and Weber
Vernal RMP (2008)	Vernal Field Office	Daggett, Duchesne, Uintah
Warm Springs RMP (1986)	Fillmore Field Office	Millard
	Forest Service	
Ashley National Forest Plan (1986)	Duchesne/Roosevelt, Vernal, and Flaming Gorge Ranger Districts	Daggett, Duchesne, Summit, Uintah, Utah (Utah); Sweetwater (Wyoming)
Dixie National Forest Land and RMP (1986)	Cedar City, Escalante, Pine Valley, and Powell Ranger Districts	Garfield, Iron, Kane, Piute, Washington, Wayne
Fishlake National Forest Land and RMP (1986)	Beaver, Fillmore, Fremont River, and Richfield Ranger Districts	Beaver, Garfield, Iron, Juab, Millard, Piute, Sanpete, Sevier, Wayne
Manti-LaSal National Forest Plan (1986)	Ferron, Price, Sanpete, Moab, and Monticello Ranger Districts	Carbon, Emery, Grand, San Juan, Sanpete, Sevier, Utah (Utah); Montrose, Mesa (Colorado)
Uinta National Forest Revised Forest Plan (2003)	Evanston-Mountain View, Heber-Kamas, Logan, Ogden, Pleasant Grove, Salt Lake, and Spanish Fork Ranger Districts	Juab, Sanpete, Tooele, Utah (Utah), Wasatch
Wasatch-Cache National Forest Plan Revision (2003)	Evanston-Mountain View, Heber-Kamas, Logan, Ogden, Pleasant Grove, Salt Lake, and Spanish Fork Ranger Districts	Box Elder, Cache, Davis , Duchesne, Morgan, Rich, Salt Lake, Summit, Tooele, Wasatch, Weber

[1]All counties are in Utah, unless otherwise indicated.

Table 3.114
Population Growth, 1990-2010

Geographic Area	1990	2000	2010	Percent Change (1990-2010)
Beaver County	4,765	6,005	6,629	39
Box Elder County	36,485	42,745	49,975	37
Cache County	70,183	91,391	112,656	61
Carbon County	20,228	20,422	21,403	6
Daggett County	690	921	1,059	54
Duchesne County	12,645	14,371	18,607	47
Emery County	10,332	10,860	10,976	6
Garfield County	3,980	4,735	5,172	30
Grand County	6,620	8,485	9,225	39
Iron County	20,789	33,779	46,163	122
Juab County	5,817	8,238	10,246	76
Kane County	5,169	6,046	7,125	38
Morgan County	5,528	7,129	9,469	71
Piute County	1,277	1,435	1,556	22
Rich County	1,725	1,961	2,264	31
Sanpete County	16,259	22,763	27,822	71
Sevier County	15,431	18,842	20,802	35
Summit County	15,518	29,736	36,324	134
Tooele County	26,601	40,735	58,218	119
Uintah County	22,211	25,224	32,588	47
Wasatch County	10,089	15,215	23,530	133
Wayne County	2,177	2,509	2,778	28
Socioeconomic Study Area	314,519	413,547	514,587	64
Utah	1,722,850	2,233,169	2,763,885	60
US	248,790,925	281,421,906	308,745,538	24

Sources: US Census Bureau 1990, 2000, 2010a

With a population of 48,174 people, Logan is the largest city in the socioeconomic study area (US Census Bureau, 2010b) and the county seat of Cache County. Other relatively populous communities are Tooele City (31,605 people and county seat of Tooele County), Cedar City (28,857 people), Brigham City (17,899 people and county seat of Box Elder County), Heber City (11,362 people and county seat of Wasatch County), Vernal City (9,089 people and county seat of Uintah County), and Price City (8,715 people and county seat of Carbon County).

Interest Groups and Communities of Place

There is a range of interest groups in the socioeconomic study area, including groups that focus advocacy on resource conservation and others that focus advocacy on resource uses such as livestock grazing and developed recreation opportunities. There are also groups that represent coalitions of interest groups. Identification of these groups is intended to inform on the different interests in the study area and not to suggest that different interests necessarily conflict. Furthermore, groups and individuals often value various interests. The types of interest groups

Table 3.115
Demographic Characteristics, Share in Total Population (percent), 2010

Geographical Unit	Women	20 to 64 Years of Age	Under 20 Years of Age	65 Years of Age or Older
Beaver County	48.6	50.6	36.8	12.6
Box Elder County	49.6	52.3	36.6	11.1
Cache County	50.3	56.0	36.3	7.7
Carbon County	50.4	56.0	30.4	13.6
Daggett County	43.6	57.4	23.6	19.0
Duchesne County	49.2	52.8	36.5	10.7
Emery County	49.1	53.0	34.5	12.5
Garfield County	48.3	54.5	29.4	16.1
Grand County	49.6	61.4	25.0	13.6
Iron County	50.3	54.8	35.4	9.8
Juab County	49.0	49.7	40.1	10.2
Kane County	50.6	53.7	26.8	19.5
Morgan County	49.6	51.3	38.2	10.5
Piute County	48.8	46.4	32.3	21.3
Rich County	48.3	51.8	33.0	15.2
Sanpete County	47.7	51.2	37.3	11.5
Sevier County	49.6	51.2	34.3	14.5
Summit County	48.5	62.5	29.9	7.6
Tooele County	49.6	53.9	38.6	7.5
Uintah County	49.2	54.7	36.1	9.2
Wasatch County	49.2	55.1	36.3	8.6
Wayne County	49.5	52.4	32.3	15.3
Socioeconomic Study Area	49.5	54.7	35.4	9.9
Utah	49.8	56.3	34.7	9.0
US	50.8	60.1	26.9	13.0

Source: US Census Bureau 2010b

identified within the socioeconomic study area include the following: federal agencies, state agencies, county agencies, local agencies, Congressional representatives, local representatives, academic institutions, civic organizations, local chambers of commerce, environmental groups, land conservation groups, outdoors groups, local school boards, farm associations, Native American groups and tribal governments, and various business groups. Specific types of business interest groups identified include the following: real estate, tourism, mineral/oil and gas extraction, farms/ranches, textile manufacturers, livestock growers, and news media.

The socioeconomic study area includes various communities of people who are bound together because of where they reside, work, visit, or otherwise spend a continuous portion of their time. A survey conducted by Utah State University assessed the extent to which Utah residents experience strong feelings about public land environments and settings in the state. According to the authors of the study, the study and sample sizes were designed to produce results generalizable at the statewide level, with generalizations increasingly risky as the sample area diminishes. Nonetheless, the study provides current and interesting results not available

elsewhere and shows the dependence of local communities on public lands for a variety of economic and recreational pursuits.

The analytic results were based on clustered groupings of two to four geographically adjacent counties. The 11 county clusters are as follows:

- Davis, Salt Lake, Utah, and Weber Counties
- Cache and Rich Counties
- Box Elder and Tooele Counties
- Morgan, Summit, and Wasatch Counties
- Daggett, Duchesne, and Uintah Counties
- Carbon and Emery Counties
- Piute, Sanpete, and Sevier Counties
- Beaver, Juab, and Millard Counties
- Garfield, Kane, and Wayne Counties
- Grand and San Juan Counties
- Iron and Washington Counties

The Davis, Salt Lake, Utah, and Weber Counties cluster is not in the socioeconomic study area and will not be discussed further.

The second column of **Table 3.116** provides the percentage of survey respondents from each county cluster that reported that a portion of their household's income is directly linked to permitted uses of BLM-administered land or resources. The third column of **Table 3.116** provides the percentage of individuals who reported affirmatively (i.e., are included in the percentage in column two) that 25 percent or more of their household income is derived from activities linked to permitted uses of BLM-administered land or resources.

The percentage of respondents reporting a linkage between household income and BLM-administered land or resources varied across the county clusters. The county clusters with the smallest percentage of respondents reporting a linkage between their household income and BLM-administered lands included Cache/Rich (2 percent), Morgan/Summit/Wasatch (3 percent), Iron/Washington (3 percent), and Box Elder/Tooele (6 percent). On the other end of the spectrum, the county clusters with the largest percentage of respondents reporting a linkage between their household income and BLM-administered lands included Beaver/Juab/Millard (14 percent), Carbon/Emery (15 percent), Grand/San Juan (16 percent), Garfield/Kane/Wayne (17 percent), and Daggett/Duchesne/Uintah (18 percent). Among the respondents who did report participation in economic activities on BLM-administered lands, the percentage indicating that a quarter or more of household income is derived from activities related to BLM-administered lands ranged from a low of 28 percent in the Cache/Rich county cluster to 86 percent in the Daggett/Duchesne/Uintah county cluster (Utah State University 2008).

Table 3.116
Survey Respondents Reporting Household Income Linkage to BLM-administered Land

County Clusters	Respondents Reporting Linkage (Percentage)	Affirmative Respondents Reporting Linkage to > 25% of Household Income (Percentage)
Cache and Rich Counties	2	28
Box Elder and Tooele Counties	6	42
Morgan, Summit, and Wasatch Counties	3	36
Daggett, Duchesne, and Uintah Counties	18	86
Carbon and Emery Counties	15	75
Piute, Sanpete, and Sevier Counties	8	45
Beaver, Juab, and Millard Counties	14	46
Garfield, Kane, and Wayne Counties	17	32
Grand and San Juan Counties	16	35
Iron and Washington Counties	3	29

The second column of **Table 3.117** provides the percentage of survey respondents from each county cluster that reported that a portion of their household's income is directly linked to permitted uses of National Forest System land or resources. The third column of **Table 3.117** provides the percentage of individuals who reported affirmatively (i.e., are included in the percentage in the second column) that 25 percent or more of their household income is derived from activities linked to permitted uses of National Forest System land or resources.

Table 3.117
Survey Respondents Reporting Household Income Linkage to National Forest System Land

County Clusters	Respondents Reporting Linkage (Percentage)	Affirmative Respondents Reporting Linkage to more than 25% of Household Income (Percentage)
Cache and Rich Counties	2	20
Box Elder and Tooele Counties	5	29
Morgan, Summit, and Wasatch Counties	4	52
Daggett, Duchesne and Uintah Counties	7	47
Carbon and Emery Counties	14	84
Piute, Sanpete, and Sevier Counties	11	54
Beaver, Juab, and Millard Counties	9	24
Garfield, Kane, and Wayne Counties	14	44
Grand and San Juan Counties	10	23
Iron and Washington Counties	4	25

The percentage of respondents reporting a linkage between household income and National Forest System lands or resources varied across the county clusters. Similar to the trends seen

for BLM-administered lands, the county clusters with the smallest percentage of respondents reporting a linkage between their household income and National Forest System lands included Cache/Rich (2 percent), Iron/Washington (4 percent), Morgan/Summit/Wasatch (4 percent), and Box Elder/Tooele (5 percent). On the other end of the spectrum, the county clusters with the largest percentage of respondents reporting a linkage between their household income and National Forest System lands included Grand/San Juan (10 percent), Piute/Sanpete/Sevier (11 percent), Carbon/Emery (14 percent), and Garfield/Kane/Wayne (14 percent). Among the respondents who did report participation in economic activities on National Forest System lands, the percentage indicating that a quarter or more of their household income is derived from activities related to National Forest System lands ranged from a low of 20 percent in the Cache/Rich county cluster to 84 percent in the Carbon/Emery county cluster (Utah State University 2008).

Table 3.118 provides the percentage of survey respondents that reported that a portion of their household's income comes from a business economically linked to recreation and tourism activities, which are influenced by the presence of public land resources.

Table 3.118
Survey Respondents Reporting Household Income Linkage to Recreation and Tourism Influenced by the Presence of Public Land Resources

County Clusters	Respondents Reporting Linkage (Percentage)
Cache and Rich Counties	4
Box Elder and Tooele Counties	7
Morgan, Summit, and Wasatch Counties	18
Daggett, Duchesne, and Uintah Counties	8
Carbon and Emery Counties	8
Piute, Sanpete, and Sevier Counties	8
Beaver, Juab, and Millard Counties	8
Garfield, Kane, and Wayne Counties	36
Grand and San Juan Counties	31
Iron and Washington Counties	11

The county clusters with the smallest percentage of respondents reporting a linkage between their household income and recreation and tourism, which is influenced by the presence of public land resources, are the Cache/Rich (4 percent) and Box Elder/Tooele clusters (7 percent). On the other end of the spectrum, the county clusters with the largest percentage of respondents reporting a linkage between their household income and recreation and tourism, which is influenced by the presence of public land resources, are Grand/San Juan (31 percent) and Garfield/Kane/Wayne (36 percent). In addition, respondents who did report household involvement in such businesses generally considered BLM-administered and National Forest System lands and resources to be either very or extremely important to the success of the relevant reported category of business (Utah State University 2008).

Table 3.119 provides the percentage of survey respondents that reported that a portion of their household's income comes from a business linked economically to farming and ranching operations, logging operations, or other enterprises that use or process natural resources located on BLM-administered and National Forest System lands.

Table 3.119
Survey Respondents Reporting Household Income Linkage to Farming and Ranching Operations, Logging Operations, or Other Enterprises That Use or Process Natural Resources Located on Public Lands

County Clusters	Respondents Reporting Linkage (Percentage)
Cache and Rich Counties	3
Box Elder and Tooele Counties	10
Morgan, Summit, and Wasatch Counties	3
Daggett, Duchesne, and Uintah Counties	17
Carbon and Emery Counties	12
Piute, Sanpete, and Sevier Counties	10
Beaver, Juab, and Millard Counties	10
Garfield, Kane, and Wayne Counties	16
Grand and San Juan Counties	12
Iron and Washington Counties	8

The county clusters with the smallest percentage of respondents reporting a linkage between their household income and farming and ranching operations, logging operations, or other enterprises that use or process natural resources located on BLM-administered and National Forest System lands include Cache/Rich (3 percent) and Morgan/Summit/Wasatch (3 percent). On the other end of the spectrum, the county clusters with the largest percentage include the Carbon/Emery (12 percent), Grand/San Juan (12 percent), Garfield/Kane/Wayne (16 percent), and Daggett/Duchesne/Uintah (17 percent) county clusters. In all areas of the state respondents who reported household involvement in these types of business activities most often considered BLM-administered and National Forest System lands and resources to be very important or extremely important to the success of their business (Utah State University 2008).

Many communities in the study area have strong economic and social ties to BLM-administered and National Forest System lands. Among the larger communities, Cedar City is the headquarters of Dixie National Forest, which is the largest national forest in Utah, and a main starting point for travelers visiting Bryce Canyon National Park, Zion National Park, and Cedar Breaks National Monument. Brigham City serves as a gateway to 74,000 acres of refuge property that include opportunities for wildlife observation, photography, and environmental education (Brigham City 2012). Smaller towns such as Vernal, Panguitch, or Randolph may be more vulnerable to changes in public land management due to their less diversified economies.

County Land Use Plans

BLM-administered and other federal land in the socioeconomic study area is intermingled with state and private lands. County governments have land use planning responsibility for the private lands within their jurisdictions. County-level LUPs were identified for 15 of 22 counties within the socioeconomic study area (City of Beaver 1994; Carbon County 1997; Daggett County 2009; Duchesne County 2005 (amended 2013); Emery County 2012; Grand County 2012; Kane County 2011; Morgan County 2010; Sanpete County 2010; Sevier County 1998; Summit County Eastern 2010; Summit County Snyderville 2002; Tooele County 2012; Uintah County 2011; Wayne County 2009; Wasatch County 2012). These plans typically include explicit economic development components, such as promotion of specific industrial sectors and natural resource use.

Other counties have developed RMPs that take into consideration land use and economic development considerations. Garfield adopted an RMP in 2006 and a follow-up comprehensive economic development plan in 2007 (Garfield County 2007). The Iron County RMP was developed in 2009 (Iron County 2009).

Economic Conditions

Economic analysis is concerned with the production, distribution, and consumption of goods and services. This section provides a summary of economic information, including trends and current conditions. It also identifies and describes major economic sectors in the socioeconomic study area that can be affected by management actions. Most likely affected would be those economic activities that rely on or could rely on BLM-administered and National Forest System lands, such as recreation, livestock grazing, or energy development.

Economic Sectors, Employment, and Personal Income

The distribution of employment and income by industry sector within the socioeconomic study area is summarized in **Table 3.120** and **Table 3.121**, below. See **Appendix T**, Detailed Employment and Earnings Data, for equivalent data by county.

With respect to distribution of employment, the services-related sector accounted for the largest share (59 percent) of total employment in the socioeconomic study area in 2010. This reflects a growth rate of 36 percent from 2001 (compared to an overall employment growth rate for all sectors of 24 percent from 2001). Compared with the services-related sector, the non-services-related sector and the government sector represented lower levels of employment, 22 percent and 16 percent, respectively. At the industry level, retail trade (11 percent) accounted for the largest share of employment of all industries in 2010, followed by local government (9 percent), manufacturing (9 percent), and accommodation and food services (8 percent). The industries that demonstrated the largest growth between 2001 and 2010 were educational services, with an increase of 102 percent; finance and insurance, with an increase of 97 percent; and real estate and rental and leasing, with an increase of 94 percent. The only industries to decrease in employment levels from 2001 to 2010 were management of companies and enterprises (decrease of 51 percent) and farming (decrease of 9 percent).

Table 3.120
Employment by Sector within the Socioeconomic Study Area

Socioeconomic Study Area	Absolute			Percentage of Total		Percent Change 2001-2010
	2001	2010	Change 2001-2010	2001	2010	
Total Employment (number of jobs)	**229,717**	**285,249**	**55,532**	**100**	**100**	**24**
Non-services-related	**57,718**	**62,358**	**4,639**	**25**	**22**	**8**
Farm	12,904	11,716	-1,188	6	4	-9
Forestry, fishing, & related activities	969	1,165	196	<1	<1	20
Mining (including oil and gas)	4,619	7,755	3,136	2	3	68
Construction	15,496	17,283	1,787	7	6	12
Manufacturing	23,731	24,439	708	10	9	3
Services-related	**124,450**	**169,088**	**44,638**	**54**	**59**	**36**
Utilities	684	776	92	<1	<1	13
Wholesale trade	3,359	4,453	1,093	2	2	33
Retail trade	26,297	30,302	4,005	11	11	15
Transportation and warehousing	6,215	9,822	3,607	3	3	58
Information	2,823	3,084	262	1	1	9
Finance and insurance	6,993	13,779	6,786	3	5	97
Real estate and rental and leasing	8,471	16,393	7,921	4	6	94
Professional and technical services	8,384	13,378	4,995	4	5	60
Management of companies and enterprises	3,195	1,555	-1,640	1	<1	-51
Administrative and waste services	9,396	11,950	2,554	4	4	27
Educational services	1,643	3,322	1,678	<1	1	102
Health care and social assistance	10,453	15,384	4,931	5	5	47
Arts, entertainment, and recreation	5,710	7,826	2,117	3	3	37
Accommodation and food services	18,086	21,603	3,517	8	8	19
Other services, except public administration	12,741	15,462	2,721	6	5	21

Table 3.120
Employment by Sector within the Socioeconomic Study Area

Socioeconomic Study Area	Absolute			Percentage of Total		Percent Change 2001-2010
	2001	2010	Change 2001-2010	2001	2010	
Government	**39,415**	**44,398**	**4,983**	**17**	**16**	**12**
Federal	6,823	7,249	426	3	3	6
State	10,202	10,373	171	4	4	2
Local	22,109	26,755	4,646	10	9	21

Sources: Headwaters Economics 2012; US Department of Commerce 2012a
Negative numbers in the absolute change column and the percent change column indicate decreases in employment levels from 2001 to 2010.

Table 3.121
Labor Income by Sector within the Socioeconomic Study Area (2010 dollars)

Socioeconomic Study Area	Absolute (Millions)			Percentage of total[1]		Percent Change 2001-2010
	2001	2010	Change 2001-2010	2001	2010	
Total Labor Earnings[2]	**$7,832.9**	**$10,154.2**	**$2,321.3**	**100**	**100**	**30**
Non-services-related	**$2,461.1**	**$2,948.2**	**$487.1**	**31**	**29**	**20**
Farm	$280.6	$119.4	-$161.2	4	1	-57
Forestry, fishing, & related activities	$23.2	$21.7	-$1.5	<1	<1	-7
Mining (including oil and gas)	$342.4	$556.8	$214.4	4	6	63
Construction	$544.6	$748.0	$203.3	7	7	37
Manufacturing	$1,270.3	$1,502.3	$231.9	16	15	18
Services-related	**$3,831.9**	**$5,130.5**	**$1,298.5**	**49**	**51**	**34**
Utilities	$150.8	$153.8	$3.0	2	2	2
Wholesale trade	$199.4	$247.6	$48.2	3	2	24
Retail trade	$602.1	$720.3	$118.2	8	7	20
Transportation and warehousing	$290.5	$490.0	$199.5	4	5	69
Information	$90.9	$124.2	$33.3	1	1	37
Finance and insurance	$175.2	$256.3	$81.1	2	3	46
Real estate and rental and leasing	$224.5	$239.8	$15.2	3	2	7
Professional and technical services	$330.6	$510.5	$179.9	4	5	54
Management of companies and enterprises	$133.4	$63.4	-$70.1	2	<1	-53
Administrative and waste services	$267.8	$393.2	$125.4	3	4	47

Table 3.121
Labor Income by Sector within the Socioeconomic Study Area (2010 dollars)

Socioeconomic Study Area	Absolute (Millions)			Percentage of total[1]		Percent Change 2001-2010
	2001	2010	Change 2001-2010	2001	2010	
Educational services	$138.3	$125.9	-$12.4	2	1	-9
Health care and social assistance	$291.8	$570.8	$279.0	4	6	96
Arts, entertainment, and recreation	$193.2	$206.7	$13.5	3	2	7
Accommodation and food services	$311.4	$439.0	$127.6	4	4	41
Other services, except public administration	$431.9	$589.1	$157.3	6	6	36
Government	**$1,769.7**	**$2,221.2**	**$451.5**	**23**	**22**	**26**
Federal	$412.7	$557.4	$144.7	5	6	35
State	$460.0	$561.9	$101.9	6	6	22
Local	$886.8	$1,101.9	$215.1	11	11	24
Nonlabor Income[3]	**$3561.4**	**$5310.4**	**$1,749.0**	**31**	**34**	**49**
Dividends, interest, and rent	$2,086.0	$2,798.0	$712.0	18	18	34
Personal current transfer receipts[4]	$1,475.4	$2,512.4	$1,037.0	13	16	70
Contributions to government social insurance[5]	**$863.4**	**$1,171.6**	**$308.2**	**7**	**8**	**36**
Total Personal Income[6]	**$11,394.3**	**$15,464.6**	**$4070.3**	**100**	**100**	**36**

Sources: Headwaters Economics 2012; US Department of Commerce 2012a. Values reported in 2001 dollars were converted to 2010 dollars using the Consumer Price Index (US Bureau of Labor Statistics 2012a).
Negative numbers in the absolute change column and the percent change column indicate decreases in employment levels from 2001 to 2010.
[1]Industry earnings are reported as a share of total labor earnings. Dividends, interest, and rent; personal current transfer receipts; and contributions to government social insurance are reported as a share of personal income.
[2]Total labor earnings are reported by place of work.
[3]Nonlabor income includes dividends, interest, and rent and personal current transfer receipts.
[4]"Personal current transfer receipts" are benefits received by persons for which no current services are performed. They are payments by government and business to individuals and institutions, such as retirement and disability insurance benefits.
[5]"Contributions for government social insurance" consists of payments by employers, employees, the self-employed, and other individuals who participate in the following government programs: Old-age, Survivors, and Disability Insurance; Medicare; unemployment insurance; railroad retirement; pension benefit guarantee; veterans' life insurance; publicly administered workers' compensation; military medical insurance; and temporary disability insurance (US Department of Commerce 2012b).
[6]Total personal income is reported by place of residence.

Appendix T provides county-level employment figures. The greatest difference in industry sector proportion between counties in 2010 was in the manufacturing industry. Manufacturing contributed a low 1 percent of total employment in Grand County but a much larger percentage in Box Elder County (24 percent). Other industries also showed large variation in shares of employment across counties, including the accommodation and food services industry (from 4 percent in Duchesne County to 22 percent in Grand County); the farm industry (from 2 percent in Grand County to 20 percent in Piute County); and the mining industry (less than 1 percent in Box Elder County to 15 percent in Uintah County). Recreation-related economic activity, including the retail trade; arts, entertainment, and recreation; and accommodation and food services industries varied across the counties (by 9 percentage points, 10 percentage points, and 18 percentage points, respectively). Note that these sectors are influenced not only by recreation but also by many other industries. See **Appendix T** for individual county detail.

With respect to personal earnings, the services-related sector accounted for the largest share (51 percent) of personal earnings in the socioeconomic study area in 2010, followed by the non-services-related sector (29 percent) and the government sector (22 percent). In 2010, the individual industries that generated the largest shares of personal earnings included the manufacturing industry (15 percent), the local government industry (11 percent), and the construction industry (7 percent). Healthcare and social services, transportation and warehousing, and mining have shown strong trends of growth (a percent change of 96 percent, 69 percent, and 63 percent, respectively); these were the highest growth rates between 2001 and 2010. During the same period, the farm industry and management of companies and enterprises industry experienced the largest decline in earnings of all the industry sectors (declines of 57 percent and 53 percent, respectively).

Appendix T provides county-level labor earnings figures. The county-by-county patterns are similar to those for employment, with more variation between counties in income from manufacturing than from other industries. In 2010, manufacturing contributed the most to earnings in Box Elder County at 49 percent, followed by Cache County at 24 percent. However, half of the counties for which data are provided show a share of income below 5 percent for manufacturing. Earnings from the mining sector are left undisclosed in 9 of the 22 counties due to confidentiality requirements, but for the counties for which data are available, earnings range from a negligible amount (less than $50,000) in Piute County to a share of 28 percent of total earnings in Duchesne County and 26 percent in Uintah County. Farm income varied from a low share of negative 3 percent of total earnings in Garfield County to a high of 23 percent in Beaver County. Of the 22 counties, 9 report negative values for farm earnings in 2010. Total earnings associated with accommodation and food services ranged from 1 percent of total earnings in Duchesne County up to 18 percent in Grand County. Additionally, the other recreation and travel-related industries (e.g., the retail trade industry and the arts, entertainment, and recreation industry) have differing impacts on earnings in the 22 counties. Retail trade contributes a high of 12 percent of total earnings in Grand County; earnings from the arts, entertainment, and recreation industry were negligible (less than $50,000) in Emery and Piute Counties.

In addition to industry shares of labor earnings, another metric–residence adjustment–provides information about the economic conditions in the socioeconomic study area. Residence

adjustment represents the net inflow of the earnings of inter-area commuters. A positive number indicates that, on balance, area residents commute outside to find jobs; a negative number indicates that, on balance, people from outside the area commute in to find jobs. Morgan County's residence adjustment represented 36 percent of its total personal income, the highest share of all counties in the socioeconomic study area. Juab County had the second highest share (12 percent). Residence adjustment accounted for the lowest share of total personal income in Daggett County (negative 14 percent), followed by Emery County (negative 4 percent) and Grand County (negative 4 percent). See **Appendix T** for detailed county data.

In addition to the 22 counties of the socioeconomic study area, **Appendix T** provides employment and earnings data for Davis, Millard, Salt Lake, Utah, and Weber Counties, which constitute a secondary study area as discussed in the introduction. In 2010, overall employment and total earnings were greater in the 5-county secondary study area than in the entire 22-county primary socioeconomic study area. Employment and income in the 5-county secondary study area was nearly 4.5 times greater than employment in the 22-county primary socioeconomic study. The economies of the five counties in the secondary study area are relatively diversified, with no industry capturing more than 15 percent of the workforce in any one county. In Davis, the federal government is the largest employer, contributing 12 percent of total employment; the next largest contributor is retail trade (11 percent). In Millard, the farm industry dominates, contributing 15 percent of total employment; the next largest contributors are local government (12 percent) and retail trade (11 percent). In Salt Lake, retail trade contributes the largest share of employment (10 percent), followed by the finance and insurance industry (9 percent). In Utah County, retail trade contributes the largest share of employment (11 percent), followed by healthcare and social assistance (11 percent) and professional and technical services (9 percent). In Weber County, the industries with the largest share of employment are retail trade (12 percent), healthcare and social assistance (9 percent), and manufacturing (10 percent). Besides retail trade, other industries that are directly and indirectly affected by recreation (e.g., accommodation and food services, arts, entertainment and recreation) do not contribute significantly to the economies of the counties within the secondary study area. The impact analysis in the next chapter will document potential effects on the economy in the secondary study area, as well as for the 22 counties within the primary socioeconomic study area.

Table 3.122 presents the unemployment rates for each county in the socioeconomic study area, as well as the rates for the counties aggregated, and the State of Utah. The data show that unemployment in the socioeconomic study area is similar to that of the state for each of the years listed. At the county level, in 2013, the unemployment rate ranged from a low of 4 percent in Beaver County to a high of 12 percent in Wayne County.

Recreation

In the Utah State University survey discussed at the beginning of this chapter, county clusters across the state uniformly reported high levels of participation in the following activities on BLM-administered and National Forest System lands: camping, picnicking, day hiking, wildlife viewing, visiting historic sites, and sightseeing/pleasure driving. Reported participation in camping ranged from 62 percent of respondents in Cache/Rich Counties to 76 percent of respondents in

Table 3.122
Annual Unemployment, 2007 – 2013

Geographic Area	2007	2008	2009	2010	2011	2012	2013
Beaver County	3%	3%	7%	10%	7%	5%	4%
Box Elder County	3%	4%	9%	9%	8%	7%	5%
Cache County	2%	3%	6%	6%	5%	4%	4%
Carbon County	4%	4%	8%	9%	7%	7%	6%
Daggett County	4%	4%	6%	8%	6%	5%	5%
Duchesne County	2%	3%	9%	8%	6%	4%	4%
Emery County	3%	4%	8%	8%	7%	7%	6%
Garfield County	5%	6%	11%	11%	11%	10%	9%
Grand County	5%	6%	10%	11%	10%	8%	8%
Iron County	3%	4%	9%	10%	8%	7%	5%
Juab County	3%	5%	11%	10%	9%	7%	5%
Kane County	3%	4%	8%	8%	8%	7%	5%
Morgan County	3%	3%	7%	7%	6%	5%	4%
Piute County	2%	3%	7%	8%	7%	6%	5%
Rich County	2%	3%	5%	6%	6%	4%	4%
Sanpete County	3%	4%	9%	10%	9%	7%	6%
Sevier County	3%	4%	8%	9%	7%	6%	5%
Summit County	3%	3%	7%	8%	6%	5%	4%
Tooele County	3%	4%	8%	8%	7%	6%	5%
Uintah County	2%	2%	9%	8%	5%	4%	4%
Wasatch County	3%	4%	9%	10%	8%	7%	5%
Wayne County	4%	5%	9%	10%	11%	12%	12%
Socioeconomic Study Area	3%	4%	8%	9%	7%	6%	5%
Utah	3%	3%	8%	8%	7%	5%	4%

Source: US Bureau of Labor Statistics 2012b

Carbon/Emery Counties. Even higher levels of participation in picnicking on Utah's BLM-administered and National Forest System lands were reported, with percentages ranging from about 69 percent in Box Elder/Tooele Counties to 82 percent in Grand/San Juan Counties. Reported participation in day hiking on public land areas ranged from between 50 percent in Piute/Sanpete/Sevier Counties to 75 percent in Morgan/Summit/Wasatch Counties. Participation in wildlife viewing ranged from 48 percent in Cache/Rich Counties to 74 percent in Beaver/Juab/Millard Counties, 74 percent in Garfield/Kane/Wayne Counties, and 75 percent in Grand/San Juan Counties (Utah State University 2008).

Approximately 32,000 jobs (16 percent of total employment in 2010) in the socioeconomic study area are related to travel and tourism (Headwaters Economics 2012). This estimate is based on data from the US Census Bureau County Business Patterns and includes industrial sectors that, at least in part, provide goods and services to visitors to the local economy and to the local population.[4] This estimate includes both full- and part-time jobs. Most of these jobs

[4] Relevant NAICS categories include components of retail trade, passenger transportation, arts, entertainment and recreation, and accommodation and food.

(approximately 18,700) are concentrated in the accommodation and food services industry. The socioeconomic study area's proportion of travel and tourism-related jobs was 3 percentage points higher than the national average of 13 percent in 2010. Jobs related to travel and tourism are more likely to be seasonal or part-time and more likely to have lower average annual earnings than jobs in nontravel and tourism-related sectors. The average annual wage per travel- or tourism-related job was $16,533 (2010 dollars) in the socioeconomic study area in 2011, compared to $36,795 for jobs not related to travel and tourism (Headwaters Economics 2012).

Although much of the recreation use on BLM-administered lands is dispersed and far from counting devices (e.g., trail registers, fee stations, or vehicle traffic counters) approximations of the number of visitors to BLM-administered lands can be obtained from the BLM Recreation Management Information Service database, in which BLM recreation specialists provide estimated total visits and visitor days to various sites within their field office boundaries.[5] **Table 3.123** summarizes BLM visitation data in each field office for fiscal year 2011 (i.e., the year ending September 30, 2011), and Forest Service visitation data from Round 2 of the National Visitor Use Monitoring program.

Table 3.123
Estimated Annual Visits by Planning Unit (Fiscal Year 2011)

Field Office or National Forest	Total Individual Visits	Local Individual Visits[1]	Nonlocal Individual Visits[1]	Nonprimary[2] Individual Visits[1]
BLM Cedar City Field Office	264,539	142,851	87,298	34,390
BLM Fillmore Field Office	348,425	188,150	114,980	45,295
BLM Kanab Field Office	235,801	127,333	77,814	30,654
BLM Moab Field Office	1,809,702	977,239	597,202	235,261
BLM Price Field Office	741,303	400,304	244,630	96,369
BLM Richfield Field Office	151,722	81,930	50,068	19,724
BLM Salt Lake Field Office	363,133	196,092	119,834	47,207
BLM Vernal Field Office	152,432	82,313	50,303	19,816
Ashley National Forest	960,431	518,632	316,942	124,856
Dixie National Forest	733,097	395,872	241,922	95,303
Fishlake National Forest	531,477	286,998	175,387	69,092
Manti-LaSal National Forest	642,264	346,823	211,947	83,494
Uinta National Forest	2,934,141	1,584,436	968,267	381,438
Wasatch-Cache National Forest	5,638,819	3,044,962	1,860,810	733,046
Total	15,507,286	8,373,934	5,117,404	2,015,947

Sources: BLM 2012f, Forest Service 2012a, White and Gooding 2012
[1] Based on national averages for all national forests.
[2] Nonprimary means incidental visits where the primary purpose of the trip was other than visiting the national forest being surveyed.

[5] In RMIS, a *visit* is defined as the entry of any person onto lands or related waters administered by the BLM for any time period. A same day reentry, negligible transit, and entry to another recreation site or detached portion of the management area on the same day are considered a single visit. RMIS defines a *visitor day* as equivalent to twelve visitor hours.

Visitor expenditures can be approximated by using the Recreation Management Information Service data in conjunction with data from the Forest Service, which has constructed recreation visitor spending profiles based on years of survey data gathered through the National Visitor Use Monitoring program. Although the data are collected from national forest visitors, the analysis that follows is based on the National Visitor Use Monitoring profiles because the BLM has no analogous database. The profiles break down recreation spending by type of activity, day use versus overnight use, local versus nonlocal visitors, and "nonprimary" visits (i.e., incidental visits where the primary purpose of the trip was other than visiting BLM-administered and National Forest System lands). **Table 3.124** summarizes individual and party visits and expenditures by trip type and estimated direct expenditure.

As **Table 3.124** shows, the estimated total visitor spending on BLM-administered and National Forest System lands in the socioeconomic study area was about $1 billion in fiscal year 2011. It is important to note that this includes expenditures from local residents and from visitors whose use of BLM-administered and National Forest System lands was incidental to some other primary purpose.

Table 3.124
Visitor Spending from Recreation on BLM-administered and National Forest System Land in Socioeconomic Study Area, Fiscal Year 2011

Trip Type	Percent of Visits[1]	Estimated Number of Individual Visits	Average Party Size[1]	Estimated Number of Party Visits	Estimated Party spending per visit (2010 $)[1]	Estimated direct expenditure ($ millions)
Nonlocal Day Trips	10	1,550,729	2.5	620,291	$63.68	$39.5
Nonlocal Overnight on Public Lands	9	1,395,656	2.6	536,791	$237.27	$127.4
Nonlocal Overnight off Public Lands	14	2,171,020	2.6	835,008	$522.63	$436.4
Local Day Trips	49	7,598,570	2.1	3,618,367	$33.56	$121.4
Local Overnight on Public Lands	4	620,291	2.6	238,574	$165.14	$39.4
Local Overnight off Public Lands	1	155,073	2.4	64,614	$216.48	$14.0
Nonprimary Visits	13	2,015,947	2.5	806,379	$376.62	$303.7
Total	100	15,507,286	N/A	6,720,023	N/A	$1,081.8

Sources: US Bureau of Labor Statistics 2012a, Forest Service 2012a, White and Gooding 2012
N/A Not Applicable

Grazing

Farming employed approximately 11,716 people in the socioeconomic study area in 2010, accounting for 4 percent of total employment. The average annual wage for a farm job in the study area was $25,860 in 2010. This was lower than the average annual wage for a nonfarm job

($31,938; Headwaters Economics 2012).[6] **Table 3.125** and **Table 3.126** show that farm employment decreased 9 percent in absolute numbers in the study area between 2001 and 2010, and farm-related earnings decreased 57 percent during the same period.

Table 3.125
Farm Earnings Detail, 2010 (2010 dollars)

Geographic Area	Farm Earnings as Share of All Earnings	Agriculture and Forestry Support Activities Earnings as Share of All Earnings[1]	Farm Cash Receipts (Millions)	Share of Farm Cash Receipts from Livestock	Share of Farm Cash Receipts from Crops
Beaver County	23.4%	(D)	$206.4	95.1%	4.9%
Box Elder County	2.8%	0.2%	$134.1	62.9%	37.1%
Cache County	1.0%	0.2%	$131.7	81.0%	19.0%
Carbon County	-0.1%	(D)	$4.8	82.0%	18.0%
Daggett County	-1.4%	(D)	$1.6	64.5%	35.5%
Duchesne County	-1.6%	(D)	$33.2	77.5%	22.5%
Emery County	-0.9%	(D)	$10.6	76.2%	23.8%
Garfield County	-3.1%	(D)	$5.8	77.1%	22.9%
Grand County	-1.0%	(D)	$2.5	56.5%	43.5%
Iron County	2.2%	(D)	$74.2	38.9%	61.1%
Juab County	2.4%	(D)	$19.0	55.9%	44.1%
Kane County	0.3%	(D)	$8.5	96.2%	3.8%
Morgan County	-0.1%	(D)	$12.2	88.2%	11.8%
Piute County	15.9%	(D)	$11.5	96.8%	3.2%
Rich County	8.1%	(D)	$15.1	93.9%	6.1%
Sanpete County	4.6%	(D)	$126.2	89.2%	10.8%
Sevier County	0.3%	(D)	$48.2	73.0%	27.0%
Summit County	0.5%	(D)	$25.0	93.3%	6.7%
Tooele County	0.5%	(D)	$30.0	77.8%	22.2%
Uintah County	-0.1%	(D)	$31.8	70.2%	29.8%
Wasatch County	-0.7%	(D)	$7.9	81.7%	18.3%
Wayne County	5.8%	(D)	$14.6	92.0%	8.0%
Socioeconomic Study Area	1.2%	0.1%	$955.1	78.8%	21.2%
Utah	0.3%	0.1%	$1377.4	72.7%	27.3%

Sources: Headwaters Economics 2012, US Department of Commerce 2012a. Values reported in 2001 dollars were converted to 2010 dollars using the Consumer Price Index (US Bureau of Labor Statistics 2012a).
[1]This division is the finest resolution of data provided by the US Department of Commerce's Bureau of Economic Analysis that includes agricultural services.
[2](D) indicates that the value is not shown to avoid disclosure of confidential information.

Table 3.125 presents the proportion of personal income originating from farm earnings and the farm cash receipts from livestock received in 2010 throughout the socioeconomic study area and Utah as a whole.

[6] All dollar values were converted to 2010 dollars using the Consumer Price Index (BLS 2012a).

Table 3.125 shows that the relative contribution of farm earnings varies across the counties in the socioeconomic study area, and that the share of farm earnings is greatest in Beaver and Piute counties (23 percent and 16 percent, respectively). Absolute cash contributions from farm earnings are highest in Beaver ($206.4 million), Box Elder ($134.1 million), Cache ($131.7 million), and Sanpete ($126.2 million) Counties. In all but one county within the socioeconomic study area, the majority of farm cash receipts come from livestock rather than crops. The share of farm cash receipts originating from livestock is 6 percentage points higher in the socioeconomic study area than in Utah as a whole.

Table 3.126 provides information on active and billed AUMs on BLM-administered and National Forest System lands for each of the BLM field offices and national forests. The estimated expenditure data in the table are calculated from data from the USDA, Economic Research Service, which publishes annual budgets for cow-calf operations for different production regions across the country (Economic Research Service 2012). The BLM calculated a 10-year inflation-adjusted average expenditure per cow-calf operation from the Economic Research Service budgets, then converted that information to a per-AUM figure based on average forage requirements for a cow, including other livestock (e.g., bulls and replacement heifers) that are needed to support the production from the cow (Workman 1986). Based on these calculations, the BLM estimates that the 10-year average expenditure in the socioeconomic study area is $50.24 per AUM (2010 dollars), which is reflected in the table[7].

The data in the table help demonstrate the importance of livestock grazing throughout the socioeconomic study area. It is important to remember, as well, that the data are only for forage values on BLM-administered and National Forest System lands; forage on other public lands and private lands contribute additional values to the socioeconomic study area. The economic analysis of the alternatives presented in **Chapter 4** addresses additional indirect contributions of livestock grazing (as well as other resource uses) to the regional economy, comparing the alternatives to one another.

As of 2007, there were 10,387 farms within the socioeconomic study area. At that time, the average farm size within the socioeconomic study area was 14,973 acres. The average size of a farm across America was 418 acres. The farmland within the socioeconomic area in 2007 tended to be more heavily used for permanent pastureland and rangeland (78 percent of total farmland) than for cropland (16 percent of farmland of total farmland), compared to national averages of 44 percent cropland and 44 percent permanent pasture and rangeland (Headwaters Economics 2012).

Forestry and Wood Products

Timber-related industries in the socioeconomic study area employed 796 people in 2010, which made up less than 1 percent of total employment, which is close to the national average of less than 1 percent (Headwaters Economics 2012). The proportion of employment associated with timber-related industries varied by county, with a low of zero percent in Beaver, Carbon, Emery, Garfield, Juab, Piute, and Rich Counties, and a high of 2 percent in Daggett County and

[7] For areas with considerable sheep grazing, expenditure estimates may be less reliable.

Table 3.126
Active and Billed Animal Unit Months

Region	Active (2011)	% Billed	Billed (average)[1]	Cattle (%)	Sheep (%)	Other (%)	Allotments	Acres per AUM	Expenditures ($ millions)[2]
Cedar City Field Office	139,816	63	88,432	92	7	0	160	14.9	$4.4
Fillmore Field Office	256,674	60	152,760	64	36	0	165	16.8	$7.7
Grand Staircase-Escalante National Monument	76,816	50	38,464	100	0	0	80	23.5	$1.9
Kanab Field Office	18,686	49	9,189	98	2	0	116	23.3	$0.5
Moab Field Office	89,648	52	46,957	88	12	0	63	20.0	$2.4
Price Field Office	100,375	51	51,434	99	1	1	176	22.2	$2.6
Richfield Field Office	98,462	67	66,371	86	14	0	131	22.9	$3.3
Salt Lake Field Office	176,398	78	137,686	75	25	0	142	13.5	$6.9
Vernal Field Office	127,839	51	65,457	70	30	0	141	13.3	$3.3
Sawtooth National Forest	12,348	N/A	N/A	79	21	0	N/A	N/A	$0.6
Dixie National Forest	38,843	N/A	N/A	87	13	0	N/A	N/A	$2.0
Fishlake National Forest	69,707	N/A	N/A	97	3	0	N/A	N/A	$3.5
Manti-LaSal National Forest	55,561	N/A	N/A	58	42	0	N/A	N/A	$2.8
Uinta-Wasatch-Cache National Forest	44,441	N/A	N/A	59	41	0	N/A	N/A	$2.2
Ashley National Forest	43,329	N/A	N/A	89	11	0	N/A	N/A	$2.2
Total	1,348,943		N/A						$46.3

Sources: BLM 2012g; Forest Service 2012b, 2013b; Workman 1986; Economic Research Service 2012
Active AUMs on National Forests are shown only for the portions in the study area and with GRSG habitat.
Expenditures are calculated based on active AUMs and 10-year average expenditures, as described in the text
N/A = Not available.
[1]Average billed between 2000-2011
[2]Based on billed AUMs. For National Forests, billed AUMs were assumed to equal active AUMs.

Iron County. These estimates include both full- and part-time jobs and reflect three timber-related industries: growing and harvesting, sawmills and paper mills, and wood products manufacturing. **Table 3.121** and **Table 3.122** show that earnings from forestry, fishing, and related activities decreased 7 percent in the study area between 2001 and 2010, although employment actually grew 20 percent.

Average annual earnings for timber-related jobs tend to be lower than for nontimber jobs (although still higher than for tourism-related jobs). The average annual wage per timber-related job in the socioeconomic study area in 2010 was $25,493 (2010 dollars), compared to $31,898 for nontimber jobs.

Renewable Energy Resources

The BLM and the Department of Energy's National Renewable Energy Laboratory conducted an assessment of renewable energy resources on public lands in the western US (e.g., BLM, Bureau of Indian Affairs, and National Forest System lands). The results of the assessment were published in a report, *Assessing the Potential for Renewable Energy on Public Lands, 2003*. None of the planning units in Utah was listed in the top 25 highest potential planning units. However, according to their assessment, some of the BLM planning units in Utah did have high potential for renewable energy development. The Fillmore, Moab, and Salt Lake planning units had high potential for wind energy development. The Cedar City and Fillmore planning units had high potential for geothermal energy development. None of the planning units in Utah had high potential for biomass energy (BLM 2003).

Several transmission line projects crossing the study area are currently proposed. The TransWest Express Transmission Project is an extra-high-voltage direct-current transmission system that is proposed to deliver renewable energy produced in Wyoming to the Desert Southwest. The system will begin in southcentral Wyoming, extend through northwestern Colorado and central Utah, and end near Las Vegas (TransWest 2012). Another proposed transmission project carrying electricity from renewable and thermal sources in Wyoming is the Energy Gateway South Transmission Line Project, proposed to end near Mona, Utah. The Sigurd to Red Butte 345 kV Transmission Project crossing Sevier, Beaver, and Iron Counties, and the Zephyr Project, a 3,000-MW line from Wyoming to the Eldorado Valley, south of Las Vegas, would also cross the study area (Wyoming Infrastructure Authority 2013).

Wind Renewable Energy Zones are scattered throughout the state but do not seem to dominate energy production (Utah Renewable Energy Zones Task Force 2012).

With respect to geothermal energy, electric power has been generated at the Roosevelt Hot Springs and the Cove Fort-Sulphurdale known geothermal resource areas in Beaver County since 1984. Enel has completed additional Cove Fort-Sulphurdale Geothermal Field production/injection wells and constructed a 25 MW (gross) air-cooled binary-cycle power plant, which went online in October 2013. In 2008, the Blundell plant at the Roosevelt Hot Springs known geothermal resource area was expanded from 26 MW with a new 11-MW binary power generation unit. In the Thermo Hot Springs geothermal area southwest of Minersville, in Beaver County, Raser Technology developed the 10 MW Hatch geothermal power plant. This plant was subsequently replaced by a 10 MW binary-cycle power plant constructed by Raser Technology, who was reorganized as Cyrq Energy after a bankruptcy. Nine resorts use

geothermal water for heating swimming pools, small space-heating applications, and therapeutic baths (Utah Department of Natural Resources 2012b). In 2011, Beaver County produced 2,563 million kilowatt-hours (kWh) of geothermal electrical generation for a total sales value of $2.7 million (2010 dollars; Office of Natural Resources Revenue 2012).

According to the Utah Office of Energy Development, no major biomass projects are operating in the socioeconomic study area. However, the Utah State Energy Program provides technical assistance and partnering to entities submitting proposals for federal energy-related biomass grants. Utah State University, located in Cache County, received a grant from the USDA and the US Department of Energy to research and demonstrate an anaerobic system on a large dairy farm (Utah Office of Energy Development 2012).

Mining and Minerals

In 2010, Utah mineral and energy companies produced a gross value of $8.44 billion in energy and mineral commodities (Utah Geological Survey 2010).

Mineral Production

Mineral production (excluding oil and gas) totaled $4.89 billion in 2010. Base metals production in Utah accounted for $2.75 billion (56 percent of total mineral production) in 2010. Three metals accounted for roughly 98 percent of the total base metal value: copper, molybdenum, and magnesium. Also notable is that Utah is the nation's sole producer of beryllium concentrates, which were the fourth-largest contributor to 2010 base metal values (Utah Geological Survey 2010).

Production of precious metals (gold and silver) in Utah accounted for $660 million (13 percent of total mineral production) in 2010. Industrial minerals production accounted for $860 million (18 percent of total mineral production). Brine-derived products, including salt, magnesium chloride, and potash, were the largest contributors to the value of industrial-minerals production, with a combined value of $370 million. Sand and gravel, crushed stone (including limestone and dolomite), and dimension stone contributed the second-largest share of the overall value of industrial minerals produced in Utah during 2010, with an estimated value of $201 million. Portland cement and lime products were the third-largest contributors to the 2010 value of industrial minerals with a combined value of $156 million. Solid energy minerals production in Utah accounted for $630 million (13 percent of total mineral production) in 2010. Utah coal operators produced coal valued at $597 million, while uranium mine operators produced uranium oxide with a value of approximately $28 million (Utah Geological Survey 2010).

Mineral Production Regions

Minerals are produced in several different areas within the socioeconomic study area. Some important base and precious metals regions include Bingham Canyon (copper, molybdenum, gold and silver production, South of Great Salt Lake, in Salt Lake County); Iron Springs (iron production, near Cedar City in Iron County); Tintic District (gold, lead, zinc, and copper production, in Juab County); Gold Hill district (copper, gold, and silver production, in Tooele County); and Rocky and Beaver Lake mining districts (copper production, in Beaver County). The majority of the base and precious metals production occurs in the eastern part of Utah, with specific concentration in the northern part of the state (near the Great Salt Lake).

Industrial minerals are produced throughout the state, with no specific geographical pattern (Utah Geological Survey 2010; State of Utah 1983).

Solid energy minerals are produced in different parts of the socioeconomic study area depending on the mineral. Uranium production occurs in Emery, Garfield, and Grand counties. Coal production on federal minerals occurs in Carbon, Emery, and Sevier counties (Utah Geological Survey 2010; Utah Geological Survey 2011a; State of Utah 2008). In addition, the Alton coalfield, in Kane County, is expected to start federal production in 2016 (BLM 2011b).

Crude Oil and Petroleum Production

In 2010, Utah ranked 12th in the nation in crude oil production and 8th in proven reserves of crude oil. The value of extracted crude oil in Utah for 2010 was nearly $1.7 billion. Additionally, Utah ranked eighth in natural gas production and ninth in proven natural gas reserves in the US. The value of natural gas produced in Utah, for 2010, was more than $1.7 billion (Utah Geological Survey 2011b).

Crude Oil and Petroleum Production Regions

Crude oil production within the socioeconomic study area is mostly concentrated within Duchesne and Uintah counties; smaller producing areas are in Summit and Grand counties. Recently, production has started in Sevier County with the discovery of the Covenant field in central Utah. In descending order, Uintah, Carbon, Duchesne, and Emery are the largest natural gas-producing counties in Utah. Gross natural gas production is on the rise in Uintah County, which contains Utah's largest natural gas field, Natural Buttes, and Duchesne County, which also produces an increasing amount of crude oil. Production is on the decline in all other counties, including Carbon and Emery Counties where the production is mainly from coalbed methane resources (Utah Geological Survey 2011a).

Mining Sector Employment in the Socioeconomic Study Area

Mineral production in the socioeconomic study area employed approximately 5,215 people in 2010 (3 percent of total employment), which is higher than the national average of less than 1 percent (Headwaters Economics 2012). This estimate is based on data from the US Census Bureau County Business Patterns and a selection of industrial sectors that includes oil and gas extraction, coal mining, metal ore mining, and nonmetallic minerals mining industry sectors. This estimate includes both full- and part-time jobs. It may undercount employment because it does not include the self-employed, but it is shown here because it has fewer data gaps (data not disclosed for confidentiality reasons). **Appendix U**, Non-Market Valuation Methods, **Table U.1**, shows Bureau of Economic Analysis data for comparison. Additionally, the average annual earnings per mining jobs are higher than nonmining jobs. The average annual wage per job in the mining sector was $68,216 (2010 dollars) in the planning area in 2010, compared to $32,172 (2010 dollars) for jobs not related to mining (Headwaters Economics 2012).

Approximately 309 jobs (less than 1 percent of total employment) in the socioeconomic study area are from other industries related to transmission and transportation in the mining sector (Headwaters Economics 2012).[8] This estimate is also based on data from the US Census Bureau

[8] NAICS codes 486 (pipeline transportation) and 237,120 (oil and gas pipeline and related structures construction).

County Business Patterns and a selection of industrial sectors that includes mining-related industries such as pipeline transportation and pipeline and related structures construction. The share of related mining jobs in the socioeconomic study area (less than 1 percent) was equal to the national average (**Table 3.127**).

Table 3.127
Mining Sector Employment by County

Geographic Area	Number of Jobs	Percentage of Total Employment
Beaver County	103	7
Box Elder County	29	<1
Cache County	37	<1
Carbon County	999	14
Daggett County	2	2
Duchesne County	987	16
Emery County	537	20
Garfield County	8	<1
Grand County	101	3
Iron County	10	<1
Juab County	19	<1
Kane County	13	<1
Morgan County	7	<1
Piute County	0	0
Rich County	2	<1
Sanpete County	8	<1
Sevier County	440	8
Summit County	168	<1
Tooele County	20	<1
Uintah County	1,720	17
Wasatch County	3	<1
Wayne County	2	<1
Socioeconomic Study Area	5,215	3
Utah State	10,068	1
US	604,653	<1

Source: Headwaters Economics 2012

Carbon County (999 jobs), Duchesne County (987 jobs), Emery County (537 jobs), Sevier County (440 jobs), and Uintah County (1,720 jobs) were the only counties that had over 200 mining jobs. However, the mining jobs in most of these counties only make up a small percentage of the total employment. Only Duchesne County (16 percent of total employment), Emery County (20 percent of total employment), and Uintah County (17 percent of total employment) had over 10 percent of total employment from mining jobs.

Table 3.128 provides sales volume and sales value for coal, gas, and oil managed by the BLM, and underscores the importance of mining in the socioeconomic study area.

Table 3.128
Coal, Gas, and Oil: Sales Volume and Sales Value from BLM-administered Resources, Fiscal Year 2011

County	Sales Volume (millions)			Sales Value (millions)			
	Coal (tons)	Gas[1] (mcf)	Oil and Condensate (bbl)	Coal	Gas[1]	Oil and Condensate	Total
Beaver	0	0	0	$0	$0	$0	$0
Carbon	5.2	49.6	0	$186.2	$205.9	$3.8	$396
Daggett	0	0.7	0	$0	$2.6	$0	$3
Duchesne	0	4.0	4.1	$0	$13.4	$296.2	$310
Emery	1.1	4.3	0	$43.5	$14.7	$0.2	$58
Garfield	0	0	0.2	$0	$0	$11.1	$11
Grand	0	2.8	0.1	$0	$12.0	$5.2	$17
Juab	0	0	0	$0	$0	$0	$0
Piute	0	0	0	$0	$0	$0	$0
San Pete	0	0	0	$0	$0	$2.8	$3
Sevier	0.7	0	2.0	$22.1	$0	$165.2	$187
Summit	0	0.1	0	$0	$0.4	$1.1	$2
Tooele	0	0	0	$0	$0	$0	$0
Uintah	0	205.5	4.3	$0	$828.5	$324.6	$1,153
Total	7.0	266.9	10.6	$251.7	$1,077.7	$810.2	$2,140

Source: Office of Natural Resources Revenue 2012
[1]Gas includes the production of coal bed methane, processed (residue) gas, and unprocessed (wet) gas.
Values reported in 2011 dollars were converted to 2010 dollars using the Consumer Price Index (US Bureau of Labor Statistics 2012a).
Values may not sum due to rounding.

Within the socioeconomic study area, other notable leasable federal minerals managed by the BLM include gilsonite, potash, and magnesium chloride brine. In fiscal year 2011, approximately 25,000 tons of gilsonite were produced in Uintah County, for a total sales value of $23.1 million, from federal minerals administered by the BLM. Approximately 25,000 units of potash were produced in Toole County for a total sales value of $10.3 million. In addition, 71,000 units of magnesium chloride brine were produced in Tooele County for a total sales value of $1.3 million.

Other Values

BLM-administered and National Forest System lands provide a range of goods and services that benefit society in a variety of ways. Some of these goods and services, such as timber and minerals, are bought and sold in markets, and hence have a readily observed economic value (as documented in the sections above); others have a less clear connection to market activity, even though society derives benefits from them. In some cases, goods and services have both a market and a nonmarket component value to society. This section provides an overview of several nonmarket values described through a qualitative and quantitative economic valuation analysis.

The nonmarket values associated with BLM-administered and National Forest System lands can be classified as values that derive from direct or indirect use (e.g., recreation) and those that do not derive from use, such as existence values held by the general public from self-sustaining populations of GRSG. This section and the related appendix (**Appendix U**) describe the use and nonuse economic values associated with recreation, populations of GRSG, and land that is currently used for livestock grazing and ranch operations. The sections that follow discuss each of these values in turn. **Appendix U** provides more discussion of the concepts and measurement of use and nonuse nonmarket values. It is important to note that these nonmarket values are not directly comparable to previous sections that describe output (sales or expenditures) and jobs associated with various resource uses on BLM-administered and National Forest System lands (see **Appendix U** for more information).

Values Associated with Recreation

Actions that promote the conservation of GRSG habitat may result in changes in recreation activity, by changing opportunities or access for different recreational activities. Opportunities for some activities such as wildlife viewing may increase as the amount of habitat may increase for species that depend on BLM-administered and National Forest System lands, including GRSG. The environmental consequences analysis (**Chapter 4**) addresses this issue for each of the management alternatives. This section documents baseline nonmarket values visitor receive associated with recreation activities. This is measured by what economists call consumer surplus, which refers to the additional value that visitors receive over and above the price they pay. **Appendix U** provides an explanation of consumer surplus. Fees to use BLM-administered and National Forest System lands for recreation are typically very low or nonexistent, so the value people place on BLM-administered and National Forest System land recreation opportunities is not fully measured simply by the entrance fees people pay.

Economists estimate the consumer surplus from recreation by measuring how the variation in visitors' travel costs corresponds to the number of visits taken. This travel cost method has been developed extensively in academic literature and is used by federal agencies in economic analyses; the method is explained more fully in **Appendix U**. Conducting original travel cost method studies can be time-consuming and expensive. For this project, the BLM and Forest Service relied on estimates of consumer surplus from prior recreation studies in the same geographic region, using an established scientific method called benefit transfer. Based on the studies reviewed and cited in **Appendix U**, visitors to natural areas, such as BLM-administered and National Forest System lands, gain values (in excess of their direct trip cost) ranging from approximately $32 per day for camping to about $175 per day for mountain biking.

To calculate the aggregate consumer surplus value of recreation in the study area, the BLM multiplied this per-day value of recreation by the estimated number of visitor days associated with each activity type. Visitation estimates by activity are derived based on the Recreation Management Information Service database and the National Visitor Use Monitoring program for the study area.

Accounting for the value per day and the number of days, the total nonmarket value of recreation on BLM-administered and National Forest System lands in the study area was estimated to be about $561 million per year (see **Appendix U** for details). Based on the

quantity of recreational trips and the economic value of each type of activity, the largest annual nonmarket values are associated with hunting, camping, fishing, hiking, sightseeing, and pleasure driving. These categories omit downhill skiing, because there is little or no overlap between GRSG habitat and lands used for downhill skiing. The environmental consequences section (**Chapter 4**) discusses how recreational visits and total nonmarket value for recreation may change under the alternatives being considered.

Values Associated with Populations of Sage-Grouse

The existence and perseverance of the ESA and similar acts reflects the values held by the American public associated with preventing species from going extinct. Economists have long recognized that rare, threatened, and endangered species have economic values beyond those associated with active use through viewing. This is supported by legal decisions and technical analysis (see **Appendix U** for details), as well as a number of conceptual and empirical publications that refine concepts and develop methods to measure these nonuse or existence values.

The dominant method uses surveys to construct or simulate a market or referendum for protection of areas of habitat, or changes in populations of species. The survey asks the respondent to indicate whether they would pay for an increment of protection, and if so how much they would pay. Economists have developed increasingly sophisticated survey methods for nonuse value over the last two decades to improve the accuracy of this method. **Appendix U** offers an in-depth discussion of this method of value estimation.

Original surveys to estimate nonuse values are complex and time-consuming; rather than perform a new survey, the BLM and Forest Service reviewed existing literature to determine if there were existing nonuse value studies for GRSG. No existing studies on valuation specific to the GRSG were found. However, there are several studies published in peer-reviewed scientific journals for bird species that the BLM judged to have similar characteristics with GRSG, including being a candidate for listing as threatened or endangered and being a hunted species. These studies find average stated willingness to pay of between $15 and $58 per household per year in order to restore a self-sustaining population or prevent regional extinction (see **Appendix U** for details). These values represent a mix of use and nonuse values, but the nonuse components of value are likely to be the majority share, since the studies primarily address species that are not hunted. Since GRSG protection is a public good available to all households throughout the intermountain west, if similar per-household values apply to the species the aggregate regional existence value could be substantial.

Values Associated with Grazing Land

BLM-administered and National Forest System land managed for livestock grazing provides both market values (e.g., forage for livestock) and nonmarket values, including open space and western ranch scenery, which provide value to some residents and outside visitors, and may also provide some value to the nonusing public (e.g., the cultural icon of the American cowboy). Many people who ranch for a living or who otherwise choose to live on ranches value the ranching lifestyle in excess of the income generated by the ranching operations. This could be seen as a nonmarket value associated with livestock grazing. On the other hand, some residents and visitors perceive nonmarket opportunity costs associated with livestock grazing. Although

some scholars and policy makers have discussed nonmarket values associated with livestock grazing, the process for incorporating these values into analyses of net public benefits remains uncertain, and the BLM and Forest Service did not attempt to quantify these values for the present study.

Furthermore, some of the lifestyle value of ranching is likely to be captured in markets, such as through the property values of ranches adjacent to BLM-administered and National Forest System lands with historic leases or permits for grazing on BLM-administered and National Forest System land. Economists typically use a method called the hedonic price method to estimate values associated with particular amenities; this method may be used to explain the factors that influence the observed sale prices of ranch land. **Appendix U** provides more information about this method, as well as additional information to address potential nonmarket values associated with grazing.

Fiscal

As of 2010, Utah imposes a 4.7 percent state sales and use tax that applies to retail sales of tangible personal property, meals, intrastate communication and passenger service, and many other services. Other state taxes include income taxes, excise taxes, and motor vehicle taxes, as well as other sales taxes such as a transient room tax (Utah State Tax Commission 2011a). Individual income tax makes up the largest percentage of state revenue (48 percent), with state sales and use tax accounting for the second largest source at 32 percent (Utah State Tax Commission 2011b).

Utah also imposes a mining severance tax on the taxable value of products of metalliferous mines and metalliferous claims. As of 2010, the mining severance tax is 2.6 percent of the taxable value of metals or metalliferous minerals, with the taxable value differing according to the type of mineral. This tax applies to extractors of gold, silver, copper, lead, iron, zinc, tungsten, uranium, vanadium, and other metalliferous minerals. Additionally, an oil and gas severance tax applies to all interest owners of oil, gas, and natural gas liquids. Real collections of severance tax in Utah in 2010 for mine occupation, metal mining, and oil and gas extraction were $35.9 million, $9.6 million, and $26.1 million, respectively (Utah State Tax Commission 2011a).

Any county, city, or town in Utah may levy a sales and use tax as well. The tax levies an additional 1 percent of the purchase price of transactions that the state sales and use tax is applied to, and as of 2010, all counties, cities, and towns in Utah had adopted ordinances to impose the maximum 1 percent option of the local sales and use tax. Other local taxes include property taxes municipality transient room tax, and rural county hospital tax, among others (Utah State Tax Commission 2011a). Activities on federally owned lands can affect local sales and use tax revenues as well as property tax revenues. For example, counties typically collect taxes on real property located on BLM-administered and National Forest System lands (i.e., oil and gas improvements and structures) and expenditures by visitors to BLM-administered and National Forest System lands or employees of activities tied to these lands generate tax revenues through state, county, municipality sales, and use taxes.

Table 3.129 shows the largest sources of local government revenues in Utah in 2010. Tax revenues from own sources are the main source of revenue for local governments and are

composed mainly of property and sales taxes. Intergovernmental transfers from the Utah State government are close behind. The main sources of State government revenues are incomes taxes and sales and use taxes. Oil, gas and mineral severance tax were, in fiscal year 2010 approximately 1 percent of state revenues (Utah State Tax Commission 2011b). The third main source of local government revenues in importance are charges and miscellaneous, which include direct charges from hospitals, airports, educational institutions, sewerage and solid waste management, among others. Transfers from federal government include federal mineral royalties, among other source of federal government revenues that are partially transferred to states and local governments. Federal mineral royalties are distributed to local governments through several different accounts, the main ones being the Utah Department of Transportation and the Community Impact Fund (University of Utah 2010). In fiscal year 2010, federal mineral royalties distributed to the State of Utah were approximately $147 million, of which about $51 million were distributed to local governments (Headwaters Economics 2013).

Table 3.129
Local Government Revenues in Utah, 2010

Geographic Area	$ Thousands	Percentage of Total
Total	10,664,320	100
Intergovernmental Transfers from Federal Government	678,730	6
Intergovernmental Transfers from State Government	2,905,513	27
Tax Revenues from Own Sources	3,229,063	30
Charges and miscellaneous from Own Sources	1,957,502	18
Utility Revenue	1,880,827	18
Other	12,685	<1

Source: US Census Bureau 2010d

The primary government revenues that are directly linked to federal lands are payments in lieu of taxes, which are federal government payments based on the presence of all federal lands (not just BLM-administered lands) within each county; Forest Service Payments, which are payment based on Forest Service receipts and must be used for county roads and local schools; BLM Payments, which are a portion of receipts generated on BLM-administered and National Forest System lands and shared with local governments, such as timber receipts and grazing fees; and federal mineral royalties. **Table 3.130** shows the payments each county received in 2010.

BLM and Forest Service Expenditures and Employment

BLM and Forest Service offices provide a direct contribution to the economy of the local and surrounding area. BLM and Forest Service operations and management make direct contributions to area economic activity by employing people who reside within the area and by spending on project related goods and services. Contracts for facilities maintenance, shuttling vehicles, and projects contribute directly to the area economy and social stability as well. **Table 3.131** provides available information on the BLM and Forest Service expenditures from each field office and national forest, including both labor and nonlabor expenditures.

Table 3.130
Federal Land Payments Received in the Socioeconomic Study Area by County in 2010, $ Thousands

Geographic Area	Payments in Lieu of Taxes	Forest Service Payments	BLM Payments	Federal Mineral Royalties	Total
Beaver County	$868	$252	$67	$166	$1,354
Box Elder County	$2,854	$153	$66	$0	$3,073
Cache County	$596	$541	$0	$0	$1,136
Carbon County	$1,045	$2	$22	$7,488	$8,558
Daggett County	$119	$543	$6	$42	$709
Duchesne County	$1,595	$598	$8	$5,529	$7,730
Emery County	$1,190	$381	$72	$696	$2,338
Garfield County	$746	$1,654	$136	$301	$2,837
Grand County	$1,128	$78	$56	$448	$1,710
Iron County	$2,977	$552	$100	$22	$3,650
Juab County	$1,093	$238	$89	$89	$1,509
Kane County	$998	$147	$37	$0	$1,181
Morgan County	$26	$19	$0	$0	$45
Piute County	$202	$377	$21	$1	$601
Rich County	$335	$71	$37	$0	$443
Sanpete County	$1,187	$1,011	$13	$11	$2,222
Sevier County	$1,677	$1,315	$10	$6,395	$9,396
Summit County	$1,267	$156	$0	$13	$1,436
Tooele County	$3,155	$305	$138	$41	$3,640
Uintah County	$2,533	$290	$95	$26,863	$29,781
Wasatch County	$1,047	$621	$0	$0	$1,668
Wayne County	$419	$291	$39	$0	$750
Socioeconomic Study Area	$27,056	$9,595	$1,012	$48,105	$85,767

Source: Headwaters Economics 2013

Environmental Justice

Environmental justice pertains to the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the adverse environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies (BLM 2005). The BLM incorporates environmental justice into its planning process, both as a consideration in the environmental effects analysis and by ensuring a meaningful role in the decision-making process for minority and low-income populations.

Executive Order 12898 requires federal agencies to "identify and address the disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." The BLM Land Use Planning Handbook (H-1601-1) reiterates BLM's commitment to environmental justice, both in providing meaningful

Table 3.131
BLM and Forest Service Employment and Related Expenditures in the Socioeconomic Study Area

Agency	Field Office or National Forest	Employment, 2011 (FTEs)	Nonlabor Expenditures, 2011 (2010 dollars)
BLM	Cedar City Field Office	24.4	$1,336,797
	Fillmore Field Office	24.1	$1,245,434
	Kanab Field Office	15.8	$296,331
	Moab Field Office	31.3	$1,268,618
	Price Field Office	36.7	$819,505
	Richfield Field Office	28.3	$785,734
	Salt Lake Field Office	29.3	$1,777,949
	Vernal Field Office	77.2	$1,433,168
Forest Service	Dixie National Forest	144	$10,164,653
	Fishlake National Forest	108	$4,359,818
	Manti-LaSal National Forest	81X	$5,139,717
	Uinta-Wasatch-Cache National Forest	212	$10,336,140
	Ashley National Forest	101	$4,183,807

Sources: BLM 2012h, Forest Service 2013a. Values were converted to 2010 dollars using the Consumer Price Index (US Bureau of Labor Statistics 2012a).
FTE = Full-time equivalent employees (hours worked in relation to hours in a full-time schedule)

opportunities for low-income, minority, and tribal populations to participate in decision-making, and identifying and minimizing any disproportionately high or adverse impacts on these populations. Similarly, the USDA's Departmental Regulation on Environmental Justice Departmental Regulation on Environmental Justice calls for the identification, prevention, or mitigation of disproportionately high and adverse human health or environmental effects of USDA programs and activities on minority and low-income populations and provision for the opportunity for minority and low-income populations to participate in planning, analysis, and decision making that affects their health or environment.

According to the CEQ Environmental Justice Guidance Under the NEPA (CEQ 1997), "minority populations should be identified where either: (a) the minority population of the affected region exceeds 50 percent or (b) the minority population percentage of the affected region is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis." The same document states that "In identifying low-income populations, agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect."

Additionally, the same guidance (CEQ 1997) advises that, "In order to determine whether a proposed action is likely to have disproportionately high and adverse human health or environmental effects on low-income populations, minority populations, or Indian tribes, agencies should identify a geographic scale, obtain demographic information on the potential impact area, and determine if there is a disproportionately high and adverse effect on these

populations. Agencies may use demographic data available from the Bureau of the Census to identify the composition of the potentially affected population. Geographic distribution by race, ethnicity, and income, as well as a delineation of tribal lands and resources, should be examined."

Minority Populations

Table 3.132 summarizes the percentage of the population made up of ethnic minority groups in each county of the socioeconomic study area and in Utah and the US as a whole.

All counties within the socioeconomic study area have a lower minority population percentage than Utah (19 percent) and the US as a whole (36 percent). However, several counties in the socioeconomic study area have an Alaska Native or American Indian population greater than Utah's. Uintah County has the highest percentage of Alaska Natives or American Indians, with this minority group comprising 8 percent of the county's population. Uintah County also has the highest percentage of minorities (17 percent), while Morgan County has the lowest (4 percent).

Table 3.132
Population Race and Ethnicity, 2010

		Percent of Total Population								
Geographic Unit Analyzed	**Total Population**	**White**	**Black or African American**	**Alaska Native or American Indian**	**Asian**	**Native Hawaiian & Other Pacific Islander**	**Other Race**	**Two or More Races**	**Hispanic or Latino[1]**	**Total Minorities[2]**
Beaver County	6,629	89.0	0.2	1.1	1.1	0.3	6.9	1.4	10.8	14.1
Box Elder County	49,975	91.8	0.3	0.8	0.9	0.2	3.8	2.2	8.3	11.9
Cache County	112,656	89.1	0.6	0.6	1.9	0.4	5.5	1.9	10.0	14.7
Carbon County	21,403	92.3	0.4	1.2	0.6	0.1	3.0	2.4	12.4	15.9
Daggett County	1,059	95.9	0.4	0.8	0.4	0.1	1.4	1.0	3.1	5.7
Duchesne County	18,607	89.2	0.2	4.5	0.3	0.3	2.6	2.9	6.0	12.8
Emery County	10,976	93.9	0.2	0.7	0.3	0.1	3.8	0.9	6.0	7.9
Garfield County	5,172	94.1	0.4	1.6	1.2	0.2	1.6	0.9	4.5	8.4
Grand County	9,225	89.0	0.3	4.1	0.8	0.0	3.7	2.0	9.6	15.9
Iron County	46,163	90.7	0.5	2.2	0.8	0.3	3.3	2.3	7.7	12.8
Juab County	10,246	95.9	0.2	0.9	0.2	0.1	1.1	1.5	3.7	5.9
Kane County	7,125	95.7	0.2	1.5	0.4	0.0	0.9	1.3	3.7	6.7
Morgan County	9,469	97.5	0.2	0.2	0.4	0.1	0.7	1.0	2.4	3.9
Piute County	1,556	94.7	0.1	0.3	0.4	0.1	3.0	1.3	7.0	8.7

Table 3.132
Population Race and Ethnicity, 2010

Geographic Unit Analyzed	Total Population	Percent of Total Population								
		White	Black or African American	Alaska Native or American Indian	Asian	Native Hawaiian & Other Pacific Islander	Other Race	Two or More Races	Hispanic or Latino[1]	Total Minorities[2]
Rich County	2,264	97.0	0.0	0.7	0.3	0.0	0.7	1.2	4.2	5.8
Sanpete County	27,822	90.4	0.8	1.1	0.5	0.5	4.9	1.8	9.4	13.4
Sevier County	20,802	94.9	0.2	1.1	0.3	0.2	1.8	1.5	4.5	7.2
Summit County	36,324	90.5	0.4	0.3	1.2	0.1	5.7	1.6	11.5	14.6
Tooele County	58,218	90.7	0.7	1.0	0.6	0.4	3.8	2.8	11.4	15.5
Uintah County	32,588	86.6	0.4	7.7	0.5	0.2	2.2	2.3	7.1	17.1
Wasatch County	23,530	90.4	0.3	0.5	0.8	0.1	6.4	1.4	13.5	15.7
Wayne County	2,778	94.8	0.1	0.5	0.7	0.1	2.2	1.7	4.2	6.6
Socioeconomic Study Area	514,587	90.8	0.5	1.5	0.9	0.3	4.0	2.0	9.0	13.3
Utah	2,763,885	86.1	1.1	1.2	2.0	0.9	6.0	2.7	13.0	19.7
US	308,745,538	72.4	12.6	0.9	4.8	0.2	6.2	2.9	16.3	36.2

Source: US Census Bureau 2010b

[1.] Individuals who identify themselves as Hispanic or Latino might be of any race; the sum of the other percentages under the "Percent of Total Population" columns plus the "Hispanic or Latino" column therefore does not equal 100 percent, and the sum of the percentages for each racial and ethnic category does not equal the percentage of "total minorities."

[2.] The total minority population, for the purposes of this analysis, is the total population for the geographic unit analyzed minus the non-Latino/Hispanic white population.

Low-income Populations

Table 3.133 summarizes the percentage of the population below the poverty line in each county of the socioeconomic study area and in Utah and the US as a whole. Following the Office of Management and Budget's Directive 14, the Census Bureau uses a set of money income thresholds that vary by family size and composition to detect what part of the population is considered to be in poverty (US Census Bureau 2012a).

Of the 22 counties in the socioeconomic study area, 10 have a higher percentage of residents below the poverty line than the overall Utah percentage below the poverty line (11 percent). Additionally, Iron County (21 percent), Beaver County (18 percent), Sanpete County (18 percent), and Cache County (15 percent) all have a higher percentage of residents below the poverty line than the national percentage (14 percent). Iron County has the highest percentage of residents below the poverty line, and Morgan County has the lowest (1 percent).

Table 3.133
Low-Income Populations, 2006-2010 Average

Geographic Unit Analyzed	Percent Population Below Poverty Level
Beaver County	18
Box Elder County	9
Cache County	15
Carbon County	13
Daggett County	8
Duchesne County	11
Emery County	10
Garfield County	10
Grand County	13
Iron County	21
Juab County	11
Kane County	10
Morgan County	1
Piute County	13
Rich County	7
Sanpete County	18
Sevier County	12
Summit County	7
Tooele County	7
Uintah County	12
Wasatch County	6
Wayne County	12
Socioeconomic Study Area	12
Utah	11
US	14

Source: US Census Bureau 2010c

To ascertain whether there are disproportionate effects of the alternatives on low-income populations, data on effects by each alternative will be reviewed and reported in **Chapter 4**.

Tribal Populations

Five major tribes live in Utah: the Ute, the Dine' (Navajo), the Paiute, the Goshute, and the Shoshoni (Utah Travel Industry Web site 2012). The Utah Division of Indian Affairs provides information about the following tribes: Ute (Uintah and Ouray); Ute Mountain Ute (White Mesa); Dine' (Navajo); Paiute; Confederated Tribes of Goshute; Skull Valley Goshutes; and Northwestern Band of Shoshone. The Uintah and Ouray Ute Reservation is located in northeastern Utah and includes portions of Duchesne, Carbon, Grand, Uintah, and Wasatch Counties. The Paiute Indian Tribe of Utah has five separate land bases for each of its five bands; the bases are located in Southwestern Utah in portions of Washington, Iron, Beaver, Millard, and Sevier counties. The Confederated Tribes of Goshute reservation is located in Juab and Tooele Counties in West Central Utah and in White Pine County, Nevada. The Skull Valley Goshute reservation is located in Toole County. The Northwestern Band of Shoshone has its tribal headquarters in Brigham City in Box Elder County.

Two of the tribes identified by the Utah Division of Indian Affairs do not live in the socioeconomic study area. The Dine' (Navajo) Tribe lives in northeastern Arizona, northwestern New Mexico, and the southeastern portion of Utah. The Ute Mountain Ute Tribe's land is located in southwest Colorado, eastern Utah, and northern New Mexico. Its headquarters are located in San Juan County (Utah Division of Indian Affairs 2012).

3.24 TRIBAL INTERESTS

Tribal interests include economic rights such as Indian trust assets and resource uses and access guaranteed by treaty rights. Traditional cultural resources or properties include areas of cultural importance to contemporary communities, such as sacred sites or resource gathering areas.

The trust responsibility is the US Government's permanent legal obligation to exercise statutory and other legal authorities to protect tribal lands, assets, resources, and treaty rights, as well as a duty to carry out the mandates of federal law with respect to American Indian Tribes. Federal Indian policy and trust responsibilities have developed from court decisions, congressional laws, and policies articulated by the President, such as EOs 13175 (Consultation and Coordination with Indian Tribal Governments) and 13007 (Indian Sacred Sites). Different departments, branches of government, and agencies have defined responsibilities. The Secretary of the Interior has specific trust responsibilities not delegated to any other department or agency, including holding land in trust and maintaining monetary accounts for tribes and individual tribal members.

For the BLM, trust responsibilities are essentially those duties that relate to the reserved rights and privileges of federally recognized tribes as found in treaties, executive orders, laws, and court decisions that apply to BLM-administered and National Forest System lands. Trust responsibilities for the BLM are found in DOI Secretarial Order No. 3215 (DOI 2000), DOI Department Manual 512, Chapter 2 (DOI 1995), BLM Manual 8120, Tribal Consultation Under Cultural Resources, BLM Handbook H-8120-1, General Procedural Guidance for Native American Consultation), and DOI Policy on Consultation with Indian Tribes.

For the Forest Service, tribal relations responsibilities are found in USDA Department Regulations (1340-007 and 1350-002), as well as Forest Service Manual Direction (Forest Service Manual 1500) and Handbook Direction (Forest Service Handbook 1509).

Federal agencies have the responsibility to identify and consider potential impacts of plans, projects, programs, or activities on Indian lands, trust resources, and treaty rights. When planning any proposed project or action, the agencies must ensure that all anticipated effects on Indian lands, trust resources, and treaty rights are addressed in the planning, decision, and operational documents prepared for each project. Federal agencies must ensure that meaningful consultation and coordination are conducted on a government-to-government basis with federally recognized tribes. In addition, Federal agencies consult with all American Indian tribes with aboriginal territories within the federal lands as part of the Sections 106 and 110 processes to determine the presence of sites of interest to the Tribes. This includes both archaeological site types of interest as well as nonarchaeological site types, which are usually identified as Traditional Cultural Properties, sensitive sites, sacred areas, and other areas and sites considered special or of concern to modern day American Indian tribes or communities.

Traditional cultural resources or properties are places associated with the cultural practices or beliefs of a living community. They can be considered a subset of the broader category of cultural resources, which are discussed in **Section 3.12**, Cultural Resources. Traditional cultural properties are rooted in the community's history and are important in maintaining cultural identity. Examples of traditional cultural properties include natural landscape features, ceremonial and worship places, plant gathering locations, traditional hunting and fishing locations, ancestral archaeological sites, artisan material locations, rock art and communal resources such as community-maintained irrigation systems. The boundaries of these resources and impact areas are often difficult to assess. Resources tied to particular locations and that meet the criteria for eligibility can be listed on the National Register of Historic Places. Some traditional cultural resources have values that do not have a direct property referent and may not manifest themselves by distinguishable physical remains, but still are subject to consideration in planning. It is the continuity of their significance and importance to the maintenance of contemporary traditions that is important.

While many traditional cultural resources are well known, some locations or resources may be privileged information that is restricted to specific practitioners or clans. For tribes, maintaining confidentiality and customs regarding traditional knowledge may take precedence over identifying and evaluating these resources, resulting in information being unavailable for inclusion in the NEPA analysis.

3.24.1 Conditions Statewide

In September 2012, an initial contact letter was sent via certified US Mail by the Utah State Director to the tribes in the project area. The letter described the EIS process and invited recipients to consult on the project. A list of tribal contacts and specifics regarding the consultation and coordination efforts are described further in **Chapter 6**, Consultation and Coordination.

Tribal Interests and traditional cultural resources are identified primarily through consultations with federally recognized Indian tribes on a government-to-government basis (Executive Order 13084, Executive Order 13175 Consultation and Coordination with Indian Tribal Governments, Executive Order 13007 Indian Sacred Sites, Executive Memorandum of April 29, 1994, on Government-to-government Relations with Native American Tribal Governments, and the DOI Policy on Consultation with Indian Tribes). In the case of nonfederally recognized tribes and other potentially affected communities, direct consultations are also necessary to identify traditional cultural resources.

There is no comprehensive list of all Indian trust assets for tribes and individual Indians. If needed, further information on the nature of the trust asset is determined by examining government documents, such as treaties, court decisions, water rights adjudication proceedings, and reservation-establishing proclamations.

In the planning area, there is extensive geographic, environmental, historic, economic, social, ethnic, and religious diversity that is reflected in the tribal interests and traditional cultural resources that may be valued by American Indian communities. There is no comprehensive way to define all of the resources on this broad scale, especially where confidentiality is often required.

Resource-gathering areas are a broad category that can include trust assets; treaty and subsistence rights and resources; and culturally significant plants, animals, fish, and minerals. Plant resources can include foods that were established as part of a traditional seasonal round. Examples include traditions of gathering pine nuts, berries, and a variety of seed plants. Other examples of plant resources include fibers used for basketry and weaving, and wood for building, carving, and fuels. Many plants are gathered for medicinal and religious use. Plant gathering is often a communal activity with cultural and religious significance. Loss of access to these plants or gathering locations, or losing the ability to maintain their habitats, can affect religious and ceremonial uses.

Most American Indian tribes and individual tribal members conceive of spirituality, or sacred sites and daily activities, as interconnected. The spiritual and natural worlds are not separate from everyday life (Forest Service 1997). Many of the resource uses and use areas also have a spiritual or sacred dimension. Sacred sites can also include places that are an expression of belief systems in the land or nature. For some sacred areas, there may be no observable cultural function to an outsider or even to tribal members who have not been entrusted with the information. Locations such as landscape features, mountain tops, trails, water courses, springs, caves, offering areas, shrines, and rock art sites often figure in these groups' oral traditions concerning their origins, mythology, and the nature of the world. There are frequently active or ancestral ceremonial locations that are treasured. Archaeological sites, burials, and historic sites are often seen as important ties to ancestors and traditions that are not to be disturbed (Bengston 2003).

Tribal resources would experience trends similar to those experienced by cultural resources. Similar to cultural resources, tribal resources are expected to move away from desired conditions over time unless management actions exist to protect these resources.

The status of the local ecosystem, including but not limited to vegetation composition and any wildlife, is integral to many native cultures. Potential changes in local ecosystems associated with effects of climate change may alter the availability of plants, wildlife, or other natural resources for traditional uses.

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Chapter 4
Environmental Consequences

CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

4.1 CHANGES BETWEEN THE DRAFT LUPA/EIS AND PROPOSED LUPA/FINAL EIS

As a result of public comments, cooperating agency coordination, and internal review of the Draft LUPA/EIS, the BLM and Forest Service have made several changes to this chapter. Changes include the following:

- A baseline disturbance inventory has been completed and the impact analysis has been revised to incorporate the results of that inventory. The baseline disturbance inventory is provided in **Appendix L**, Baseline Disturbance Inventory.
- The likely direct and indirect impacts on the human and natural environment that could occur from implementing the BLM and Forest Service Proposed Plans presented in **Chapter 2**, Alternatives, were incorporated.
- Analyses for the draft alternatives (Alternatives A – E) were adjusted based on public and internal comments, as well as the identification of additional literature in public comments.
- In response to public comments, a more detailed, quantitative analysis of the impacts from implementing the disturbance cap for the various alternatives was included.
- Calculations have been updated and new information since the Draft LUPA/EIS has been incorporated to reflect better or more current information, where available and germane to the current conditions and analysis.

4.2 INTRODUCTION

This chapter presents the anticipated direct and indirect impacts on the human and natural environment that could result from implementing the alternatives presented in **Chapter 2**. The purpose of this chapter is to describe to the decision maker and the public how the environment could change if any of the alternatives in **Chapter 2** were to be implemented and to aid in the decision of which LUPA, if any, to adopt.

Section 4.3, Special Status Species – Greater Sage-Grouse, discloses the environmental consequences associated with the impacts on GRSG and its habitat from activities carried out in conformance with this plan, in addition to BLM and Forest Service management actions. In undertaking BLM and Forest Service management actions and, consistent with valid existing rights and applicable laws, in authorizing third party actions that result in habitat loss and degradation, the BLM and Forest Service will require mitigation that provides a net conservation gain to the species, including accounting for any uncertainty associated with the effectiveness of such mitigation. This will be achieved by avoiding, minimizing, and compensating for impacts by applying beneficial mitigation actions (conservation measures). In addition, to help implement the LUPA, a WAFWA MZ regional mitigation strategy will be developed within one year of the issuance of the ROD (see **Appendix D**, Mitigation Strategy Utah Greater Sage-Grouse LUPA). The regional mitigation strategy will elaborate on the components identified in **Chapter 2** (avoidance, minimization, compensation, additionality, timeliness, and durability), and will be considered for BLM and Forest Service management actions and third party actions that result in habitat loss and degradation. The implementation of a regional mitigation strategy will benefit GRSG, the public, and land-users by providing a reduction in threats, increased public transparency and confidence, and a predictable permit process for land-use authorization applicants.

This chapter is organized by topic, similar to **Chapter 3**, Affected Environment. Each topic area includes the following:

- A method of analysis section that identifies indicators and assumptions
- An analysis of impacts for each of the five alternatives. For resources of particular concern that have been identified as a threat to GRSG, the analysis of impacts has been broken down by alternative. For the remaining resource topics, the types of impacts would be similar across the alternatives but the magnitude may vary by alternative. In these cases, the analysis has been combined and the differences in the magnitude of impact called out.

Management actions proposed in **Chapter 2** are primarily planning-level decisions that do not result in direct on-the-ground changes. However, the analysis in this chapter focuses on impacts that could eventually result in on-the-ground changes as the decisions in this plan are implemented.

Some management actions may affect only certain resources and alternatives. This impact analysis identifies impacts that may benefit, enhance, or improve a resource because of management actions, as well as those impacts that have the potential to impair a resource. If an activity or action is not addressed in a given section, either no impacts are expected or the impact is expected to be negligible, based on professional judgment. The projected impacts on land use activities and the associated environmental impacts of land uses are characterized and evaluated for each of the alternatives.

Impact analysis is a cause-and-effect process. The detailed impact analyses and conclusions are based on the following:

- The BLM and Forest Service planning team's knowledge of resources and the project area
- Reviews of existing literature
- Information provided by experts in the BLM and Forest Service, other agencies, cooperating agencies, interest groups, and concerned citizens

The baseline used for the impact analysis is the current condition or situation, as described in **Chapter 3**. Impacts on resources and resource uses are analyzed and discussed in detail, commensurate with resource issues and concerns identified through the process. At times, impacts are described using ranges of potential impacts or in qualitative terms.

4.2.1 Analytical Assumptions

Several overarching assumptions have been made in order to facilitate the analysis of the project impacts. These assumptions set guidelines and provide reasonably foreseeable projected levels of development that would occur in the planning area during the planning period. These assumptions should not be interpreted as constraining or redefining the management objectives and actions proposed for each alternative, as described in **Chapter 2**.

The following general assumptions apply to all resource categories. Any specific resource assumptions are provided in the methods and assumptions section for that resource.

- Sufficient funding and personnel would be available for implementing the final decision.
- Implementing actions from any of the LUPA alternatives would comply with all valid existing rights, federal regulations, BLM and Forest Service policies, and other requirements.
- Implementation-level actions necessary to execute the decisions in this LUPA would be subject to further environmental review, including that under the NEPA, as appropriate.
- Direct and indirect impacts of implementing the LUPA would primarily occur on BLM-administered and National Forest System lands in the planning area.
- Local climate patterns of historic record and related conditions for plant growth may change with warmer, drier conditions likely to occur over the life of this plan.
- In the future, as tools for predicting climate changes in a management area improve and changes in climate affect resources and necessitate changes in how resources are managed, the BLM and Forest Service may be required to reevaluate decisions made as part of this planning process and to adjust management accordingly.
- The BLM and Forest Service would carry out appropriate maintenance for the functional capability of all developments.
- The discussion of impacts is based on best available data. Knowledge of the planning area and decision area and professional judgment, based on observation and analysis of conditions and responses in similar areas, are used for environmental impacts where data are limited.

- Restrictions (such as siting, design, and mitigation measures) would apply, where appropriate, to surface-disturbing activities associated with land use authorizations and permits issued on BLM-administered and National Forest System lands.
- New information may lead to changes in delineated GRSG habitat. New habitat areas, or areas that are no longer habitat, may be identified. This adjustment would typically result in small changes to areas requiring the stipulations or management actions stated in this LUPA. Modifications to GRSG habitat would be updated in the existing data inventory through LUP maintenance.
- The term ROW includes BLM ROWs, land leases, and permits, and Forest Service SUAs, as applicable. Under the Proposed Plans, the Forest Service would not make new decisions for SUAs (i.e., any decisions from Alternative A would be carried forward to the Proposed Plans). As such, acreages associated with ROW exclusion and avoidance are specific to BLM-administered lands except where current Forest Service decisions are carried forward.
- Acreage figures and other numbers used in the analyses are approximate projections for comparison and analytic purposes only. Readers should not infer that they reflect exact measurements or precise calculations.
- GHMA on National Forest System lands is approximately 5.6 percent of the Forest Service decision area in Utah.

4.2.2 General Methodology for Analyzing Impacts

Potential impacts are described in terms of type, context, duration, and intensity, which are generally defined below.

Type of impact—The analysis discloses impacts, both beneficial and adverse. Because types of impacts can be interpreted differently by different people, this chapter seeks to avoid differentiation between beneficial and adverse impacts. Notable exceptions are cases where such characterization is required by law, regulation, or policy. The presentation of impacts for key planning issues is intended to provide the BLM and Forest Service decision maker and reader with an understanding of the multiple use trade-offs associated with each alternative.

Context—This describes the area or location (site-specific, local, planning area-wide, or regional) in which the impact would occur. Site-specific impacts would occur at the location of the action, local impacts would occur within the general vicinity of the action area, planning area-wide impacts would affect a greater portion of decision area lands in Utah, and regional impacts would extend beyond the planning area boundaries.

For the Utah Greater Sage-Grouse LUPA/EIS the planning area includes all of Utah, except for Washington, San Juan, Davis, and Salt Lake Counties, which contain no mapped occupied GRSG habitat. Portions of Box Elder County that are managed by the Sawtooth National Forest are not included in the planning area, but are part of the planning area for the Idaho Sub-region. In addition, the planning area includes the portions of the Uinta-Wasatch-Cache and Ashley National Forests that extend into the State of Wyoming. Within the planning area, the GRSG analysis area is the sum of the population areas (which overlap all the above referenced

counties), regardless of land ownership (11,386,670 acres). **Table 1.1** provides a detailed breakdown of landownership status in the planning area.

The decision area is the portions of the GRSG analysis area that are comprised of BLM, Forest Service, and Bankhead Jones surface estates, as well as the mineral estates administered by the BLM. Though the planning area includes private lands, management direction and actions outlined in this EIS apply only to the BLM-administered and National Forest System lands in the planning area and to federal mineral estate under BLM jurisdiction that may lie beneath other surface ownership.

Duration—This describes the continuance of an effect, which can be classified as short term or long term. Short-term is defined as anticipated to begin and end within the first 5 years after the action is implemented; long term is defined as lasting beyond 5 years to the end of or beyond the life of this LUPA.

Intensity—Rather than categorize impacts by intensity (e.g., major, moderate, or minor), this analysis discusses impacts using quantitative data wherever possible.

Direct, indirect, and cumulative impacts—Direct impacts are caused by an action or implementation of an alternative and occur at the same time and place; indirect impacts result from implementing an action or alternative but usually occur later in time or are removed in distance and are reasonably certain to occur. Cumulative impacts are effects on the environment that result from the impact of implementing any one of the alternatives in combination with other actions, either within the planning area or adjacent to it. Cumulative effects analysis is provided in **Chapter 5**, Cumulative Impacts.

RDFs have been incorporated into the Forest Service Proposed Plans as planning-level Guidelines, which will be implemented during site-specific project analysis, or are existing standard operating procedures.

The Anthro Mountain area, while not specifically designated as PHMA, includes the same management allocations and actions as PHMA (see **Section 2.6.3**, Forest Service Proposed Plan Amendment – Utah Portions of the Planning Area). When referring to impacts from applying management associated with PHMA throughout **Chapters 4** and **5**, the identified impacts and acreages include Anthro Mountain unless specifically noted otherwise, even though the 41,200 acres of National Forest System lands on Anthro Mountain are not formally PHMA.

4.2.3 Incomplete or Unavailable Information

The CEQ established implementing regulations for NEPA that require federal agencies to identify relevant information that may be incomplete or unavailable for evaluating reasonably foreseeable significant adverse impacts in an EIS (40 CFR Part 1502.22). If the information is essential to a reasoned choice among alternatives, it must be included or addressed in an EIS. Knowledge and information is, and will always be, incomplete, particularly with infinitely complex ecosystems considered at various scales.

The best available information pertinent to the decisions to be made was used in developing the LUPA. The BLM and Forest Service have made a considerable effort to acquire and convert

resource data into digital format for use in the LUPA, both from the BLM and Forest Service and from outside sources.

Under the FLPMA, the inventory of public land resources is ongoing and continuously updated. However, certain information was unavailable for use in developing the LUPA because inventories either have not been conducted or are not complete. Some of the major types of data that are incomplete or unavailable are the following:

- Comprehensive statewide inventory of wildlife and special status species occurrence and condition.
- A comprehensive inventory of sagebrush lands which meet the guidelines as recommended by the scientific community. This information is not monitored on a statewide level.
- Forage allocations for livestock, wild horses, and wildlife.
- PFC data are presented in **Chapter 3**, but further details regarding acreages, distances, and causal factors on a sub-regional or population area basis are not available.

For these resources, estimates were made concerning the number, type, and significance of these resources based on previous surveys and existing knowledge. In addition, some impacts cannot be quantified, given the proposed management actions. Where this gap occurs, impacts are projected in qualitative terms or, in some instances, are described as unknown. Subsequent site-specific project-level analysis would provide the opportunity to collect and examine site-specific inventory data to determine appropriate application of LUP-level guidance. In addition, the BLM, Forest Service, and other agencies in the planning area continue to update and refine information used to implement this LUPA.

GIS data was used to perform acreage calculations, and to generate the maps in Appendix A. Calculations are dependent upon the quality and availability of data. Given the scale of the analysis, the compatibility constraints between datasets, and lack of data for some resources, all calculations are approximate, and serve for comparison and analytic purposes only. Likewise, the maps in Appendix A are provided for illustrative purposes and subject to the limitations discussed above. No warranty is made by the BLM or Forest Service as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

4.3 SPECIAL STATUS SPECIES – GREATER SAGE-GROUSE

4.3.1 Methods and Assumptions

Methodology

There is very little peer-reviewed published research discussing the impacts of various land uses on GRSG habitat or populations in Utah. For this impact analysis, the BLM and Forest Service have used the best available information, which often includes references to research related to impacts on GRSG and GRSG habitat outside of Utah. For example, there is no published research conducted in Utah that specifically addresses disturbance or oil and gas development

impacts on GRSG. However, numerous GRSG research projects evaluating impacts of energy development have been conducted in Wyoming and Montana. Anticipated impacts on GRSG and GRSG habitat in this analysis are based on existing research, regardless of where it was conducted.

In preparation of this EIS, the BLM and Forest Service used ESSA DDT to evaluate and compare the estimated effects of each alternative's vegetation, invasive species, grazing, and wildfire management decisions on GRSG habitat. As described in **Appendix V**, Great Basin Vegetation Modeling using Vegetation Dynamics Development Tool, the modeling effort was used to determine general habitat trends at a landscape scale considering a variety of habitat influences (e.g., wildfire, risk of overgrazing, insects and disease, conifer encroachment, and vegetation treatments).

Based on these inputs and the natural rates of succession in sagebrush systems, modeling was conducted to quantify the direction and magnitude of non-geospatial acreage trends in relation to sagebrush conditions most likely to provide GRSG habitat.

Information derived from the VDDT model provides valuable information on estimated trends; however, the model also has a number of limitations, including the following:

- The modeling effort did not include changes in habitat conditions associated with permitted activities such as infrastructure development, travel management, or mineral development. The effects of these actions, including habitat loss or habitat degradation (e.g., introduction or spread of invasive plant species), are taken into account in other sections of the analysis.
- The inputs for existing sagebrush conditions are the result of a combination of LANDFIRE and ReGap data sets, which are based on satellite imagery and other inputs. Events that have occurred since the data were collected (e.g., juniper removal, prescribed fire, and wildfire) are not reflected in the acreage. These data sets reflect the best available vegetation data available across both BLM-administered and National Forest System lands; however, they include some inaccuracies and errors.
- Vegetation modeling focuses on the amount of sagebrush in mid- to late-seral classes. Sagebrush in these classes tends to provide the percent sagebrush canopy cover needed for GRSG (10 to 35 percent); however, GRSG may also use other vegetation (e.g., sagebrush in the early seral stage, mesic areas, and aspen stands with suitable herbaceous understory). Vegetation modeling data presents an approximation of expected conditions in 50 years. In areas where a high percentage of the sagebrush is in the mid- to late-seral condition (e.g., 80 to 90 percent), it is not unexpected to see a declining trend in habitat conditions. These conditions can be either a result of overestimating existing conditions or vegetation dynamics driving the trends.
- Model results are based, in part, on assumptions regarding the number of acres of vegetation treated (conifer encroachment treatments and annual grass restoration treatments). It was assumed that treatments would continue to occur at

approximately the same rate as over the past 7 years unless the alternative restricts the type or location of treatment. Expanding the amount of treatment beyond modeled/current levels or considering the same levels of treatment distributed among the modeled areas differently could change the estimated percent of habitat in mid- to late-seral condition at 50 years.

- Each individual population area was not modeled separately, and in some instances, multiple population areas were combined for this modeling exercise. For example, the Rich, Uintah, Wyoming-Uinta, Wyoming-Blacks Fork, and Lucerne Population Areas were modeled as an individual unit. As such, the model does not account for site-specific variation in conditions (e.g., soil, elevation, and precipitation). Model units are closely associated with the general GRSG populations identified by Connelly and others (2004).
- All alternatives were modeled using GRSG mapped occupied habitat, which provides a consistent baseline for impact analysis. However, under Alternatives B, D, and E not all areas would be managed as PHMA. Some occupied GRSG habitat located in the Carbon, Uintah, Sheeprocks, Panguitch, Box Elder, Wyoming-Uinta, and Wyoming-Blacks Fork Population Areas would be managed as GHMA. GHMA are areas that have been determined to have less conservation value than PHMA. The identification of PHMA and GHMA was based on multiple variables, including quality of habitat, existing development, and number of birds. Management of PHMA and GHMA also varies by alternative. Removal of GHMA from the model area would likely decrease the percent of juniper and annual grasses and increase the percent of sagebrush in the mid- to late-seral stage.

Indicators

Indicators of impacts on GRSG are as follows:

- Habitat Loss – Likelihood of habitat avoidance due to human presence or habitat alteration
- Habitat degradation – Likelihood for habitat impacts caused by the loss of habitat function or value
- Disruption – Likelihood of impacts on survival or reproduction due to direct or indirect effects

Assumptions

In addition to the assumptions in **Section 4.2.1**, Analytical Assumptions, this analysis includes the following assumptions:

- When referring to impacts on GRSG habitats, this also incorporates the indirect impacts on GRSG. However, where appropriate, direct impacts on GRSG are discussed.
- Three general categories of anthropogenic disturbance/disruption or habitat loss/degradation would most influence GRSG and their habitat: 1)

disturbance/disruption from casual use; 2) disturbance/disruption from permitted activity; and 3) changes in habitat condition, such as from fire or weed invasion.

- BMPs, COAs, and standard operating procedures are used for analysis and would be implemented to reduce impacts on GRSG. These are subject to modification based on subsequent guidance and new science.
- Ground-disturbing activities could positively or negatively modify habitat or cause loss or gain of individuals, depending on the amount of area disturbed, the nature of the disturbance, the species affected, and the location of the disturbance.
- Roads, transmission lines, pipelines, and other infrastructure generally cause fragmentation of habitat that can impact lek persistence, lek attendance, winter habitat use, recruitment, chick survival, yearling annual survival rate, and female nest site choice (Holloran 2005; Aldridge and Boyce 2007, Walker et al. 2007a; Doherty et al. 2008; Holloran et al. 2010; Hagen et al. 2011; Johnson et al. 2011; Taylor et al. 2012).
- Most oil and gas development will be in areas with high development potential and from existing leases.
- The agencies may place restrictions on development of existing oil and gas leases to protect other surface resources, as long as the restrictions do not unreasonably interfere with the lessees' right to explore for and produce oil and gas resources.

Programs, Decisions, and Threats Addressed

BLM and Forest Service LUPAs focus on increasing GRSG conservation for programs and activities under BLM and Forest Service management authority. Therefore, threats occurring on private and state lands (e.g., agricultural conversion and urbanization), threats addressed by other state or federal programs (e.g., predator management or pesticide application), or climate change may continue to impact GRSG populations. To the extent possible, the BLM and the Forest Service address management decisions that may indirectly address some of these threats. For example, restricting or prohibiting certain land uses in an area could reduce the likelihood of human-caused fire ignitions and decrease the spread of invasive plant species.

Similarly, while the BLM and Forest Service can restrict or prohibit future energy development on unleased land within GRSG habitat, there is limited ability to restrict or prohibit development in areas where there are valid and existing rights or existing mining claims within GRSG habitat.

The analysis of impacts on GRSG is organized by the threats identified in USFWS's 12-Month Findings for Petitions to List the Greater Sage-Grouse (*Centrocercus urophasianus*) as Threatened or Endangered. Predation was not identified as a primary range-wide threat, and therefore, was not analyzed separately in the alternative impact analysis. However, during the Draft EIS public comment period, BLM and Forest Service received extensive public comments that provided information on predation and hunting and their impacts on GRSG. In response to those comments, and recognizing that the USFWS noted that predation might be a threat at local levels, the BLM and Forest Service have included more detailed discussion regarding these issues in **Chapter 1**, Introduction, and in **Appendix M**, Predation of Greater Sage-Grouse in the

Utah Sub-regional Planning Area. Though the BLM and Forest Service do not have the regulatory authority to conduct direct predator management, such management can provide short-term relief to localized GRSG populations where predation has been identified as a limiting factor for population stability. Under the Proposed Plans and other alternatives, the BLM and Forest Service would collaborate with appropriate agencies (e.g., Animal and Plant Health Inspection Service, UDWR in regards to predation) to temporarily address predation in specific areas, as necessary.

For those threats that were analyzed in detail within the alternatives analysis, impacts are analyzed by the following indicators: habitat loss, habitat degradation, and disruption to the birds. While these indicators are discussed separately, the impacts on GRSG frequently overlap and are interconnected. Similarly, the implementation of various program decisions may have similar effects on GRSG, and those effects may be repeated in each section.

4.3.2 Alternative A

GRSG Habitat and Disturbance Thresholds

Based on the assumptions mentioned at the beginning of this section, disturbances to GRSG habitats can impact GRSG, and those impacts can vary depending on the proximity to important GRSG seasonal habitats, type and quality of the habitat disturbed (e.g., good quality nesting habitat), type of disturbance (e.g., road, oil and gas wells, mining operation, wind turbines, and pipeline), associated indirect impacts (e.g., one-time human presence and noise disturbance or on-going maintenance and human presence), how the disturbance is distributed on the landscape (e.g., spread out or consolidated), other existing threats, and disturbance density. In general, any impacts that decrease nesting success and chick survival can impact population growth (Taylor et al. 2012). Relative to specific thresholds of disturbance, Kirol (2012) found that GRSG began negatively responding to disturbances at approximately 4.5 percent disturbance and did not use habitats when surface disturbance exceeded 8 percent. Analyzing western GRSG populations and factors related to occupied versus extirpated leks, Knick and others (2013) found that almost all occupied leks (99 percent) in the western portion of the range had less than 3 percent disturbance within 3.1 miles of the lek. Similarly, range-wide lek trend analyses suggest that the aggregated human influences on the landscape are associated with negative GRSG lek count trends (Johnson et al. 2011) and population persistence (Aldridge et al. 2008, Wisdom et al. 2011).

Under Alternative A, there are no established threshold levels limiting the aggregated amount of disturbance in GRSG habitat. However, in some cases existing LUPs include stipulations meant to minimize impacts on GRSG (**Table 4.1**). These stipulations vary and may include limitations on surface occupancy near leks and impart timing limitations. In general, these stipulations were developed primarily to protect GRSG from fluid minerals development, though in some cases the stipulations may be applied to all surface-disturbing activities. Within the planning area, there are surface occupancy limitations ranging from within 0.25 mile of a lek buffer to all GRSG habitat. For example, BLM-administered lands in the Uintah Population Area have an NSO stipulation that creates a 0.25-mile lek buffer, while all occupied GRSG habitat on National Forest System lands in the Strawberry and Sheeprocks Population Areas are managed with an

Table 4.1
Surface Disturbance Restrictions for GRSG in Existing Land Use Plans

Land Use Plan	Proximity Restrictions	Timing Restrictions
Bureau of Land Management Land Use Plans		
Grand Staircase-Escalante National Monument	None.	None.
Richfield	• Within **0.5 mile** of leks, no surface disturbance. Oil and gas leasing open subject to major constraints.	• **March 15 – July 15**: No surface disturbance or disruptive activities within 2 miles of leks. • **December 15 – March 14**: No surface-disturbing or disruptive activities in winter habitat.
Vernal	• Within **0.25 mile** of an active lek, no surface-disturbing activities. • Within **2 miles** of a lek, no permanent facilities will be allowed, when possible. • Within **0.5 mile** of known active leks, the best available technology will be used to reduce noise (e.g., installation of multi-cylinder pumps, hospital sound-reducing mufflers, and placement of exhaust systems).	• **March 1 – June 15**: No surface-disturbing activities within 2 miles of active GRSG leks allowed.
Price	• Within **0.5 mile** of a lek, there will be no surface disturbance. Oil and gas leasing open subject to major constraints. Subject to E[1], M[1], W[1]	• **March 15 – July 15**: No surface disturbance or otherwise disruptive activities within 2 miles of leks (nesting). E[1], M[3], W[2] • **December 15 – March 14**: No surface-disturbing or otherwise disruptive activities in winter habitat. E[3], W[2]
Kanab	• Within **0.5 miles** of a lek, no surface disturbance. Oil and gas leasing open subject to major constraints. E[2], M[2], W[1]	• **March 15 – July 15**: No surface-disturbing or otherwise disruptive activities allowed within 2 miles of leks to protect nesting and brood-rearing habitat. Oil and gas leasing would be open subject to CSU and TL stipulations. E[2], E[4], M[4], W[1] • **December 1 – March 14**: No surface-disturbing or otherwise disruptive activities allowed in GRSG winter habitat. Oil and gas leasing would be open subject to CSU and TL stipulations. E[5], E[6], M[4], W[1]
Pinyon		• **March 1 – May 15:** No drilling or exploration on strutting grounds (720 acres).

Table 4.1
Surface Disturbance Restrictions for GRSG in Existing Land Use Plans

Land Use Plan	Proximity Restrictions	Timing Restrictions
Cedar Beaver Garfield Antimony	• Within **200 yards** from a nests or roosting sites, no ground-disturbing activities would occur. [GRSG strutting grounds **March 15 – May 1** for Sigurd to Paragonah] • During critical periods, transmission line construction would cease in GRSG habitat along the transmission lines.	• **March 15 – May 1:** No ground-disturbing activities (roads, railroads, towers, and ROWs for transmission line construction) within 200 yards of leks, nests, or roosting sites. • During critical periods, transmission construction would cease in GRSG habitat along transmission lines.
Randolph	• Within **2 miles** of a lek from **March 1 – June 15**, no exploration, drilling, and any other development activity allowed. There are no exceptions to this stipulation.	• **April 1 – June 15:** No exploration, drilling, and other development activity allowed. E[7] • **December 1 – February 28:** No exploration, drilling, and other development activity allowed in winter habitat. This limitation does not apply to maintenance and operation of producing wells. This limitation does not apply to maintenance and operation of producing wells. E[7] • **March 1 – June 15:** No exploration, drilling, and other developmental activity will be allowed within 2 miles of a lek. This limitation does not apply to maintenance and operation of producing wells. There are no exceptions to this stipulation.
Pony Express	• Within **0.5 mile** of a lek, avoid placing ROWs if the disturbance would adversely impact the effectiveness of the lek.	• **March 15 – June 15:** No seismic work, well development, new road construction, ROWs, organized recreational activities within 0.5 mile of leks and crucial nesting habitat. This does not limit maintenance activities. E[8] • **December 1 – March 1:** No seismic work, well development, new road construction, ROWs, organized recreational activities in crucial wintering habitat areas. This does not limit maintenance activities. E[8]
Box Elder	• Within **0.5 mile** of a lek, ROWs will, to the maximum extent possible, be avoided if the disturbance would adversely impact the effectiveness of the lek.	• **March 15 – June 15:** No exploration, seismic work, drilling, well development, ROWs, new road construction, and other development activity within 0.5 mile of a lek. If activities may impact the effectiveness of the lek, a yearlong avoidance may apply. This limitation does

Table 4.1
Surface Disturbance Restrictions for GRSG in Existing Land Use Plans

Land Use Plan	Proximity Restrictions	Timing Restrictions
		not apply to maintenance and operation of producing wells. This stipulation does not pertain to maintenance activities. E[8]
House	None.	None.
Park City	None.	None.
IsoTracts	None.	None.
	Forest Service Land Use Plans	
Dixie	• Within **1 mile** of a leks (all habitats), and between **1 and 2 miles** of a lek within sagebrush habitat only, prohibit all surface-disturbing activities such as roads, well pads, and other facilities.	• **May 1 – July 15:** No activities allowed. Outside these dates, surface disturbance for oil and gas operations is limited to no more than 1 percent of total habitat (1 percent=130 acres), including the areas of avoidance due to human activity (i.e., roads and well pads) with radius/buffer to be determined by the Dixie National Forest. Reclaimed oil and gas disturbance that has met reclamation requirements is not included in the disturbed / avoidance area calculation. • **March 1 – May 15:** Seismic activities, including blasting, would be limited during the lekking period
Uinta	• Within **2 miles** of a lek, do not locate energy transmission, mining, or other large structures and facilities that could be used as perch sites for raptors • Within **2 miles** of GRSG habitats (nesting, brood-rearing, and winter) in the Vernon and Strawberry Reservoir Management Areas, avoid building power lines and other tall structures that could become potential perch sites for raptors. Bury power lines or, if structures must be built or currently exist, modify the structures to prevent raptors from using the structures. • Within **4 miles** of a lek, no well sites or production facilities such as tank batteries and compressor stations may be constructed on these lands. Construction of roads, pipelines and other similar facilities must comply with direction in the 2003 Uinta National Forest LRMP,	• **March 1 – June 1** in the Vernon Management Area **March 1 – June 15** in the Strawberry Reservoir and Currant Creek Management Areas: preclude activities that could cause increased stress, displacement, and or breeding failures during the critical time period. • **November 15 – March 1** in the Vernon Management Area **November 1 – March 15** in the Strawberry Reservoir and Currant Creek Management Areas: Preclude activities that could cause increased stress, displacement, and or breeding failures during the critical time period. • **March 1 – June 1** in the Vernon Management Area **March 1 – June 15** in the Strawberry Management Area: Adjust timing and location of management and public activities to minimize disturbance of breeding sites.

Table 4.1
Surface Disturbance Restrictions for GRSG in Existing Land Use Plans

Land Use Plan	Proximity Restrictions	Timing Restrictions
	and involve consultation with the USFWS and coordination with the UDWR. M[5], W[3] • Within **3.1 miles** of known active leks use the best available technology such as installation of multi-cylinder pumps, hospital sound reducing mufflers, and placement of exhaust systems to reduce noise. • Within **4 miles** of an active lek in breeding or brood-rearing habitat, no permanent (i.e., lasting more than 1 year) structures or facilities. E[9], M[5], W[3] • Within sight distance or **0.5 miles** of a lek, adjust timing and location of management and public activities to minimize disturbance of breeding sites. • Within **300 yards** of GRSG foraging areas along riparian zones, meadows, lakebeds, and farmland, avoid removing sagebrush unless such removal is necessary to achieve GRSG habitat management objectives.	
Wasatch-Cache	None.	None.
Manti La Sal	• NSO stipulations will be used as appropriate in leases, licenses, or permits on GRSG leks/nesting/brooding areas.	None.
Fishlake	• NSO within **4 miles** of GRSG leks delineated and mapped by the Forest Service. E[10]	• Within GRSG brood-rearing habitat delineated and mapped by UDWR, no activities would be allowed during the period from **May 1 – July 5**. E[10], M[5], W[3]. • No surface disturbance during the critical period from **December 1 – March 15** in GRSG winter habitat delineated and mapped by UDWR. E[10], M[5], W[3].
Ashley	None.	None.

Notes:
E[1] An exception may be granted by the BLM Authorized Officer if an environmental analysis demonstrates that the action would not impair the function or utility of the site for current or subsequent reproductive display, including daytime loafing/staging activities, and/or would not result in development of a permanent aboveground structure within 0.5 mile of a lek.
E[2] An exception may be granted by the Field Manager if the operator submits a plan that demonstrates that

Table 4.1
Surface Disturbance Restrictions for GRSG in Existing Land Use Plans

Land Use Plan	Proximity Restrictions	Timing Restrictions

impacts from the proposed action can be adequately mitigated.
E[3] For the December 15 – March 14 TL, upon review and monitoring, the BLM Authorized Officer may grant exceptions because of climatic and/or habitat conditions if certain criteria are met and if activities would not cause undue stress to wintering GRSG.
E[4] Exception: An exception could be granted if surveys determine that the lek in nesting and brood-rearing habitat is not occupied.
E[5] Exception: An exception could be granted if surveys determine that the winter habitat is not occupied, and that snow depths in the area allow continued GRSG use.
E[6] Exception: An exception may also be granted by the Field Manager if the operator submits a plan that demonstrates that impacts from the proposed action can be avoided, sufficiently minimized, or adequately mitigated.
E[7] Exceptions may be specifically approved in writing by the BLM Authorized Officer.
E[8] Exceptions may be granted by the BLM if the proposed activity will not seriously disturb wildlife habitat values being protected. This determination will be made by a BLM wildlife biologist in coordination with the UDWR and, if appropriate, the USFWS. Such a determination may result if the GRSG complex has remained inactive over a period of years and it is determined by the BLM and UDWR that the population no longer used the complex and no longer requires protection from disturbing activities for fluid mineral leasing and exploration.
E[9] An exception may be granted if the BLM Authorized Officer, in consultation with the USFWS and coordination with the UDWR, determines through analysis that the nature of the actions, as proposed or conditioned, could be fully mitigated. This might occur if topography and/or vegetation are present that would effectively screen the structure or facility from the breeding habitat.
E[10] An exception may be granted if the Forest Supervisor in coordination with UDWR determines through analysis that the nature of the actions as proposed or conditioned could be fully mitigated.
M[1] Modification: The BLM Authorized Officer may modify the area managed with NSO stipulations in extent if an environmental analysis finds that a portion of the area managed with NSO stipulations is nonessential to site utility or function, or if further analysis shows that the size or location of the lek has changed, or that the proposed action could be conditioned to not impair the function or utility of the site for current or subsequent reproductive display including daytime loafing/staging activities.
M[2] Modification: The Field Manager may modify the boundaries of the stipulation area if (1) portions of the area do not include lek sites, (2) the lek site(s) have been completely abandoned or destroyed, or (3) occupied lek site(s) occur outside the current defined area, as determined by the BLM.
M[3] Modification: Season may be adjusted depending on climatic and habitat conditions. Disturbance could occur if the activity were proposed to occur within the buffer, but would occur in non-sagebrush habitat, i.e., the activity could be allowed if it was not in GRSG habitat and did not in some other way disturb nesting or brood-rearing activity.
M[4] Modification: The Field Manager may modify the boundaries of the stipulation area if portions of the area do not include habitat or are outside the current defined area, as determined by the BLM.
M[5] Modification: A modification may be granted if the authorizing official determines, through consultation with the USFWS and coordination with the UDWR, that new habitat studies demonstrate a portion of the lease area affected by this stipulation no longer contains brood-rearing or winter habitat.
W[1] A waiver may be granted if there are no active lek sites and it is determined the sites have been completely abandoned or destroyed or occur outside the initial identified area, as determined by the BLM.
W[2] This stipulation may be waived if, in cooperation with UDWR, it is determined that the site has been permanently abandoned or unoccupied for a minimum of 5 years.
W[3] A waiver may be granted if the authorizing official determines through consultation with the USFWS and coordination with the UDWR, that new habitat studies demonstrate the entire lease area affected by this stipulation no longer contains brood-rearing or winter habitat.

NSO stipulation. Despite the existence of NSO and TL stipulations, current lek buffers (including those that preclude disturbance 0.25 to 0.5 mile from a lek) included in most LUPs are insufficient to adequately maintain persisting GRSG populations (Walker et al. 2007a; Taylor et al. 2012). In addition, disturbances would be allowed in GRSG habitats outside of those lek buffers. Therefore, under this alternative, disturbance would likely continue and, as discussed above, may surpass GRSG tolerance levels of disturbance. As a result, there would be increased direct and functional habitat loss, habitat degradation, and disturbance to GRSG. By combining these unlimited disturbance levels in GRSG habitat with other threats on the landscape, there would be a decreased likelihood that GRSG populations would be maintained and an increased likelihood that GRSG populations would decline.

Minerals

Surface and underground mining for mineral resources (e.g., coal, uranium, copper, phosphate, and aggregate) can result in GRSG habitat loss caused by construction of infrastructure, surface or underground mines, and other associated facilities. However, not all of these impacts would occur in every situation, especially where potential adverse impacts are avoided, minimized, and/or mitigated. Sagebrush communities that are lost or modified may not regain vegetation character suitable for GRSG use for 20 to 30 years or longer following interim or final reclamation.

Surface disturbance from aboveground infrastructure related to underground mining (e.g., coal, uranium, copper, and phosphate) results in direct loss of habitat if it occurs in GRSG habitat. In contrast, surface mining has a greater impact than underground activity due to the amount of direct habitat loss. Direct habitat loss from mining can occur from removing vegetation and soil to access mineral resources and storage of overburden (soil removed from mining activities or the formation of mine shafts) in undisturbed habitat. In addition, construction of ancillary facilities (e.g., air vents, fans, and shafts), staging areas, roads, railroad tracks, and structures such as buildings and power lines can result in direct habitat loss. In addition to direct habitat loss, indirect impacts associated with mining can result in indirect impacts on GRSG. For example, an increase in human presence can expose GRSG to pathogens introduced from septic systems and waste disposal (Moore and Mills 1977). GRSG could also be indirectly impacted by increased dust from heavy equipment use on unpaved roads, which could decrease adjacent plant community photosynthesis and insect populations.

The interaction and intensity of effects from habitat loss could cumulatively or individually lead to habitat fragmentation in the long term (Connelly et al. 2004; Holloran 2005). Several studies have documented negative effects of fragmentation as a result of oil and gas development and its associated infrastructure on lek persistence, lek attendance, winter habitat use, recruitment, decreased chick survival, yearling annual survival rate, and female nest site choice (Holloran 2005; Aldridge and Boyce 2007; Walker et al. 2007a; Doherty et al. 2008). The presence of visible energy wells has been associated with increased risk to chick survival (Aldridge and Boyce 2007). Impacts on male lek attendance have been noted as far as 12 miles from leks (Taylor et al. 2012). In lieu of GRSG research evaluating the impacts of mineral developments, the BLM and Forest Service anticipate that mineral developments that include infrastructure similar to that of oil and gas development (e.g., roads, high levels of sound, and clearing soils) would have similar impacts on GRSG. Infrastructure requirements vary between different mineral developments.

Impacts from various types of infrastructure listed above are discussed in further detail in the infrastructure section of the GRSG analysis.

In addition, human alterations, uses, and impacts, coupled with natural variability (e.g., drought), have changed the extent, condition, and distribution of sagebrush-steppe and the ecosystem services these biomes provide (Meinke et al. 2009). Underground mining could cause subsidence, which could alter surface water availability for vegetation communities (Guither 1986), particularly shallow-rooted understory species that are important components of important nesting or brood-rearing habitat for GRSG. Though possible, past experience with underground mining on the Manti-La Sal National Forest indicates that impacts on vegetation from subsidence in the planning area are very rare. Furthermore, disrupted disturbance regimes, degraded or depressed native species, and dominance by introduced, noxious, and/or nonnative plants have moved many of these systems towards, or beyond, critical thresholds from which restoration is difficult or excessively time-consuming and expensive (Meinke et al. 2009).

Overburden and waste rock from surface mining could cause water contamination from leaching of waste rock and overburden and nutrients from blasting chemicals and fertilizer (Moore and Mills 1977). However, current state and federal regulations required controlling runoff from disturbed sites. Water regime alteration could lead to decreased surface water and eventual habitat degradation if wildlife or livestock concentrate at remaining sources. On the contrary, it is also possible to increase available surface water by releasing formation water during mining. GRSG do not require water other than what they obtain from plant resources (Schroeder et al. 1999); therefore, local water quality deterioration or dewatering is not expected to have substantial impact. However, if the dewatering results in degradation of riparian areas, this could decrease herbaceous understory and associated insects, resulting in a loss of brood habitat.

Industrial activity associated with energy and mineral development could result in noise and human activity that disrupts GRSG habitat and its life cycle. All studies that assessed impacts of energy development on GRSG found negative effects; no studies reported a positive influence of development on populations or habitats (Naugle et al. 2011).

Blasting, a practice used to remove overburden or the target mineral, produces noise and ground shock. The full effect of ground shock on wildlife is unknown. Repeated use of explosives during lekking activity could result in lek or nest abandonment (Moore and Mills 1977). Noise from mining activity could mask vocalizations, resulting in reduced female attendance and yearling recruitment as seen in sharp-tailed grouse (*Pedioecetes phasianellus*; Amstrup and Phillips 1977). In this study, the authors found that the mining noise in the study area was continuous across days and seasons.

The mechanism of how noise affects GRSG is not known, but it is known that GRSG depend on acoustical signals to attract females to leks (Gibson and Bradbury 1985; Gratson 1993). Noise associated with oil and gas development may be a factor in habitat selection and a decrease in lek attendance by GRSG (Holloran 2005; Blickley et al. 2012a). Holloran's (2005) research in energy development areas observed that leks downwind from drilling rigs declined more than leks upwind, supporting evidence that increased noise intensity may negatively influence male lek attendance. More recently, in central Wyoming, Blickley and others (2012a) used recorded energy development-related sounds (drill rigs and haul trucks) to evaluate the response of

GRSG. The noise treatments were continuous (drilling) and intermittent (road) noise calibrated to mimic noise levels similar to levels measured at 0.25 mile from a noise source (70 decibels [unweighted] or 56 decibels [weighted]). Males on leks decreased immediately, and response was sustained. There was a larger response (73 percent decline) with the intermittent road noise treatments compared to the constant drilling noise treatments (29 percent decline). In addition, to evaluate stress levels of males that remained on the leks, Blickley and others (2012b) measured immunoreactive corticosterone metabolite levels in fecal samples from males on noise-treated and untreated leks and found that noise-treated leks had 16.7 percent higher immunoreactive corticosterone metabolite levels than untreated leks. Specific impacts of elevated immunoreactive corticosterone metabolite levels on GRSG are unknown, though corticosterone levels are associated with increased physiological stress (Wasser et al. 2000; Wingfield 2005; Bonier et al. 2009). Industrial noise may also mask lekking sounds used in GRSG mating displays (Blickley and Patricelli 2012). This may interfere with female attendance, and increase the likelihood that younger males will not be drawn to the lek and that eventually leks will become inactive (Amstrup and Phillips 1977; Braun 1986). There is also the concern that the quieter communications between hens and chicks are more prone to masking than male vocalization, thereby potentially increasing predation risk to hens and chicks in noisy areas (Blickley and Patricelli 2012). Based on calculating how far noise will diminish to 30 decibels, Patricelli and others (2013) recommend roads or traffic be avoided within 0.8 to 1 mile from the edge of seasonally sensitive areas. The impacts of noise to GRSG still requires more research to determine what role noise may play in affecting habitat use, vital rates, and overall persistence.

A few scientific studies examine the effects of coal mining on GRSG. In a study in North Park, Colorado, overall GRSG population numbers were not reduced, but there was a reduction in the number of males attending leks within 0.8 mile of 3 coal mines, and existing leks failed to recruit yearling males (Braun 1986; Remington and Braun 1991). New leks formed farther from mining disturbance (Remington and Braun 1991). Additionally, some leks that were abandoned adjacent to mine areas were reestablished when mining activities ceased, suggesting disturbance rather than habitat loss was the limiting factor (Remington and Braun 1991). Hen survival did not decline in a population of GRSG near large surface coal mines in northeast Wyoming, and nest success appeared not to be affected by adjacent mining activity (Brown and Clayton 2004). However, the authors concluded that continued mining would result in fragmentation and eventually impact GRSG persistence if adequate reclamation was not employed (Brown and Clayton 2004).

There are negative short-term impacts on GRSG numbers and habitats from surface mining and activities associated with mining (Braun 1998). GRSG have reestablished on mined areas once mining has ceased, but there is no evidence that population levels will reach their previous levels. Population reestablishment could take 20 to 30 years based on observations of disturbance in oil and gas fields (Braun 1998).

Many of the lands that include GRSG habitat are presently poor-quality habitat due to past disturbance. Strip mining and some underground mining would allow for some or the entire surface to be reclaimed. In the long term, reclaimed lands could create new habitat for GRSG and other species to occupy. In addition, mining on federal lands, where stipulations can control how the lands will be reclaimed in order to benefit GRSG, could be more advantageous than

closures on federal lands, which could encourage operations to move to private lands where controls cannot be applied.

Nonenergy Leasables

Under Alternative A, there are 3,870,080 acres open for leasing and 138,500 acres closed to nonenergy leasing. Stipulations associated with development are not consistent across the decision area (see **Appendix I**, Detailed No Action Alternative). Recent RMPs may apply stipulations identified for fluid minerals to new nonenergy leases. Site-specific analysis would be completed for each project; however, there is no standard protection for GRSG across the sub-regional plans. Therefore, impacts as described above, including habitat loss, degradation, and direct and indirect disturbance to GRSG, would most likely continue to occur. These impacts would likely decrease population growth and decrease the likelihood of population persistence. Deposits of gilsonite and phosphate are in the Uinta-Wasatch-Cache and Ashley National Forests portions and the southcentral portion of the Wyoming-Uinta Population Area, and north into the southern portions of the Rich Population Area. Impacts would likely be concentrated in the Wyoming-Uinta Population Area, where potential is the highest for both minerals and associated development.

Solid Minerals - Coal

Under Alternative A, 22,900 acres of federal mineral estate with coal occurrence in the decision area (1 percent of the federal mineral estate decision area) would remain unacceptable for coal leasing consideration. Although no RMP decision has specified that these areas are unacceptable, they are required to be managed as such by the BLM Manual 6330, Management of Wilderness Study Areas, and the presidential proclamation establishing the Grand Staircase Escalante National Monument (Proclamation No. 6920).

All other acres in the decision area (3,982,800 acres, or 99 percent of the decision area) are acceptable for further leasing consideration. However, 271,300 acres (7 percent) of federal mineral estate beneath National Forest System lands in the decision area are unsuitable for surface mining with the exception of surface operations incident to underground mines. For BLM-administered lands that are acceptable to leasing, upon receipt of a coal lease application in GRSG habitat, the BLM will review criterion 15 set forth in 43 CFR 3461.5 to determine if the specific area being proposed for lease is suitable for all or certain stipulated methods of coal mining. Within the decision area, there are no standardized stipulations for coal mining specifically intended to protect GRSG. LUP stipulations that apply to all surface-disturbing activities would be applied to new coal leases. While efforts to minimize impacts on GRSG could be considered on a project-by-project basis, implementation of such measures is not required. Examples of minimization efforts could include special conditions, conservation measures, and pre-project mitigation requirements that include habitat suitability success criteria (e.g., GRSG occupancy).

A majority of the acres within the Emery and Carbon Population Areas have high or moderate development potential for coal. All mining in these population areas is accomplished using underground mining methods.

Underground coal development, including construction of ancillary infrastructure, could occur near leks, in nesting and early brood-rearing habitats. This could decrease overall nest success

and chick survival and decrease the likelihood for population growth and persistence. Construction of aboveground ancillary facilities associated with underground coal mines would have the greatest impact in areas where there are small GRSG populations. For example, the Emery GRSG populations are in a small area and use the same habitats for breeding, nesting, early and late brood rearing, and wintering. Therefore, any impacts that appreciably increase hen mortality or decrease nesting success, chick survival, or habitat availability would decrease the likelihood of persistence for these populations. It is important to note that current underground coal mining occurs in the Wildcat Knoll portion of the Emery Population Area. Development has occurred in this area (without appurtenant facilities in GRSG habitat), and mitigation and habitat treatments have been implemented. To date, existing GRSG populations in the Wildcat Knoll area are stable and increasing.

Exploration for coal on BLM-administered lands and nonfederal lands with federal mineral interests in the Carbon and Emery Population Areas includes a series of drill holes using helicopter access or from a truck-mounted drill. On-lease exploration must abide by the seasonal restrictions outlined in the Price RMP. Nearly all coal exploration drilling in the Manti-La Sal National Forest (Emery Population Area) is accomplished using helicopter portable rigs and must comply with standard drilling stipulations. The overall impact on GRSG habitat is usually minimal from these operations because they are temporary in nature, drilling occurs outside important seasons, and the amount of disturbance is negligible.

Portions of the Panguitch and Parker Population Areas also have high or moderate development potential. To date, no leasing of federal coal has occurred in these population areas; however, there is an existing surface-mining operation in the extreme southern extent of the Panguitch Population Area on private lands in the Alton area. The BLM is currently evaluating leasing federal coal adjacent to the existing mining operations through a NEPA process.

Future development in the Panguitch Population Area could include both surface and underground mining activities. The impacts would depend on which type of mining occurs in the area. Refer to the general discussion above for impacts from underground and surface mining to GRSG. Overall, underground mining would impact GRSG less than surface mining. Proposed development of federal minerals could result in loss of nesting, brood rearing, and winter habitat. Development of the coal mine, removal of the overburden, and surface-mining operations would result in the long-term loss of habitat and displacement of individual birds. Although mitigation and reclamation could reduce the impacts, development of the coal mine could result in loss of the local population and retraction of the southern extent of GRSG habitat.

Locatables

Under Alternative A, 498,200 acres (12 percent) of federal mineral estate in the decision area would remain withdrawn from location under the Mining Law of 1872, as amended, and an additional 560 acres (less than 1 percent) would continue to be petitioned for withdrawal. These minerals can be extracted at three levels that could cause different impacts on GRSG. Casual use as defined in 43 CFR 3809.5 and similarly for National Forest System lands in 36 CFR 22834(a)(1) is one level of disturbance that could occur in the areas that are not withdrawn from mineral entry. While there are no GRSG stipulations associated with casual use mineral

extraction, the operators remain responsible to prevent undue and unnecessary degradation and ensure full reclamation of any disturbance created while engaging in casual use activities, as required by 43 CFR 3809.5. Casual use, which does not involve use of mechanized equipment, typically results in limited to no surface disturbance. Impacts associated with casual use would be a short-term, temporary disruption of birds.

A notice is required for exploration activity greater than casual use that will cause surface disturbance of 5 acres or less on BLM-administered lands and on nonfederal lands with federal mineral interest. On National Forest System lands, an NOI is required from any person proposing to conduct operations that might cause significant disturbance of surface resources (36 CFR 228.4(a)). For activities under BLM jurisdiction, the content of the notice will determine whether the operation qualifies as a notice-level operation and will not cause undue and unnecessary degradation (43 CFR 3809.21). Activities qualifying under a notice could cause more direct habitat loss, and possibly fragment and degrade GRSG habitat. For activities under Forest Service jurisdiction, the content of the NOI will determine whether the operation is causing or will likely cause significant disturbance of surface resources, which would require a plan of operations (36 CFR 228.4(a)(4)). Disturbance and disruption associated with exploration activities are typically intermittent, short term, and limited in extent.

When mining development requires a plan of operations, by meeting the criteria under 43 CFR 3809.11 and 43 CFR 3809.21 or 36 CFR 228.4(a)(4) or because total unreclaimed disturbance will exceed 5 acres (43 CFR 3809.21), impacts on GRSG would be greater than under notice level operations or an NOI since the area being affected could increase. The impacts on GRSG would depend on the size and location of the operation (e.g., seasonally sensitive habitats). These operations may use certain equipment (e.g., mechanized earth-moving equipment, truck-mounted drilling equipment, and motorized vehicles in areas closed to OHV use) that may contribute to increased habitat fragmentation by causing habitat loss, degradation, or direct disturbances to the GRSG. Operations that use chemicals in the recovery or processing of minerals (e.g., cyanide leaching, explosives, and mercury) could cause impacts on GRSG and their habitat similar to those described in the general impacts section, above. All of these actions would lead to the functional loss of habitat in the area. Locatable mining in GRSG habitat is not identified as a primary threat within the decision area. While there are mining claims in GRSG habitat, actual locatable mining in GRSG habitat is minimal. Therefore, anticipated locatable mining impacts on GRSG population growth and GRSG population persistence are expected to be low.

Mineral Materials

Under Alternative A, 3,935,080 acres of GRSG habitat would be open to mineral materials development and 73,500 acres would be closed. While development of mineral materials would occur throughout the decision area, the scale of development is relatively small and is often close to human development or some type of existing infrastructure. Use of these areas is usually small in scale, localized, and not continuous. Commercial mineral material sites could cause a higher amount and intensity of impact on GRSG habitat due to a potential for larger areas of development and continuous operation of the sites. There are 8 sales contracts in GRSG habitat in the planning area, and the average permit size for these areas is 82 acres. It is important to note that the amount of surface disturbance in an area is not the same as the size

of the permit. If development occurs near leks or in nesting, brood-rearing, or wintering habitat, it could decrease nest success, chick survival, and adult survival. Due to the scale and recent mineral material development trends in GRSG habitat, anticipated impacts on GRSG population growth and GRSG population persistence are expected to be low.

Fluid Minerals (Including Geothermal)

Under Alternative A, 1,333,300 acres of GRSG habitat would be open to fluid mineral leasing with standard stipulations, 1,300,400 acres would be open with moderate constraints, 483,500 acres would be open with major constraints, and 138,500 acres would be closed to fluid mineral leasing. Impacts from oil and gas activities would likely be greatest in areas open with standard stipulations, lower in areas with moderate constraints, and negligible in areas where there are major constraints or areas closed to fluid mineral leasing.

Some NSO stipulations would be applied to leases to protect GRSG leks, but buffers vary across the planning area from 0.25 mile to all GRSG occupied habitat. In general, recently completed plans include a larger protective buffer. Even in areas identified to be managed with NSO stipulations for GRSG, there may be valid existing rights that pre-date the LUP decision that established the NSO stipulation area. These previously leased parcels may have few or no stipulations to protect GRSG. In these areas, COAs would likely be applied to proposed developments to protect BLM and Forest Service sensitive species (including GRSG), but these would not be consistently applied throughout the decision area because currently there is no agreed-upon list of COAs. In addition to surface use restrictions, most LUPs have seasonal restrictions to protect GRSG. This includes TL stipulations to protect nesting, brood-rearing, and wintering habitat. Not all plans include a stipulation for winter habitat, and the plans are not consistent across the decision area.

Research indicates that stipulations commonly applied by the BLM and Forest Service to oil and gas leases and permits do not adequately address the scope of negative influences of development on GRSG (Holloran 2005; Walker et al. 2007a). Continued exploration and development of traditional and nonconventional fossil fuel sources in the eastern portion of the GRSG range is predicted to continue to increase over the next 20 years (US Energy Information Administration 2013a). GRSG populations are negatively affected by energy development activities, even when mitigation measures are implemented (Holloran 2005; Walker et al. 2007a, Kirol et al. 2015). Present threats to GRSG are contributing to the destruction and modification of GRSG habitat.

In addition to stipulations specifically intended to protect GRSG, in some cases, CSU, TL, and NSO stipulations developed for protection of other resources could indirectly provide protection for GRSG. For example, stipulations designed to protect crucial mule deer winter habitat could provide protection for GRSG winter habitat, to the extent that these areas overlap. However, if waivers, exceptions, or modifications are granted, any incidental protection that would have been afforded by NSO, CSU, and TL stipulations intended to protect other resource values could be removed. In addition, while stipulations intended to protect other resources may provide indirect protection from disturbance during certain seasons, they would not prevent loss of habitat from activities that are allowed during other seasons.

In other cases, CSU, TL, and NSO stipulations developed for protection of other resources outside GRSG habitats could result in development shifting into GRSG habitat where there may currently be fewer restrictions, resulting in increased potential for habitat loss, degradation, and disturbance to birds.

There is a high potential for energy development to impact sagebrush-obligate species (Holloran 2005; Sawyer et al. 2006; Walker et al. 2007a) because the five geologic basins that contain most of the onshore oil and gas reserves in the Intermountain West overlap with the sagebrush ecosystem (Connelly et al. 2004). Impacts can result from direct habitat loss; fragmentation of important habitats by roads, pipelines, and power lines; noise; and direct human disturbance (Holloran 2005; Kaiser 2006; Holloran et al. 2007). GRSG population declines can often be attributed to the negative effects of energy development that is additive to the impacts from other human development and activities (Harju et al. 2010; Naugle et al. 2011). Population declines associated with energy development result from the abandonment of leks, decreased attendance at leks that persist, lower nest initiation, decreased nest success, decreased chick survival and yearling survival, and avoidance of energy infrastructure in important wintering habitat areas (Braun et al. 2002; Holloran 2005; Kaiser 2006; Aldridge and Boyce 2007; Walker et al. 2007a; Doherty et al. 2008; Harju et al. 2010; Holloran et al. 2010; Gregory and Beck 2014).

Avoidance of energy development reduces the distribution of GRSG and may result in population declines through avoidance of suitable habitat or disruption of breeding activities (Braun et al. 2002; Aldridge and Brigham 2003; Doherty et al. 2008). Visible energy wells have been found to be associated with increased risk to chick survival (Aldridge and Boyce 2007). In the Greater Green River Basin area, yearling male GRSG reared near gas field infrastructure had lower survival rates and were less likely to establish breeding territories than males with less exposure to energy development; yearling female GRSG avoided nesting within 0.6 mile of natural gas infrastructure (Holloran et al. 2010). The fidelity of GRSG to natal sites may result in birds staying in areas with development, but they do not breed (Lyon and Anderson 2003; Walker et al. 2007a; Holloran et al. 2010). The amount of direct GRSG habitat loss is determined by well densities and ancillary facilities but should also consider other ancillary infrastructure, including flow lines, other roads, compressor stations, pumping stations, and electrical facilities necessary to develop a field. The types of wells and associated facilities can vary depending upon the individual field. Facilities include pump jacks, separators, storage tanks, electrical lines, produced water ponds/pits, or water discharge pipelines (Connelly et al. 2004).

Direct habitat loss from fluid minerals development would occur because of vegetation clearing (well pads, access roads, and ancillary facilities). Loss or modification of sagebrush communities would result in loss of GRSG habitat for approximately 20 to 30 years. In some cases, sagebrush areas may not be restored to the point where they are capable of supporting GRSG during the life of the plan amendment.

Habitat fragmentation could occur because of energy development. Fragmentation is the result of habitat loss or alteration that breaks GRSG habitat into smaller patches. While there is limited information on minimum habitat patch size for GRSG, they generally rely on large, contiguous, or interconnected expanses of sagebrush to accommodate local migrations and

access seasonal habitats distributed within their inhabited range (Connelly et al. 2004). Due to this, fragmentation of sagebrush habitats has been cited as a primary cause of the decline of GRSG populations (Patterson 1952; Connelly and Braun 1997; Johnson and Braun 1999; Connelly et al. 2000; Miller and Eddleman 2000; Aldridge and Brigham 2003; Beck et al. 2003; Connelly et al. 2004; Schroeder et al. 2004; Leu and Hanser 2011). Several studies have documented negative effects of fragmentation as a result of oil and gas development and its associated infrastructure on lek persistence, lek attendance, winter habitat use, recruitment, chick survival, yearling annual survival rate, and female nest site choice (Holloran 2005; Aldridge and Boyce 2007; Walker et al. 2007a; Doherty et al. 2008). Human alterations, uses, and impacts, coupled with natural variability (e.g., drought), have changed the extent, condition, and distribution of sagebrush-steppe and the ecosystem services these biomes provide (Meinke et al. 2009); current GRSG range is estimated to be 65 percent of historic (prior to Euroamerican contact) distribution (Stiver et al. 2006). Disrupted disturbance regimes, degraded or depressed native species, and dominance by introduced noxious plants have moved many of these systems towards, or beyond, critical thresholds from which restoration is difficult or excessively time-consuming and expensive (Meinke et al. 2009). Analyses conducted by Wisdom et al. (2011) demonstrate that fragmentation due to disturbance results in reduced population numbers and population isolation. There are no management decisions under Alternative A specifically designed to protect GRSG habitat from fragmentation.

Population trends in the Powder River Basin indicated that from 2001 to 2005, lek count indices inside gas fields declined by 82 percent, whereas indices outside development declined by 12 percent. By 2004 and 2005, 38 percent of leks inside gas fields remained active, whereas 84 percent of leks outside of development remained active (Walker et al. 2007a). Studies that assessed impacts of energy development on GRSG found negative effects, whereas no studies reported a positive influence of development on populations or habitats (Naugle et al. 2011). Studies consistently reported that breeding populations of GRSG were negatively impacted at conventional well pad densities of 4 and 8 well pads per square mile, with declines in lek attendance by male GRSG ranging from 13 to 79 percent (Harju et al. 2010; Naugle et al. 2011). Lek attendance declines have consistently been reported when well pad densities exceed 1 pad per square mile within approximately 2 miles of a lek (Tack 2009 as cited by Naugle et al. 2011). Well pad densities exceeding approximately 0.4 pad per section within 11 miles of leks negatively influenced lek trends range-wide (Johnson et al. 2011), and larger leks (greater than 25 males) did not occur in areas where well pad densities exceeded 2.5 pads per section within 7.6 miles of a lek (Tack 2009). A recent study reported that the probability of lek persistence (e.g., leks remaining active) approached 0 percent when well pad densities exceeded approximately 6.5 pads per section (Hess 2012 as cited by Manier et al. 2013). Gregory and Beck (2014) recently evaluated various effects of development out to various distances from leks, and their findings suggest that 1 well pad within 1.2 miles leads to immediate lek attendance declines. In addition, they suggest a time-lag effect when industrial development occurs within 6.2 miles of a lek. Stipulations often restricted surface occupancy within 0.25 mile of a lek during the time of most studies, and leks that had one or more pads within this radius had 35 to 92 percent fewer attending males than did leks with no wells within this distance (Harju et al. 2010; Naugle et al. 2011). In general, the research suggests that GRSG are negatively affected when well pad densities within approximately 2 miles of a lek exceed 1 well pad per section and when leks become surrounded by infrastructure. Energy development as far as 4 miles of a lek may

negatively influence lek attendance (Naugle et al. 2011). At this time, well pad densities in many developed areas in the Uintah Population Area exceed 6.5 pads per section, suggesting that there is most likely a substantial impact on any leks in the area. Since well pad densities in some areas surpass the rate of disturbance at which research suggests there is an impact on GRSG, it is reasonable to assume that GRSG within developed areas are being negatively impacted to some degree. In addition, there are varying buffers maintained through NSO stipulations in these areas. More focused studies are needed in Utah and within those population areas to further understand all of those impacts and to what degree the individual populations are being affected.

Impacts on leks from energy development were most severe near the lek, remained discernible out to distances greater than 3.7 miles, and have resulted in the extirpation of leks within gas fields (Holloran 2005; Walker et al. 2007a). Curvilinear relationships in Holloran (2005) showed that lek counts decreased with distance to the nearest active drilling rig, producing well, or main haul road, and that development influenced the counts of displaying males to a distance of between 2.9 and 3.85 miles (Figure 5). All well-supported models in Walker et al. (2007a) indicated a strong negative effect of energy development, estimated as proportion of development within either 0.25 mile or 2 miles, on lek persistence. Models with development at 4 miles had considerably less support indicating that negative impacts were still apparent out to 3.85 miles. Based on Walker and others (2007a), a 0.25-mile buffer around leks is insufficient to conserve breeding GRSG populations. Furthermore, full-field development of 98 percent of the landscape within 2 miles of leks in a typical landscape in the Powder River Basin reduced the average probability of lek persistence from 87 percent to 5 percent (Walker et al. 2007a). Management under Alternative A only limits activities outside 0.25-mile to 3.1-mile lek buffers with NSO stipulations within the GRSG habitat. Habitat outside of the buffers is still open to development outside of seasonal time periods. According to the Wyoming research, where prevalent energy development overlaps with GRSG population areas, impacts could be substantial. Further studies within Utah are needed to confirm if already fragmented populations respond similarly to Wyoming populations. In the meantime, the best available science on oil and gas development impacts on GRSG is from Wyoming.

Impacts from roads may include direct habitat loss, direct mortality, barriers to migration corridors (depending on size of road and season of use) or seasonal habitats, facilitation of predators and spread of invasive vegetation species, and other indirect influences such as noise (Forman and Alexander 1998, Blickley et al. 2012a). For a detailed description of impacts on GRSG from these impacts, except noise (discussed above), refer to the infrastructure section.

General impacts from roads document that GRSG avoided nesting and summering near major roads (e.g., paved secondary highways) in southcentral Wyoming (LeBeau 2012), and traffic disturbance (1 to 12 vehicles per day) within 1.9 miles of leks during the breeding season reduced nest-initiation rates and increased distances moved from leks during nest site selection of female GRSG in southwestern Wyoming (Lyon and Anderson 2003). Roads may be the primary impact of oil and gas development on GRSG due to their persistence and continued use even after drilling and production have ceased (Lyon and Anderson 2003). Daily vehicular traffic along road networks for oil wells can impact GRSG breeding activities based on lek abandonment patterns (Braun et al. 2002). A recent summary of studies investigating GRSG response to natural gas development reported impacts on leks from energy development were

most severe when infrastructure occurred near leks and that impacts remained discernible out to distances of 3.8 to 4 miles (Naugle et al. 2011). In summary, research suggests that roads within 4.7 miles of leks negatively influence male lek attendance (Connelly et al. 2004). This suggests that the current NSO stipulation areas (except the Uinta-Wasatch-Cache National Forest) would not be adequate to maintain persistent GRSG populations.

Declines in GRSG population growth (21 percent) between pre- and post-development was primarily attributed to decreased nest success and adult female annual survival; treatment effect (proximity to gas field infrastructure) was especially noticeable on annual survival of nesting adult females (Holloran 2005; Taylor et al. 2013). Annual survival of individuals reared near gas field infrastructure (yearling females and males) was significantly lower than control individuals that were not reared near infrastructure (Holloran et al. 2010). Yearling female GRSG avoided nesting within 0.6 mile of the infrastructure of natural gas fields (Holloran et al. 2010), and visible wells within a 247-acre area negatively influenced female selection of nesting habitats (Kirol 2012). Female early brood-rearing (early June to early July) locations were negatively correlated with the number of visible wells within a 247-acre area, and late brood-rearing females (early July through late August) avoided habitats when a surface disturbance (e.g., well pads and improved roads) threshold of approximately 5 percent of a 1,200-acre area was surpassed (Kirol 2012). In general, females selecting habitats near infrastructure have demonstrated lower annual survival (resulting in population-level declines in response to development), and females influenced by development activity within 1.8 miles of the lek are less likely to initiate a nest (Manier et al. 2013). Studies in southwest Wyoming showed that early in the development process, nest sites were farther from disturbed leks than from undisturbed leks, that nest-initiation rate for females from disturbed leks was 24 percent lower than for GRSG breeding on undisturbed leks, and that 26 percent fewer females from disturbed leks initiated nests in consecutive years (Lyon and Anderson 2003). Similarly, in northeast Wyoming, Kirol and others (2015) evaluated the effectiveness of implementing various mitigation practices in natural gas development areas based on GRSG nest success. Mitigation activities included piping water rather than having on-site reservoirs, reducing vehicle traffic volume, minimizing sagebrush removal, reducing well pad construction, and buffering industrial noise. As a result, analyses suggested that mitigation activities did increase the nest success compared to nest success in unmitigated areas but was not as high as nest success in undeveloped areas. The analysis suggests that the presence of water reservoirs has the largest impact on nesting success in this area. While there is a TL stipulation specifically for GRSG that applies to disturbance during the nesting season, management under Alternative A does not protect nesting habitat year-round from any disturbance. The stipulation protecting the lek does incidentally provide some protection but not to the extent to prevent negative impacts, including direct habitat loss and degradation. Since disturbance has been and would continue to be allowed within 1.8 miles in almost all current plans, decreased likelihood of nesting may decrease the likelihood of population persistence as localized development increases to levels described above in various GRSG nesting and brood-rearing habitats.

In Wyoming, GRSG were 1.3 times more likely to use winter habitat if development was not present (Doherty et al. 2008). Under Alternative A, current plans vary from no protection for GRSG winter habitat to TL stipulations during GRSG winter use. TL stipulations prevent activities from disturbing birds when they would be in winter habitat but would not prevent

development from occurring in winter habitat and resulting in winter habitat loss. Like nesting habitat, the NSO stipulations for leks provide some incidental protection where this habitat overlaps the buffer around the lek. The impacts on GRSG from loss, fragmentation, degradation, and disturbance to winter habitat would most likely be substantial under this alternative.

There is also potential for limited oil sands and tar shale development in Utah. There is one existing oil shale preference right lease in GHMA (White River Oil Shale Oil Shale Research, Development, and Demonstration site and Preference Lease Right Area), and one pending tar sands preference right lease area (Asphalt Ridge Preference Lease Right Area) in GHMA and PHMA. These are the only two areas in GRSG habitat where oil shale and tar sands development would be permitted.

The impacts associated with geothermal leasing and development is essentially the same as those stated above with the exception that they usually require additional facilities (thermal plant). This is usually a centralized facility that harnesses the power produced from several geothermal wells within one area. The Bald Hills Population Area is the only population area where geothermal activity is anticipated. Within the Bald Hills Population Area occupied habitat, there is an existing undeveloped 980-acre geothermal lease with an RFD scenario of five geothermal energy production or produced fluid injection wells. With an estimated surface disturbance of 7 acres per well, including respective access roads and pipelines, 35 acres of long-term surface disturbance would result.

Fluid Mineral Development Reasonably Foreseeable Development in Population Areas

Fluid mineral development would likely be concentrated where there are existing leases that are held by production. These areas have high potential for oil and gas. The majority of these areas are in the Uinta Population Area and portions of the Carbon Population Area.

A cluster of federal oil and gas leases covers the northwest extent of the occupied habitat within the Emery Population Area. There are three federal oil and gas exploratory units; listed from west to east, they are Skyline II, Middle Mountain, and the productive East Mountain Unit. Based on the existing well spacing, the topography, and access, the RFD scenario for the Emery Population Area is 884 acres of disturbance from 45 new wells on 45 new pads during the next 15 years. Some roads and pipelines are already present and would not require additional surface disturbance, thereby limiting further fragmentation and habitat loss. Impacts on the Emery Population Area from the predicted development could result in the loss of functional habitat for GRSG. Even though most of the development is expected to be outside of occupied habitat, there are several existing leases within the northern portion of occupied habitat available to be developed. Development of these leases could add to the fragmentation between the Emery and Carbon Population Areas. Due to the limited knowledge of these small areas of GRSG habitat, the full extent of the potential impact on these populations if development were to occur is not fully understood.

The western portion of the occupied habitat in the Strawberry Population Area covers National Forest System lands, whereas the eastern portion is mostly fee and state lands. The RFD scenario for the occupied habitat within the Strawberry Population Area is calculated as 60 well pads (120 wells), only 4 of which would be located on federal land. Since this is an area with a large amount of birds and a small amount of habitat, if 60 well pads and infrastructure were to

be realized in this area, it would have a substantial impact on the population of GRSG. According to the RFD, construction of 60 well pads could result in 1,247 acres of disturbance with the possibility of 132 miles of pipelines and 132 miles of roads. The Strawberry Population Area has the largest area managed with NSO stipulations (all GRSG habitats), which would protect GRSG on leases issued on National Forest System lands. However, because the majority of development is projected to occur on nonfederal lands, development would most likely result in direct habitat loss, habitat degradation, and fragmentation of the Strawberry Population Area.

A total of 1,417 wells are predicted to be drilled from 709 pads within the occupied habitat of the Carbon Population Area, with a total disturbance estimated to be 6,384 acres. Development of 1,417 wells from 709 pads within occupied habitat in the Carbon Population Area would most likely impact some portions of the population to a greater degree than others. Most of the development is expected to occur in the Gasco, West Tavaputs, Gordon Creek, Drunkards Wash, and Brundage Canyon development areas. Developing 709 pads additional wells and ancillary facilities would likely cause direct habitat loss, functional habitat loss, and fragmentation and may impact the local GRSG population. The development in some of these areas may hinder the function of seasonal habitat for some of the local populations, causing localized population declines. The northern population that uses these areas for most of their life history needs would most likely decline. The population that is centered in the central region of the Carbon Population Area (Emma Park) would be impacted to a lesser degree because development is not currently focused in this area, this habitat would be left more intact, and the local birds are mostly nonmigratory. However, under this alternative, additional leasing and development could still occur in this area, leaving it vulnerable to the impacts of future development.

The Uintah Population Area consists of three distinct areas: a southern area in southern Uintah County and northern Grand County comprising mostly BLM-administered and tribal lands, a smaller eastern portion of the population area on the Utah-Colorado border in central Uintah County with BLM-administered and state lands, and a large east-west area extending from central Duchesne County to the northeastern corner of Utah. The latter area includes tribal, fee, state, BLM-administered, and National Forest System lands.

The RFD scenario estimates that there will be 5,947 acres of disturbance from 788 well pads, with a total of 1,575 wells, 276 miles of road, and 433 miles of pipeline in occupied habitat. Drilling is expected to continue in the southern and western areas, but little drilling will occur in the northeastern corner during the next 15 years.

The 788 wells pads would mainly occur within the Uinta Basin portion of this population area, where oil and gas development is already occurring. Increased development would result in direct habitat loss and fragmentation that could cause the local loss of populations. The larger GRSG populations in the northeastern portion of the Uintah Population Area are less likely to be affected by development and the impacts that oil and gas because there is low oil and gas development potential. However, there is a small area on the Wyoming-Utah border (Clay Basin) that is heavily impacted, and it is anticipated that it will continue to be impacted at the same rate. The eastern portion of the population along the Colorado border has many existing leasing and development activities encroaching from the west. This population will continue to be impacted by development as described above.

An RFD scenario, completed for the Rich Population Area in 2012, projected 712 acres of disturbance from 35 new wells on 35 well pads (13 on federal lands) in the next 15 years, which would cause a direct loss of habitat, most likely lead to the propagation of new roads and other infrastructure, and increase fragmentation. There have not been any successful exploratory actions to date on federal lands, so there is no way to predict where the oil and gas activity would occur and, therefore, where the impacts would take place. However, based on the concentration of leks in the Rich Population Area, development would likely result in direct loss and fragmentation of nesting, brood-rearing, and winter habitats, as described above.

There is little reasonably foreseeable development proposed in the remaining population areas (typically one well during the next 15 years). Any development that does occur will likely be exploratory in nature. Impacts from isolated exploration could include a temporary loss of habitat, short-term disruption from increased human activity, and secondary impacts (e.g., introduction of weeds).

For additional information on the RFD scenario for each population area, refer to **Appendix R**, Oil and Gas Reasonably Foreseeable Development Scenario for Greater Sage-Grouse Occupied Habitat in Utah Sub-Region.

Infrastructure

The infrastructure section of this analysis includes a broad array of activities, including range improvements and fences, mineral development, ROWs and permits for pipelines, communication and meteorological towers, fiber optic lines, power lines, roads, renewable energy facilities, and urban and agricultural development. Though impacts from infrastructure are common throughout Utah GRSG populations, they are particularly pronounced in areas where there is mineral development and areas near large and growing human populations. Under Alternative A, most GRSG habitat would be open to new ROWs, and new infrastructure development (e.g., roads, pipelines, transmission lines, and communication facilities) would be allowed in GRSG habitat. Approximately 27,600 acres of GRSG occupied habitat would continue to be managed as ROW exclusion areas and 67,200 acres would be managed as ROW avoidance areas. While existing ROW avoidance areas are intended to protect other resource values, not GRSG habitat, these areas may provide incidental protection from ROW development. In addition to new roads authorized under ROWs, cross-county OHV travel could occur on 797,000 acres of BLM-administered land that are currently open to cross-country use.

Currently, coal leasing has been identified as unacceptable on 22,900 acres in Utah GRSG management areas. This leaves approximately 432,109 acres of moderate and high coal development available for leasing in GRSG management areas (6 percent is potential surface extraction). For mineral materials in GRSG management areas, only 73,500 acres are closed to mineral material development and there has been low demand for this resource in Utah and in GRSG management areas (64 community pits, 59 free use permits, and 8 sales contracts). Infrastructure development potential associated with fluid minerals and nonenergy leasable minerals development is also high where these resources are found because only 138,500 acres of GRSG habitat are currently closed to leasing.

Some protection of GRSG habitats would be provided by existing protective buffers around leks. Depending on the LUP, some or all infrastructure development may be prohibited within 0.25 mile of a lek in all GRSG habitats. Loss of GRSG habitat would occur across the range of GRSG in Utah. As a result, GRSG populations would be less likely to persist. The greatest loss is expected to occur in the Uintah and Carbon Population Areas where there is high potential for minerals development, the Summit and Morgan County areas of the Rich Population Area due to urban development, and the Sheeprocks Population Area due to ROW authorizations and OHV use.

Construction of linear ROWs is most likely to occur in designated corridors. As discussed in the Lands and Realty section of **Chapter 3**, there are approximately 177,700 acres of designated corridors in mapped occupied GRSG habitat. Impacts on GRSG from construction of transmission lines and other types of linear ROWs are discussed in detail in the ensuing sections.

GRSG are a landscape-scale species and require large expanses of intact sagebrush-dominated areas (Connelly et al. 2004; Schroeder et al. 2004). Increasing human-related fragmentation has broken large expanses of sagebrush areas into smaller and less connected pieces and is attributed as the primary factor in GRSG declines (Aldridge et al. 2008; Johnson et al. 2011, Leu and Hanser 2011, Wisdom et al. 2011). Habitat fragmentation can occur at multiple scales, from nest sites up to the scale of multiple lek complexes. Fragmentation may result from direct habitat loss (e.g., a paved highway), habitat degradation (e.g., increased occurrence of nonnative invasive understory vegetation; Bergquist et al. 2006), or habitat alterations, making the habitat less suitable or unusable (i.e., functional habitat loss; USFWS 2010). Degraded habitat or habitat loss can increase predation rates above natural levels directly (e.g., less suitable cover) and indirectly (e.g., increased energy expenditure from increased movements by hens and broods to find the resources they need to meet life history requirements). A population's resiliency may decline if various types of fragmentation persist over time or occur concurrently. GRSG have a relatively low reproductive output and are a relatively long-lived species (compared to other upland gamebird species) and did not evolve with the combined suite of natural and anthropogenic impacts that may influence a population. At a population level, the effects of fragmentation may decrease or degrade habitat to the extent that movements between populations decrease and potentially result in reduced genetic fitness of populations.

Infrastructure can result in a variety of direct and indirect impacts, including habitat loss, habitat degradation at multiple scales (e.g., invasive species at the microsite habitat scale and increased habitat fragmentation at the seasonal habitat scale and population level), increased likelihood of predation because of increased predator abundance or decreased suitable habitat and cover, increased likelihood of disturbance because of increased human presence, and functional habitat loss as a result of habitat avoidance. GRSG population declines have resulted from avoidance of infrastructure and reduced productivity and/or reduced survival near infrastructure (Holloran 2005). Infrastructure impacts may be associated with avoidance from increased predation risk, noise associated with construction, operation or maintenance, disturbance from traffic volumes, or increased habitat fragmentation. More research is necessary to clarify the mechanisms of these anthropogenic features and how site-specific conditions may affect the extent and magnitude of impacts on GRSG (UWIN 2012; Messmer et al. 2013).

Power Lines

Power lines can result in direct habitat loss, habitat degradation, and GRSG mortality (Braun 1998; Connelly et al. 2004, Beck et al. 2006). The degree of other potential impacts, such as GRSG habitat avoidance near lines or increased predation from the additional perching/nesting opportunities, are difficult to determine due to limited research and multiple confounding factors (e.g., roads, oil and gas development) (Messmer et al. 2013, Walters et al. 2014, Manier et al. 2014). The primary potential reasons for avoidance are thought to relate to increased risk of predation near power lines, especially where perching opportunities are limited (Steenhof et al. 1993; Atamian et al; 2007; LeBeau 2012). Other potential effects of power lines such as electromagnetic fields to GRSG physiology have not been evaluated (Messmer et al. 2013) but have been shown to adversely affect reproduction and development in other bird species (Fernie and Reynolds 2005).

Keeping in mind the difficulties of determining causation, range-wide analyses of the influences of environmental and anthropogenic features on the landscape suggest that GRSG lek trends generally decreased as the number of towers within 3.1 miles and 11.2 miles of leks increased (Johnson et al. 2011). In addition, a Wyoming gas development GRSG study found that probability of lek persistence declined as proximity to transmission lines decreased, and lek persistence declined as power line density increased within a 4-mile buffer of a lek (Walker et al. 2007a).

While predation from eagles perching on newly constructed transmission lines (Ellis 1985) and GRSG mortality from collision with distribution lines (Beck et al. 2006) have been documented, the only research, to date, that has evaluated the effects from the installation of a new transmission line on GRSG has been on the Falcon to Gondor 345 kV line in Nevada. It should be noted that this project only collected GRSG location data for one year prior to the installation of the transmission line. This project demonstrated the complexity of variables that influence GRSG at any one time. For example, the Falcon-Gondor 345 kV line research first concluded that nest locations were not affected by the installation of the line, but once the study took habitat quality into consideration, nest location and female survival did show the line had a substantial effect (Gibson et al. unpublished).

A range-wide evaluation of the effects of increased avian predator abundance, specifically ravens, and resulting predation rates on GRSG has not been conducted. However, the fact that ravens increase in abundance and distribution expansion is well-documented (Boarman et al. 1993; Sauer et al. 2011). Though GRSG are a prey species, there is mounting concern that raven abundance, because of human-related changes on the landscape (e.g., food and substrate), may be increasing nest predation above naturally observed levels in some areas. In support of this, Nevada has found that when raven abundance goes up, likelihood of nest success goes down (Coates and Delehanty 2010). Ravens are a known primary GRSG nest predator in some areas in Nevada and are assumed to be responsible for nest predation events in other states (Coates et al. 2008, Lockyer et al. 2013; Connelly et al. 2011). Furthermore, ravens concentrate foraging behaviors within 1.4 miles of transmission lines, and raven foraging was observed 6.8 miles out from transmission lines (Coates et al. 2014a). Howe and others' (2014) research suggest that the greatest potential for impact on GRSG nests occurs within 0.35 mile of structures, and Dinkins and others (2014) found that risk of death for female GRSG was higher near perches. In

addition, power poles and cross-arms provide nesting opportunities for potential avian predators, such as golden eagles and ravens. In contrast, a Wyoming study found that female GRSG did not avoid habitats close to transmission lines, though the researcher attributed the results to site fidelity and time lags, making population impacts difficult to detect immediately following disturbance (LeBeau 2012).

Degradation of habitat occurs from ground disturbance that decreases habitat availability, may increase predation, and may spread invasive plant species. Infrastructure associated with energy development in the Powder River Basin resulted in increased invasive species presence relative to undeveloped areas (Bergquist et al. 2007). Invasive species introduction and proliferation degrades habitat for GRSG, decreasing habitat function and carrying capacity, resulting in lower bird densities. In general, Wyoming big sagebrush sites in Utah are more susceptible to nonnative vegetation invasion because the elevation is lower, precipitation is less, and there is less understory cover. Some Wyoming big sagebrush sites are reported as providing winter habitat and may only meet winter needs now because the amount of understory vegetation no longer supports GRSG nesting and brood-rearing habitat. Extensive habitat degradation can lead to habitat loss. For example, if cheatgrass increases to the extent that its presence increases fire risk and subsequent fire return intervals, habitat functionality for GRSG can be permanently lost.

GRSG change their behavior in response to noise and increased human presence associated with construction, operation, and maintenance. Similarly, GRSG may change their behavior in response to tall structures (or electromagnetic radiation from communication towers; Balmori 2005, 2006, 2009). As a result, GRSG may be displaced to lower quality habitat that can disrupt breeding and nesting (Lyons and Anderson 2003; Holloran 2005).

Burying power lines in GRSG habitat would avoid GRSG predator perching or nesting opportunities, GRSG avoidance of aboveground power lines, and GRSG collisions with power lines, but there would be ground disturbance in the short term from construction and the potential for aboveground ancillary infrastructure (e.g., vaults). Ground disturbance occurring during construction, repairs, and maintenance may result in large, permanent displacement of excavated soil and subsequent issues with re-establishing native vegetation and preventing the overgrowth of invasive species.

Communication Towers

Impacts from communication towers can be similar to those from power lines, including direct habitat loss, habitat degradation, GRSG habitat use avoidance, and mortality (Braun 1998; Connelly et al. 2004). GRSG avoidance of habitat due to tall communication tower structures may be due to electromagnetic between electromagnetic radiation within 500 meters of communication towers and a number of species' decreased reproductive success (Balmori 2005, 2006, 2009). In addition, recent modeling suggests GRSG are specifically avoiding habitat in close proximity to communication towers (Knick et al. 2013), resulting in functional habitat loss. Wisdom et al. (2011) reported the mean distance to cellular towers in occupied GRSG range (13 miles) was almost twice that of extirpated range (7 miles).

Roads

Impacts from roads are similar to those from power lines and communication towers and may include direct habitat loss, habitat degradation, GRSG habitat avoidance, and mortality from

collision with vehicles or increased predation rates (Braun 1998; Connelly et al. 2004). Roads result in direct habitat loss, fragment the habitat by impeding use of migration corridors or seasonal habitats, facilitate habitat degradation in the remaining habitats by creating a corridor along which invasive plants can spread (Bergquist et al. 2007), increase noise disturbance that can result in GRSG habitat use avoidance (i.e., functional habitat loss) (Blickley et al. 2012a), and increase mammalian and avian predator abundance (Forman and Alexander 1998). Connelly and others (2004) suggest road traffic within 4.7 miles of leks negatively influences male lek attendance. Similarly, lek count trends are lower near interstate, federal, or state highways compared with secondary roads (Johnson et al. 2011), and Connelly and others (2004) reported no leks within 1.25 miles of an interstate and, in general, leks closer to the interstate had higher rates of decline than leks further away from the interstate. In Montana and southern Canada, as the miles of roads within 2 miles of a lek increased, the likelihood of lek persistence decreased (Tack 2009).

Fences

Fences may also cause habitat disturbance and degradation, but the impacts may not rise to the same level of power lines and roads. Fences do result in direct mortality from collisions, and impacts may be substantial in localized areas (see additional discussion on fence collisions under the Grazing section). In addition, fence posts may provide predator perch sites, and linear fence corridors may facilitate predator movements into contiguous GRSG habitats for mammalian species that tend to follow linear features. Fences may allow for the invasion or spread of invasive weeds along the fencing corridor. Furthermore, fences may result in habitat fragmentation and functional habitat loss, as GRSG may avoid habitat around the fences to escape predation (Braun 1998). Fencing impacts likely vary depending on the population and landscape topography (Stevens 2011).

Renewable Energy

Wind-generating facilities have increased in size and number and currently surpass the pace of other renewable development in the GRSG range (USFWS 2010). Similar to nonrenewable energy development, impacts on GRSG from wind development facilities include roads, power lines, noise, and increased human presence (Connelly et al. 2004). These impacts are associated with both construction and operation of wind energy facilities, which increase habitat fragmentation through habitat loss and degradation and directly disturb GRSG. While there are impacts that are unique to wind development (e.g., noise produced by the rotor blades, GRSG mortality from flying into rotors, and GRSG avoidance of structures) most of the impacts are from the roads and power lines necessary for construction and maintenance (see Infrastructure section; Connelly et al. 2004). Only one study in southcentral Wyoming has evaluated the specific immediate impacts of wind development on GRSG and found that while birds were not avoiding nesting or using brood-rearing habitat near wind turbines, nesting success and brood survival decreased in close proximity to wind turbines (LeBeau 2012). Based on GRSG population response time lags documented in coalbed natural gas development (Walker et al. 2007a), impacts may take 2 to 4 years before population responses are observed (Manier et al. 2013). LeBeau (2012) found that adult female survival did not appear to be affected by wind turbines.

There is no utility-scale wind energy development within occupied GRSG habitat in Utah. However, high wind potential exists on 35,500 acres of occupied GRSG habitat, mainly within the Rich, Carbon, and Hamlin Valley Population Areas. Assuming wind energy demand increases at the current rate, these are the areas where wind development would most likely occur. Under Alternative A, most GRSG habitat would be open to new wind ROWs, and wind energy applications would be processed on a case-by-case basis. Depending upon the size and location of permitted wind development in GRSG habitat, there could be impacts ranging from discountable in less important habitats to decreasing the population growth rate if placed in important habitats. COAs could be applied to reduce impacts on GRSG, but they would not be consistently applied across the decision area. Therefore, wind development in GRSG habitat would be expected to result in habitat loss, degradation, fragmentation, and direct disturbance to the birds. In the Rich Population Area, high wind potential overlaps approximately 2 percent of population in nesting and brood-rearing habitat. In the Hamlin Valley Population Area, high wind potential overlaps approximately 15 percent of the population's habitat, including high-elevation brood-rearing habitat. While the value of this area to GRSG is not well understood, it would decrease brood-rearing habitat in an area where habitat is limited. In a portion of the Carbon Population Area (Anthro), high wind potential overlaps half of the primary habitat area and would impact all seasonal habitat types (breeding, nesting, brood-rearing, and wintering). If wind development were to occur, it would be in an area that supports a small population where habitat is already fragmented and limited. Based on LeBeau's research (2012), nests and broods near wind facilities would have a lower rate of success and such declines in these vital rates, especially impacts on nest success, would decrease the population growth rate in these populations and may lead to loss of the population over time (Taylor et al. 2012).

Fire

Fire is the primary threat to GRSG populations in the western half of their distribution. In the Great Basin, fire has been increasing in size and frequency (Baker 2011). Fire is particularly problematic in sagebrush systems because it kills sagebrush plants and, in some cases, re-burns before sagebrush has a chance to re-establish.

Fire is a primary threat to GRSG populations where increasing exotic annual grasses, primarily cheatgrass, are resulting in sagebrush loss and degradation (USFWS 2010). Cheatgrass can more easily invade and create its own feedback loop in areas that are dry, with the understory vegetation cover that is not substantial, or where surface-disturbing activities (e.g., road construction) take place. It can facilitate short fire-return intervals by outcompeting native herbaceous vegetation with early germination, early moisture and nutrient uptake, prolific seed production, and early senescence (Hulbert 1955; Mack and Pyke 1983; Pellant 1996). Furthermore, by providing a dry, fine fuel source during the peak of fire season, cheatgrass increases the likelihood of fire and thus increases the likelihood of further cheatgrass spread (Pellant 1990). Without fire, cheatgrass dominance can prevent sagebrush seedlings from establishing, though the presence of cheatgrass is attributed to larger and more frequent fires in the Great Basin (Balch et al. 2013). With fire, areas can be converted to annual grasslands. Without shrubs and a diversity of grasses and forbs, such annual grasslands will not support GRSG, and populations could be displaced.

Fire risk and the likelihood of the cheatgrass fire cycle in GRSG habitat is highest in arid, low-elevation areas with Wyoming big sagebrush (*Artemesia tridentata* ssp. *tridentata*), particularly in areas where there is ground disturbance or bare ground (e.g., recently burned areas). Ground disturbance, such as roads, facilitate establishment and spread of cheatgrass and other invasive weeds (see discussion on infrastructure and invasive species; Gelbard and Belnap 2003). While fires do occur within higher-elevation mountain big sagebrush (*Artemesia tridentata* ssp. *vaseyana*) GRSG habitats, typically they are smaller and lower-intensity fires. This is primarily due to higher precipitation levels, resulting in higher fuel moisture levels, more robust understory vegetation, and more rapid growth rates.

Another factor affecting fire in some sagebrush sites is the encroachment of pinyon and juniper trees from higher elevations downslope into sagebrush habitats (Baker 2011; Balch et al. 2013). Under suitable conditions, wildfires that start in pinyon and juniper stands can move into Wyoming big sagebrush stands. In the absence of cheatgrass, Wyoming sagebrush sites can take 150 years to recover. Where cheatgrass is present, fire can open the site to invasion of annual grasses as described above.

In Utah, most of the population areas are susceptible to some level of cheatgrass invasion and subsequent fire. This is especially the case in the Wyoming big sagebrush sites at lower elevations in the western part of the state (Box Elder, Ibapah, Sheeprocks, Hamlin Valley, and Bald Hills Population Areas). Low-elevation areas are less resistant and resilient to cheatgrass invasion, have a higher likelihood of burning, and are more difficult to rehabilitate after a fire due to their warmer and drier soils (Chambers et al. 2014). Depending on the amount of habitat available to the birds, a single fire can influence a local population's distribution, migratory patterns, and overall habitat availability (Fischer et al. 1997). If a large area of GRSG habitat burns and repeatedly burns in subsequent years, it could lead to the extirpation of a local GRSG population (Pedersen et al. 2003). In degraded GRSG habitats where cheatgrass is dominant under the sagebrush canopy, the habitat may be adequate winter habitat or provide adequate cover for nesting. However, these areas may lack the understory forb diversity and insect abundance necessary for brood rearing and could result in lower chick survival. As GRSG habitats become smaller and less connected to adjacent GRSG populations, they become increasingly susceptible to stochastic events and local extirpation (Knick and Hanser 2011; Wisdom et al. 2011).

The cheatgrass fire cycle causes GRSG habitat loss and degradation on an annual basis. Currently, due to the extent of the threat, there are no management actions that can effectively alter this trend, and fires are predicted to reduce GRSG habitat within the Great Basin by 58 percent in the next 30 years (Miller et al. 2011). While research and management efforts are focused on developing means of controlling cheatgrass on a large scale, the only current management actions under the fire program to minimize the likelihood of fire ignition or the extent of fire in GRSG habitat are fuels treatments, pre-suppression planning, fire prevention efforts, and effective fire suppression geared toward protecting GRSG habitat. Current fire suppression efforts lead to the suppression of 93 to 98 percent of all fires. Under the infrastructure, minerals, and recreation sections, facilitating the spread of cheatgrass and the likelihood of ignition through BLM-administered and Forest Service-authorized programs is further discussed.

In general, BLM and Forest Service planning decisions have had limited effect to decrease fire occurrence in GRSG habitats. Under Alternative A, the BLM would continue to follow guidance provided in BLM IM 2011-138, Sage-Grouse Conservation Related to Wildland Fire and Fuels Management. This IM provides BMPs, habitat maps, and guidelines applicable to fire and fuels management functions and prioritizes GRSG and their habitats for fire suppression. The majority of the fire management decisions are related to fire suppression, fuels management (e.g., prescribed fire, shrub or woodland control, or fuelbreaks), and reclamation after fire. In general, fuels management, stabilization, and rehabilitation efforts are not specifically focused on GRSG, but GRSG may benefit from reduced fire size in sagebrush habitats, post-fire site stabilization, or rehabilitation of diverse native vegetation communities. However, recent research found that past post-fire rehabilitation efforts have yielded little benefits for GRSG (Arkle et al. 2014), though past projects were not specifically focused on rehabilitating GRSG habitat. Future fuels projects would consider where and how to best protect GRSG habitat from fire while conserving GRSG habitat quality. Some LUPs promote the use of native seed for stabilization and rehabilitation, but this guidance is not consistently applied across the decision area.

Under this alternative, fires would likely continue to increase in size and frequency in GRSG habitats, and those habitats would continue to be degraded or lost. Small and heavily disturbed population areas with cheatgrass-invaded habitats, such as Ibapah, Hamlin Valley, and Sheeprocks would be particularly susceptible to these impacts.

Results from the Great Basin VDDT modeling effort (see **Appendix V**) for Alternative A are presented in **Table 4.2**. **Table 4.2** presents the modeled percentage of sagebrush within mapped occupied habitat in each population area that provides between 10 and 30 percent sagebrush cover. That reflects the degree of sagebrush coverage in the mid- to late-seral stage, which is typically the areas identified as providing for GRSG habitat needs (Connelly et al. 2000). Based on current levels of management and vegetation treatment, the modeled trends reflect that areas such as the Emery, Hamlin Valley, Ibapah, Strawberry, and Box Elder Population Areas will have stable to increasing trends in the amount of acres that provide GRSG habitat. Parker Mountain, Panguitch, Bald Hills, and Carbon Population Areas are anticipated to decrease in the short term but hold relatively steady in the long term. The model indicates that current levels of management are not sufficient to alter the decreasing trend of sagebrush in the Sheeprocks Population Area and the population areas associated with the Wyoming Basin (Rich, Uintah, Lucerne, Wyoming-Uinta, and Wyoming-Blacks Fork). The model shows this is due to the collective pressures from conifer encroachment, fire, and nonnative annual grasses. Under Alternative A, the percent of these areas that provide GRSG habitat would be on a negative trend.

Under current management, fire would continue to be a concern in the majority of the population areas. However, according to the model, the number of acres burned annually is projected to slightly decrease in the next 50 years in all population areas except the Sheeprocks, where there is a steady trend. Reductions in the amount of fire would result in minor reductions in the amount of annual GRSG habitat loss.

Table 4.2
Sagebrush Condition and Trend Analysis: Comparing Alternatives by Percent of Sagebrush Area in Mid or Late Seral Classes for Population Areas at 10 Years and 50 Years – Alternative A

Population Area	Percent of Sagebrush Area in Mid- and Late-Seral Class		
	Current Conditions	10 Years	50 Years
Uintah	80	76	67
Carbon	66	57	58
Emery	77	83	85
Parker Mountain	70	67	68
Panguitch	70	67	68
Bald Hills	70	67	68
Hamlin Valley	36	45	54
Ibapah	36	45	54
Sheeprocks	53	46	38
Box Elder	55	61	70
Rich	80	76	67
Strawberry	76	76	78
Lucerne	80	76	67
Wyoming-Uinta	80	76	67
Wyoming-Blacks Fork	80	76	67
All	**57**	**60**	**65**

Invasive Plant Species

Weeds

In this analysis, invasive plant species are considered both nonnative and native plants that result in GRSG habitat degradation and loss. Species (such as diffuse knapweed *(Centaurea diffusa)*, spotted knapweed *(Centaurea stoebe)*, Russian knapweed *(Rhaponticum repens)*, dyers wood *(Isatis tinctoria)*, leafy spurge *(Euphorbia esula)*, hoary cress *(Cardaria draba)*, and several thistles) can invade rangelands and any area in GRSG habitat where soils are disturbed. In riparian areas used by GRSG, species such as Johnson grass *(Sorghum halepsense)*, purple loosestrife *(Lythrum salicaria)*, perennial pepperweed *(Lepidium latifolium)*, poison hemlock *(Conium maculatum)*, and saltcedar *(Tamarix chinensis)* can invade riparian areas, altering the plant composition and reducing the forb component. Medusahead *(Taeniatherum caput-medusae)* is an annual grass that is a growing concern in northern Utah because of its extremely competitive nature. Of particular concern to GRSG habitats is invasive plant species, most notably downy brome, otherwise known as cheatgrass. Invasive plant species can proliferate with surface disturbance (Rice and Mack 1991; Gelbard and Belnap 2003; Zouhar et al. 2008) or without disturbance (Young and Allen 1997; Roundy et al. 2007), and multiple factors (e.g., wildfire, energy development, infrastructure, mining, and over-grazing) may result in invasive plant species colonizing, replacing, and outcompeting desirable native species. In general, surface-disturbing activities could cause erosion, loss of topsoil, and soil compaction, which could affect the ability of native vegetation to regenerate and could facilitate the invasion of invasive plant species. The extent and magnitude of effects that invasive plant species have on GRSG habitat depends upon a variety of factors, including ecological site potential, pre-disturbance sagebrush condition and

composition, and the presence of propagules or sprouting of native species (West and Yorks 2002; Beck et al. 2009; Epanchin-Niell et al. 2009; Condon et al. 2011).

Invasive plant species alter plant community structure and composition, productivity, nutrient cycling, and hydrology and may cause declines in native plant populations, including sagebrush, through competitive exclusion and niche displacement, among other mechanisms. Invasive plant species reduce and, in cases where monocultures occur, eliminate vegetation that GRSG use for food and cover. Invasive plant species do not provide suitable GRSG habitat, since chick survival depends on a diversity of native forbs and associated insects. As a result, areas that become completely converted to invasive plant species can be considered to be habitat lost to GRSG. GRSG also depend on sagebrush, which is eaten year-round and used exclusively throughout the winter for food and cover. Along with replacing or removing vegetation essential to GRSG, invasive plant species can fragment existing GRSG habitat or reduce habitat quality. Invasive plant species can also create long-term changes in ecosystem processes, such as fire-cycles (see discussion under Fire, above) and other disturbance regimes that persist even after an invasive plant is removed (USFWS 2010).

Under current management, each field office or forest would use their Weed Management Plan, Normal Year Fire Rehabilitation Plan, Standard Operation Procedures, and COAs to address noxious weed issues and help ameliorate the threat of invasive plant species to GRSG. Emergency stabilization and rehabilitation after wildland fire can help prevent the introduction of invasive plant species, and wildland fire suppression can provide long-term protection to intact native vegetation, thereby preventing the spread and conversion to invasive plant species. Current BLM and Forest Service policies do not require that GRSG are prioritized above other resources. Given the extent of cheatgrass, and the fact that it is not a noxious weed, invasive plant programs are unlikely to directly treat or suppress this species.

Invasive plant species would continue to be introduced and spread as a result of ongoing vehicle traffic in and out of GRSG habitat, recreational activities, wildlife, improper livestock grazing, fire, and surface-disturbing activities (e.g., construction of ROWs and roads, mineral development, and fuelbreaks). Areas most susceptible to cheatgrass invasion are low-elevation areas with low understory vegetation cover and surface-disturbing activities. Sheeprocks and Ibapah already have cheatgrass-dominated areas and are at high risk for cheatgrass expansion. One of the Sheeprocks primary wintering areas is a Wyoming big sagebrush stand with a cheatgrass understory and is particularly susceptible to fire. A fire would result in winter habitat loss and could limit winter survival and subsequently impact the entire population. Other potentially susceptible population areas are the Box Elder, Hamlin Valley, and Bald Hills, where there are currently low levels of cheatgrass, but the frequent occurrence of fires may facilitate the spread of cheatgrass. The spread of cheatgrass in these areas would degrade habitat and may eventually lead to habitat loss from fire.

According to the VDDT model, during the next 50 years it is projected that the percent of annual grass would increase or remain stable in all population areas except Box Elder and Strawberry. Decreases in annual grasses are expected in these two areas. As shown in **Table 4.3** during the next 50 years it is estimated that annual grasses would constitute less than 10

Table 4.3
Alternative A VDDT Model Outputs – Average Juniper and Annual Grasses Over 50 Years

Population Area(s)	Percent Juniper	Percent Annual Grasses
Box Elder	7	9
Hamlin Valley, Ibapah	25	7
Rich, Uintah, Wyoming-Uinta, Wyoming-Blacks Fork	13	4
Carbon	29	2
Emery	3	0
Parker, Panguitch, Bald Hills	18	1
Strawberry	12	0
Sheeprocks	35	17

percent of total vegetation in mapped occupied habitat in all population areas except the Sheeprocks, where annual grasses are estimated to make up approximately 17 percent of the total vegetation. The percent of annual grasses is estimated to be higher in population areas in the Great Basin region (Box Elder, Hamlin Valley, Ibapah, Sheeprocks) than those in the Rocky Mountain region.

Conifer Encroachment

Woodland expansion, especially juniper (*Juniperus spp.*) encroachment, is a wide-spread invasive species threat to GRSG habitat. Native junipers have expanded into sagebrush ecosystems over the last century (Miller et al. 2011). GRSG are negatively impacted by the expansion of juniper regardless of the understory condition (Freese 2009) because they avoid habitats where conifer encroachment is occurring (Casazza et al. 2011). Studies have shown that GRSG lek attendance is impacted at very low levels of conifer encroachment (Baruch-Mordo et al. 2013). As juniper increases in abundance and size, the shrub and herbaceous understory components for GRSG diminishes. In Utah, juniper is encroaching into GRSG habitat throughout BLM-administered and National Forest System lands but is particularly problematic in the Sheep Rocks, Box Elder, Bald Hills, Hamlin Valley, and Panguitch Population Areas. Woodland expansion is also occurring to a lesser degree in the Halfway Hollow, Three Corners (Uintah Population Area), West Tavaputs (Carbon Population Area), and the western portion of the Parker Mountain Population Area. Fire suppression is a primary cause of juniper encroachment because fire intervals are longer than the natural cyclical variation, allowing junipers time to establish as seedlings and grow to mature trees and dominate a site (Miller et al. 2011). Juniper encroachment is a synergistic result of fire suppression, introduction of grazing, increases in carbon dioxide concentrations, climate change, and natural recovery from past disturbance (Miller and Rose 1999; Miller and Tausch 2002; Baker 2011).

In Utah, juniper inhabits elevations ranging from 4,000 to 7,500 feet. More precipitation and site productivity are found in these higher elevations and in the absence of fire, juniper has encroached moving downslope to neighboring communities (Miller and Rose 1995; Miller et al. 2000; Miller and Heyerdahl 2008; Sankey and Germino 2008; Shinneman et al. 2008; Bradley 2010). In the encroachment areas, active restoration such as mechanical treatments may be needed to maintain GRSG habitats by reducing juniper cover (Bradley 2010; Rowland et al. 2010).

The current approach in Utah is to manage juniper encroachment by removing trees in Phase 1, where trees are present but shrubs and herbaceous species (e.g., perennial grasses and forbs) are the dominant vegetation that influence ecological processes; and Phase 2 sites where trees are co-dominant with shrubs and herbaceous species and all three vegetation layers influence ecological processes. Targeted removal of juniper is based on what seasonal habitat area is being encroached upon and the specific limiting factors for a GRSG population.

Restoration potential is the greatest where there is the least disturbance for vegetation and soils recovery (Shinneman et al. 2008). The rate of recovery processes may be supported and enhanced through treatment methods and timing of application (Bates et al. 2011; Rau et al. 2011). Based on past trends and the current distribution of juniper relative to sagebrush habitat, it is anticipated that juniper will continue expanding at varying rates across the landscape and result in further loss of sagebrush habitat within the GRSG range.

According to the VDDT model, during the next 50 years the percent of juniper within GRSG habitat is expected to increase in the Box Elder, Rich, Uintah, Wyoming-Uinta, and Wyoming-Blacks Fork Population Areas. The percent of juniper is expected to decrease in all other population areas. As shown in **Table 4.3**, regardless of trends, juniper encroachment is expected to continue to affect the majority of the population areas in the Utah Sub-regional planning area.

Under Alternative A, current LUPs provide varying degrees of habitat objectives identified for maintenance, improvement, and restoration of sagebrush communities, which provide for improvements to wildlife habitat or to increase available forage for wildlife, livestock, and wild horses. A few LUPs (e.g., Vernal RMP and Uintah LRMP) provide more detailed habitat objectives (e.g., desired seral stage, percent canopy cover, or height) or include management actions to implement the most recent UDWR Strategic Management Plan for Sage-Grouse (UDWR 2002) and the BLM National Sage-Grouse Habitat Conservation Strategy. Under Alternative A, management would focus restoration of GRSG habitat impacted by conifer encroachment based on habitat objectives set forth in these plans, which would allow for the incorporation of BMPs to avoid, minimize, or mitigate conifer encroachment. Under Alternative A, the BLM would continue to prioritize the use of mechanical treatments for removing encroaching conifers, which would result in improvements to habitats that may have been less desirable due to the presence of conifers. Restoration of habitats affected by conifer encroachment can allow for rapid recolonization of leks by GRSG (Baruch-Mordo et al. 2013). The Forest Service would continue to pursue current vegetation management objectives, including conifer removal. Focus under Alternative A would continue to be on removal of early-stage juniper stands that may transform unsuitable habitat into effective habitat for GRSG. Highly flammable juniper stands would continue to be removed (stands where trees are the dominant vegetation and the primary plant influencing ecological processes) (Phase 3; Miller et al. 2008) in low-elevation sagebrush habitats, which would lead to improvements to GRSG habitat. Restoring sagebrush communities where conifer encroachment has resulted in habitat degradation or loss within specific population areas could result in improvements to the sagebrush community. Increasing quality or quantity of habitat available to GRSG increases a population's resiliency to adapt to changing environmental conditions and provide for expansion into areas that may be more suitable for meeting seasonal habitat requirements.

Grazing (Including Wild Horses and Burros)

Grazing by livestock and wild horses is one of the most widespread land uses across GRSG habitat (Connelly et al. 2004). Through historic and current livestock grazing practices, most sagebrush habitats in Utah have been grazed at some point over the last century (Knick 2011). Domestic livestock grazing was first introduced into the planning area in the mid- and late-1800s, coinciding with settlement of the area. Following their introduction, the number of domestic livestock increased steeply over the ensuing decades (Manier et al. 2013; Knick 2011). This increase in livestock numbers, combined with the drought in the 1920s and 1930s, severely altered the condition of western landscapes (Manier et al. 2013; Connelly et al. 2004). "Native perennial grasses and forbs that were not adapted to heavy grazing pressure were depleted from the vegetative community and replaced, in much of the Great Basin and surrounding inter-mountain regions by grazing tolerant grass species, exotic annual grasses, or both" (Manier et al. 2013). In the Great Basin, West (1988) noted it is possible that the more arid sagebrush rangelands are more sensitive to drought and may have been more severely affected by overgrazing than wetter shrub-steppe to the north.

Since passage of the Taylor Grazing Act of 1934 (1940 to 2009), grazing permits in the planning area have been reduced by approximately 63 percent (Banner 2009). Most of the decreases came in the 1940s, 1950s, and 1960s, with reductions enacted to bring livestock stocking rates in line with carrying capacity of allotments (Banner 2009). Because of the lasting impacts of the historic grazing of the late 1800s and early 1900s, the reduced numbers of livestock in the modern era often do not simply represent reduced effects from grazing (Knick et al. 2011), but a slower rate of accumulation of effects (Manier et al. 2013). Research has shown that livestock grazing in GRSG habitat may either improve or decrease habitat quality, depending on the type of habitat, spatial and temporal scale, and how the grazing is administered (Beck and Mitchell 2000).

It is imperative to note that because of numerous variables that influence the landscape (e.g., vegetation present, soil, elevation, aspect, and precipitation) combined with historic and current levels (e.g., numbers and use) and methods of livestock grazing (e.g., kind of livestock, rest-rotation, and seasonal use), impacts on GRSG habitat from livestock grazing vary tremendously in space and time (Manier et al. 2013). Because these variables, history of use, and site-specific livestock grazing practices vary widely in Utah within GRSG habitats, the nature and level of impacts discussed in this analysis are discussed in broad terms in regards to grazing pressures.

Impacts from Domestic Livestock Forage Use (Herbivory)

There is little scientific data directly linking grazing practices to GRSG population levels (Knick et al. 2011). However, use over time can influence ecological pathways and can shape which plant and animal species persist (Knick et al. 2011). There is literature that has identified relationships between aspects of grazing and effects on various components of GRSG habitat (see in below text). These relationships vary based on site-specific conditions and grazing practices.

Impacts from livestock herbivory (consumption of vegetation) are diffuse (exerted over broad spatial or temporal scales) and are different in nature than discrete disturbances (BLM IM 2012-044, BLM National Greater Sage-Grouse Land Use Planning Strategy). In some areas, the

environmental conditions combined with livestock use strategies and levels could result in decrease or loss in GRSG habitat functionality, in other areas there could be no loss of functionality, and in other areas specific grazing practices could result in improvement of GRSG habitats. Due to the complexity of these systems and the site-specific nature of how these factors may interact, it is not possible to make simple assumptions. For example, in the Box Elder, Rich, Parker Mountain, and Diamond Mountain portion of the Uintah population areas, livestock grazing is the primary use of public lands in GRSG habitat. These areas also provide habitat for more than 70 percent of breeding birds in Utah and are the only areas in Utah with populations large enough to sustain regular harvest (UDWR 2009). While there may be portions of these and other population areas that have site-specific impacts that limit GRSG habitat functionality, some may assume that the presence of livestock grazing in these population areas has not resulted in unsustainable GRSG populations. Making these conclusions assumes that these areas have similar past grazing and current grazing management (season of use, stocking level, duration), vegetation communities, history of impacts on the area (e.g., fire), and temperature and precipitation, when in fact they are very different. The primary commonality of these populations is the amount of relatively contiguous habitat, which is a function of how the sagebrush areas naturally occur on the landscape and where substantial human-related impacts currently exist. It is well documented that the resiliency of a population is closely related to larger areas of habitat.

In relation to the effects of livestock herbivory on GRSG habitat, there are two important influences: the influence of grazing on annual vegetation conditions, and the accumulation of effects on vegetation from livestock selectively consuming specific species, resulting in altered vegetation dominance over time. Prolonged selective grazing pressure on vegetation communities can affect the condition of individual plants, abundance of species, interspecific competition, and ultimately, community composition (Manier and Hobbs 2006). Jones (2000) review of literature found detrimental effects of cattle grazing on xeric ecosystems in 11 of 16 variables measured, including litter cover and soil quality. While specific effects and conditions from grazing are localized in most cases, the continuous and collective presence of these effects across the West may affect the regional condition of GRSG habitats (Manier et al. 2013).

The timing of when grazing occurs relative to plant growth stages (e.g., growth initiation, rapid growth, seed development, seed ripe, and dormancy) can influence the effects of grazing on the vegetation on which wildlife depend (Briske and Hendrickson 1998; Briske et al. 2003; Veblen et al. 2011). Repeated grazing during periods of fastest growth of the dominant grasses and forbs in intermountain sagebrush steppe over multiple consecutive years tends to favor sagebrush growth (Pyke 2011) through reduced competitive ability of grasses (Manier et al. 2013). GRSG preferred areas of reduced spring grazing and low forage use for nesting sites near Lander, Wyoming (Kuiper 2004). However, spring grazing in winter habitat may improve GRSG winter habitat because grass reductions can increase sagebrush densities (Wright 1970; Owens and Norton 1990; Angell 1997; Beck and Mitchell 2000). The relationship between spring grazing and long-term sagebrush densities suggests an opportunity for adaptation of grazing systems to graze GRSG winter habitats in spring when brood-rearing habitats would be avoided, and vice versa (Manier et al. 2013), thereby improving both. However, this would only be a viable option where allotments in wintering habitat do not overlap with allotments with nesting and brood-rearing habitats. Because GRSG initiate nesting early in the year, prior to new herbaceous

growth, grazing levels from the previous year and the residual grass remaining provides initial cover for nesting GRSG (Hausleitner et al. 2005; Holloran et al. 2005). Grazing during the dormant season (late summer through winter) influences spring grass stubble height (Pyke 2011). However, due to the variability in population and site-specific conditions, it is possible to manage for a healthy sagebrush community but fail to achieve GRSG habitat objectives if sufficient residual vegetation (standing crop) is not provided (Manier et al. 2013).

Direct conflicts between livestock and GRSG may occur during spring and early summer when both livestock and GRSG are using forbs and grasses. Because nesting GRSG consistently select areas with more sagebrush canopy cover and taller grasses compared with available habitats (Hagen et al. 2007), the presence of such characteristics increases the probability of a successful hatch (Manier et al. 2013). If nesting and early brood-rearing habitats are grazed in a manner that consistently results in a lack of sufficient residual grass cover the following spring, predation of GRSG nests could increase and the rate of GRSG nest success could decrease (USFWS 2010).

Decreases in the forb component of the sagebrush environment will also affect GRSG population areas. The availability of forbs may be an essential component of a pre-laying hen's diet (Barnett and Crawford 1994; Connelly et al. 2000; Gregg et al. 2008). In Nevada, greater forb diversity and higher plant species richness were small-scale habitat factors associated with brood success (Casazza et al. 2011). Forb diversity and concentration dramatically increase invertebrate densities, which are crucial for chick survival and growth (Blenden et al. 1986; Brush and Stiles 1986; Johnson and Boyce 1990). Insect diversity and density was positively correlated with herbaceous density and diversity (Hull 1996; Jamison et al. 2002). Different research has found that stocking intensity and season of use are both related to increases in herbage production (Van Poolen and Lacey 1979; Mueggler 1950; Laycock 1978; Owens and Norton 1990). In general, livestock grazing systems that reduce the presence of forbs or alter higher-value forbs within the sagebrush community would likely reduce the value of nesting and early and later brood-rearing habitat for GRSG and may cause them to use less optimal habitat, potentially affecting nesting GRSG (Barnett and Crawford 1994) and chick survival (Huwer et al. 2008).

Under certain conditions, livestock grazing may reduce sagebrush cover and alter plant community composition (Messmer and Peterson 2009; Vavra 2005). Sagebrush is not typically considered a key forage species for grazing animals, except on winter sheep allotments because terpene concentration levels limit use by most grazing animals. Terpene levels decrease in late summer, fall, and winter, making sagebrush more palatable (Kelsey et al. 1982). This is especially true for sheep fall and winter use, when sheep readily browse sagebrush and may reduce the vertical structure, density, and vigor of sagebrush, thus affecting the quantity and quality of GRSG habitat (Wright 1970; Owens and Norton 1990; Angell 1997; Beck and Mitchell 2000). Isolated occurrences of such use levels may occur within GRSG habitats in Utah, which would reduce the ability of the sagebrush to provide sufficient hiding cover, thermal protection, and forage for GRSG, particularly in winter habitat where sagebrush comprises the majority of GRSG diet.

Spring grazing during wet conditions may increase potential for soil compaction, which can reduce water infiltration rates, decrease water availability for vegetation, increase surface run-off, and increase erosion. In addition, alteration of plant community composition caused by livestock grazing on preferred species can also affect water infiltration rates, increase run-off in areas where vegetation cover has been reduced, and increase soil erosion. While all of these effects are possible, the presence and magnitude of each depends on the local environmental conditions and grazing levels and strategies.

The effects from grazing also vary by kind of livestock, numbers of livestock (intensity), and grazing management systems (e.g., rest-rotation and deferred rotation). Grazing intensity (e.g., stocking rate, duration, and frequency) has consistently been identified as having impacts on ecosystem and rangeland health (Vallentine 1990; Briske et al. 2008; Veblen et al. 2011), including the vegetative structure required by GRSG. The different kinds of livestock (e.g., cattle or sheep) that are managed within GRSG habitats are important considerations due to dietary preferences of each and the differing manner in which each are managed. Livestock utilization patterns are dependent on what types of forage are available, which may vary seasonally (e.g., abundant in the spring growing season) or because of depleted rangeland conditions (e.g., fire, drought, and heavy utilization). Different kinds of livestock will focus on preferred species initially, then move to less preferred species as the availability of the first reduces. This results in uneven pressure on plants that livestock prefer (e.g., herbaceous understory), which in turn provides a competitive disadvantage for water, space, and nutrients when compared with other species in the area (e.g., noxious weeds or shrubs). Over time, this effect favors one species over another. Which species is preferred by livestock and therefore is impacted over time depends on the species available on the ecological site and grazing strategies (e.g., kinds of livestock, the season of use, and duration of use).

Riparian and wet-meadow habitats are seasonally important to GRSG, especially for brood rearing, since they provide areas high in forbs and invertebrates necessary for early chick development. Livestock, especially cattle, prefer to concentrate near water sources; the location of water affects livestock distribution patterns. This pattern can result in disproportional use of riparian habitats and wet meadows, which can result in loss of riparian vegetation and cover, as well as compaction of soils and lowering of water tables, which alters water quality, invertebrate populations, and plant species composition. This can result in degradation of crucial habitats for GRSG. Some research demonstrated that livestock exclusion from riparian habitats can result in increased sedge cover, forb cover, foliage height diversity, and water table depth along with expansion of riparian vegetation laterally from stream channels (Dobkin et al. 1998). Other research has shown that livestock grazing of riparian and wet meadow habitats can increase forb diversity in certain cases, depending on timing and intensity (Evans 1986). Additionally, other research has shown that GRSG prefer grazed over ungrazed wet meadows where protective cover conditions were otherwise equal under rest-rotation grazing at moderate stocking levels (Neel 1980).

Riparian areas make up only a small fraction of the total planning area but receive a disproportionate amount of use by livestock as well as being a key seasonal habitat for GRSG. Under the Utah Standards for Healthy Rangelands (Standard #2–Riparian – Wetland), the BLM is required to ensure that riparian and wetland areas are in proper functioning condition (PFC).

When standards are not being met, the BLM must take action to assure significant progress towards achievement is being made. Similarly, the Forest Service is required to manage grazing allotments to standards laid out in the LUP or grazing decisional document. Under Alternative A, managing riparian and wetland habitat to meet Utah's riparian standard, meeting PFC, and implementing Utah's livestock grazing guideline would maintain or improve brood-rearing habitat for GRSG.

In some situations, livestock grazing can be a management tool to aid in the management or maintenance of certain vegetation communities within GRSG habitat. When properly applied, livestock grazing may change plant community composition, increase productivity of selected species, increase forage quality, and alter structure to increase habitat diversity (Vavra 2005). "Well-prescribed livestock management may positively influence GRSG habitat suitability especially during nesting (spring), early brood rearing (early summer), and winter, but extended rest may be required for areas that are currently degraded" (Manier et al. 2013). Many studies demonstrate that weeds can be controlled through grazing at a specific time, intensity, and duration to reduce abundance of these species. Under controlled situations, where livestock is used as a targeted vegetation treatment tool, livestock can reduce fine fuel loads (e.g., cheatgrass) (Diamond et al. 2009). Recent research suggests that bunchgrass community structure and the presence of biological soil crusts increases resistance to cheatgrass invasions and that grazing management that decreases those components decreases the vegetation communities' resistance to invasion (Reisner et al. 2013). Cheatgrass completes its reproductive cycle, using limited soil moisture and nutrients, well before most native perennial grasses and is usually dry by mid-summer, which coincides with increased fire danger (Pellant 1996). Intense "flash" grazing during the winter or early-late spring, while it is still green, may control cheatgrass. Cheatgrass is highly variable in regards to production and grazing readiness from year-to-year (Schmelzer 2009), which makes it difficult to target livestock grazing at the most opportune time and to the proper extent to be an effective management tool. Sheep and goats (if permitted) can be used to control noxious weeds such as leafy spurge, spotted knapweed, and yellow star thistle. Weed management usually needs to occur during the spring to be most effective, though spring timing for the application of livestock specifically as a tool to control undesirable vegetation could conflict with GRSG nesting season.

Effectiveness of livestock as a management tool for the control of undesirable vegetation is highly dependent on the scale, livestock behavior, and ability to avoid grazing native vegetation. Within current permits, small-scale grazing management systems can be used to control invasive and noxious weeds but require consideration of several factors to ensure strategic planning is in place to target weeds. These factors include the kind of livestock, class (e.g., yearling, does, and ewes) of livestock most effective at controlling a particular species, growth stage of the plant at which livestock would be most effective, palatability of the plant, and plant response to grazing. Impacts on GRSG from the various targeted grazing practices could reduce habitat suitability shortly after the targeted grazing, but this would occur in areas where the presence of invasive weed species would have already affected the condition of GRSG habitat. After the targeted area recovers from grazing, if grazing to reduce invasive species were implemented effectively and controlled from using adjacent unaffected areas, GRSG habitat could be improved. While livestock grazing as a management tool for controlling undesirable plants within GRSG habitat may be effective in limiting the expansion of these species and may protect intact sagebrush

habitat for GRSG, livestock can also disperse weed seeds, which could cause spread of invasive plants into areas previously free from infestation. Implementation of weed control practices through livestock management may limit the permittees ability to use the allotment for general livestock production. The use of targeted livestock grazing as a management tool has been effective in resulting in changes in small area, when conducted within specific terms of a permit. However, management of large-scale weed invasions and manipulating livestock management to address those situations would require additional NEPA before implementation.

The impacts of livestock grazing within sagebrush habitats can be compounded during periods of drought. The BLM and Forest Service have authority to modify grazing management practices when necessary to lessen livestock impacts on drought-stressed public land resources. Drought conditions often require annual adjustments in livestock numbers to provide for the sustainability of the vegetative community. The impacts associated with the onset of drought can be alleviated through drought agreements and decisions to modify use and to monitor or temporarily close areas until conditions are suitable for grazing. Severe drought conditions within GRSG habitat could result in adverse effects on the sagebrush communities, and in some cases may result in a long-term loss of the herbaceous vegetation due to reduced capabilities to plants to recover from the increase stresses of drought. Herbaceous vegetation, especially in areas that did not evolve with repeated large ungulate grazing, may be more susceptible to mortality during or after droughts if grazing (domestic and wild) has already reduced the overall vegetation vigor.

Although the potential for population level effects are uncertain, GRSG may also be directly impacted by livestock in the event that livestock destroy GRSG eggs or cause nest desertion (Beck and Mitchell 2000). Trampling by livestock under short-duration or season-long grazing may also kill sagebrush, particularly seedlings growing in the spaces between shrubs (Beck and Mitchell 2000). This occurs most where livestock congregate (e.g., near watering areas or supplement blocks).

While active AUMs would be available for livestock grazing, the actual number of AUMs authorized on a permit may be adjusted through permit renewals, permit modification, allotment management plan development, or other appropriate implementation activity. While 329,521 AUMs would be available on BLM-administered lands and 265,373 AUMs would be available on National Forest System lands, the average actual billed use over the past 10 years was approximately 70 percent and 98 percent of permitted use, respectively. Therefore, although Alternative A could result in 100 percent of the permitted use being used, such use would only be permitted if climatic and environmental conditions resulted in forage production capable of supporting this level of use while complying with the terms and conditions of the permits.

Annual adjustments to active AUMs would continue to occur through annual grazing and would be based on site-specific evaluations to respond to variations in vegetation (e.g., rangeland health standards, allotment conditions, and permittee operational considerations drought). Making these annual adjustments to meet rangeland health standards and LUP objectives could maintain or improve GRSG habitat since actual use would correspond to vegetative conditions. However, because Alternative A does not require consideration of GRSG habitat guidelines and because

most existing plans do not include specific GRSG habitat objectives that must be met, annual adjustments would maintain or improve GRSG habitat only insofar as such habitat is benefitted by rangelands that meet general rangeland health standards and guidelines for livestock grazing in Utah, as well as considerations given to BLM special status species (see **Table 3.59** on the acres of allotments and the Rangeland Health Standards). Without specific management actions in regards to GRSG, current trends in overall GRSG habitat condition would continue and livestock actual use numbers would be anticipated to be maintained. Additionally, completion of rangeland health standards evaluations in GRSG habitat would receive the same prioritization as all other areas. As a result, rangeland health standards evaluations would be conducted on a case-by-case basis, usually associated with permit renewals. This would mean that some areas of GRSG habitat would go several years without a formal evaluation of whether the area is meeting rangeland health standards, which could result in habitat in some areas being affected in a negative trend before the issue is identified and steps are implemented to correct the trend. Because the Uintah planning unit LUP includes specific height and use requirements for GRSG habitat, livestock grazing in the areas addressed by that plan would be conducted in a manner that achieves or maintains the needed GRSG habitat attributes.

Impacts from Wild Horse Forage Use (Herbivory)

While the effects of wild horse grazing on vegetation are similar in nature to those described above, horses remove more of the plant than cattle or sheep, which limits and/or delays vegetative recovery (Menard et al. 2002), and horses can range further between water sources than cattle, making them more difficult to manage (USFWS 2013). Additionally, because horses separate themselves from cattle and use higher elevations and steeper slopes, areas of sagebrush with wild horses may have fewer occurrences of ungrazed areas (Connelly et al. 2004). Research has shown that sites grazed by wild horses have a greater abundance of invasive plant species, reduced native plant diversity, and reduced grass density (Beever and Aldridge 2011) compared with areas not grazed by wild horses. This is because wild horses are dietary generalists; while they will preferentially select for grasses, in the absence of grass species, wild horses will turn to shrub and forb communities for a major portion of their diets for sustained nutritional needs. Unlike cattle, wild horses are continuous grazers, capable of being highly selective, and clip grass very close to the base of a plant. The manner in which wild horses use forage could lead to reduced herbaceous vegetation (perennial grasses and forbs) for nest concealment. Reduced nesting cover could lead to increased predation on nests and young. The ability to selectively choose forage species that are preferred could also lead to reduced diversity of desirable perennial grasses in areas that are heavily used by wild horses and a dominance of less palatable and less desirable vegetation species (Beever and Aldridge 2011).

Research on vegetation community responses to grazing pressures by horses demonstrated that areas without horses showed higher shrub cover, greater total plant cover, greater species richness, greater native grass cover, and greater frequency of native grasses (Beever et al. 2008). In areas where wild horses and GRSG use overlap in winter concentration areas, wild horses may reduce shrub cover and the quality of winter habitat for GRSG.

Water is an important resource for wild horses, which use water troughs and natural springs. Wild horses are often one of the causal factors for riparian habitats that are not achieving proper functioning condition. Impacts on riparian habitat degradation are similar to those

discussed in the Grazing section. As previously mentioned, wild horses are year-round grazers on public lands within the HMAs, unlike livestock where grazing management systems can be developed to alleviate seasonal grazing pressures such as hot-season grazing in riparian habitat. One of the only means to alleviate wild horse impacts on riparian areas is to construct an exclosure fence and develop the spring with an offsite trough or ensure there is still some access to the water. The loss or degradation of riparian habitats could cause GRSG to use less optimal habitats for late brood-rearing activities, and in the absence of other areas, could reduce the population levels. In the Hamlin Valley, Carbon, and Sheeprocks Population Areas, the impacts from wild horses may interact with other local threats and decrease a GRSG population's vigor and resiliency.

Under Alternative A, wild horse populations would continue to be managed for AMLs and in balance with other resource uses (e.g., rangeland health, livestock, and wildlife). Wild horse gathers would be prioritized based on escalating or potential emergencies, public safety, nuisance animals, court orders, population growth suppression, and resource impacts associated with monitoring data, which is generally based on wild horse population inventories, wild horse condition, availability of sufficient water and forage resources, rangeland health, use levels of upland habitats, and riparian resource conditions.

Impacts from Wild Ungulate Forage Use (Herbivory)

Native herbivores, such as pronghorn antelope (*Antilocapra americana*), elk (*Cervus elaphus*), and mule deer (*Odocoileus hemionus*) co-occur with GRSG (Miller et al. 1994), but there are no known studies that evaluate the impacts of native herbivores on GRSG. Concentrated native ungulate herbivory may impact vegetation in GRSG habitat on a localized level. For instance, elk may forage heavily in low-elevation sagebrush during heavy snow years (Wambolt and Sherwood 1999), and such browsing could have localized impacts on the vegetation by decreasing sagebrush cover. Impacts on GRSG could be detrimental or beneficial depending on when GRSG use the habitat and whether that habitat type is of limited availability for the local GRSG population. Loss of sagebrush in limited GRSG wintering habitat could adversely affect GRSG, especially when combined with other threats impacting a local GRSG population. Conversely, if the area impacted by winter foraging from elk is also brood-rearing habitat, the decreased sagebrush cover may improve brood-rearing habitat by decreasing the competitive advantage for sagebrush and increasing the availability of resources for grasses and forbs.

Impacts from Livestock Grazing Program Actions

A variety of actions are taken to support the use of BLM-administered and National Forest System lands for livestock grazing, which may include the construction of fences, roads, and stock ponds/watering troughs. Range improvement projects such as fences, water developments, and pipelines are intended to provide for implementation of grazing management systems that ensure proper livestock grazing. Additionally, vegetation treatments, though often not implemented just for the livestock-grazing program, can affect GRSG habitat. The effect of these actions on GRSG are different than those of herbivory, in that these actions are discrete in time and place and can directly affect GRSG and their habitat.

The development of water sources has the potential to improve the distribution of livestock on the landscape, allowing grazing in areas that were previously ungrazed or lightly grazed within an

allotment. In many situations in Utah, water developments for livestock are designed to provide water sources away from riparian areas and other livestock concentration areas, improving the condition of the natural riparian areas and the associated brood-rearing habitat. In addition to range improvement projects to facilitate livestock management, herding and placement of mineral/salt blocks can be employed to improve livestock distribution. These practices can increase use of little used areas in an allotment due to distance from water. This reduces the use of some areas in the allotment, but it also has the effect of spreading the impacts of herbivory over a larger area (Connelly et al. 2004), thus expanding affects upland areas important for GRSG during nesting, early brood rearing, and winter seasons.

Open water associated with ponds, natural or constructed, has been suggested as a limiting factor for summering GRSG. While water availability may influence the species' summer distribution (Patterson 1952; Autenrieth 1981), movements to summer range are probably in response to lack of succulent forbs in an area rather than a lack of free water (Connelly and Doughty 1989). GRSG do not need open water sources but will opportunistically use water when available. Existing research suggests that GRSG do not regularly use water developments even during relatively dry years, but obtain required moisture from consuming succulent vegetation in the vicinity (Connelly 1982; Connelly and Doughty 1989; Connelly et al. 2004). Water sources may also facilitate the spread of West Nile virus within GRSG habitats as these water developments may support populations of the mosquito *(Culex tarsalis)* associated with West Nile virus longer than natural, ephemeral water sources (Walker and Naugle 2011). Water projects that create mesic zones around water developments to promote the growth of succulent vegetation may inadvertently contribute to the proliferation of West Nile virus as *Culex tarsalis* regularly breed in water-filled hoof prints in these areas (Walker and Naugle 2011). In addition, Kirol and others (2015) found that presence of water developments (associated with energy development) was that primary factor attributed to decreased nest success.

Fences are widely used within grazing allotments to facilitate livestock grazing management systems. Fences within GRSG habitat can result in GRSG collision, causing injury or mortality, though it is unknown if those mortalities are compensatory or additive (Call and Maser 1985; Connelly et al. 2004; Christiansen 2009; Stevens et al. 2012). Much of the available research has been limited to GRSG breeding habitats; however, fence collisions are likely a risk factor in other GRSG habitats. Fence collisions have been documented by localized studies or observations in Wyoming, Idaho, and Utah. In the Rich Population Area in Utah, 36 GRSG carcasses were found along a 2-mile stretch of fence within 3 months of the fence being constructed (Call and Maser 1985). In Wyoming, Christiansen (2009) placed fence markers on a portion of fence after 143 GRSG collisions were documented over a 2-year timeframe and found that the markers decreased collisions by 70 percent over unmarked fences. Christiansen identified that fence design, landscape topography, and spatial relationship to seasonal habitats are the primary factors that affect mortality risk to GRSG. More recently, Stevens (2011) conducted research in Idaho GRSG breeding habitat to specifically test the efficacy of fence markers by identifying numerous high-collision fence areas and marking these fences. Results were similar to Christiansen; marking high-risk fences decreased collision rates, but by 83 percent (Stevens et al. 2012). In general, collisions were more common along fences with steel t-posts and a greater than 12-foot span between posts than with wooden post fences with a less than 12-foot span between them (Stevens 2011). Ultimately, terrain ruggedness and distance

from the leks were the primary factors associated with high fence collision risk (Stevens et al. 2013). As a result, Stevens and others (2013) developed a Fence Collision Risk Tool to aid managers throughout the West in identifying potential high-risk areas for fence collisions (Stevens et al. 2013). This mapping will assist in marking fences where there is a high risk for collision, because not all fences within 1.2 miles of all leks are a high-collision risk and need to be marked.

Fences can also increase opportunities for raptor perching and predation on GRSG. Impacts would be expected to increase in areas where perching is occurring in proximity to seasonal habitats where GRSG are concentrating. Concentrations of predators may also result in habitat fragmentation due to avoidance strategies by GRSG to avoid areas of high predator use (Dinkins et al. 2012).

In contrast to the deleterious effects of fencing, fences can also improve GRSG habitat conditions by protecting riparian areas and brood-rearing habitats from overgrazing. The assessment of the impact or benefit of fences must be made considering local ecological conditions and the movement of GRSG within local areas (Stevens et al. 2012).

GRSG have been known to use openings in the sagebrush created by human activities (e.g., sheep camps, water hauls, and corrals) as leks during breeding season. Continued human use of these areas outside of breeding season would maintain the areas' openness and value to GRSG as a lek. However, if human use of these areas shifts to coincide with breeding season, breeding activities could be disrupted by the presence of humans, livestock, sheep dogs, and associated equipment (e.g., camp trailers, water trucks, and troughs) at the site. The potential of impact would depend on the type of activity and its timing and duration (e.g., winter season versus breeding season, 1 month versus 4 months). If the human presence extends from the breeding through the nesting season, the impacts could result in GRSG displacement from the area and shifting into less desirable locations.

Other disruptions that may occur because of rangeland management include disturbance from water hauling, range improvement project maintenance, and livestock trailing/herding or transporting. Given the frequency of these types of projects, the likelihood of a long-term effect on population areas is low.

Livestock and associated human facilities may also increase the presence of predators such as ravens, coyotes, eagles, and other raptors. Dead livestock and trash can attract predators, which may then prey upon or disrupt GRSG using these sites (e.g., leks, nesting areas) or cause displacement into less desirable habitats.

Direct augmentation of habitat condition by rangeland treatments used to manipulate vegetation may have a greater effect on long-term GRSG habitat availability and condition than the impacts of grazing described above (Freilich et al. 2003; Knick et al. 2011). After the introduction of livestock grazing in the West, the reduction of native grasses and forbs would have created a competitive advantage for sagebrush, increasing density over time. Driven by the desire to increase forage production on rangelands, large areas of sagebrush were treated to reduce shrub cover and introduce additional forage species adapted to regular grazing. These historic treatments directly reduced available GRSG habitats and fragmented intact blocks of sagebrush,

reducing the quality and quantity of habitat value for GRSG. Current management generally provides for the maintenance of existing areas that were treated and implementation of new treatments to meet LUP objectives, as needed. Currently, the nature of BLM vegetation treatments are designed in consideration of multiple-resource benefits and provide quality habitat for wildlife, wild horses, and livestock and are not oriented towards single-use projects as was done in the 1950s to 1970s for livestock forage. The BLM currently implements treatments for general habitat augmentation, such as reducing pinyon-juniper, treating areas of dense sagebrush to increase understory grasses and forbs, treating areas affected by invasive species or wildfire, or reducing vegetation through building fuelbreaks. Additionally, diverse seed mixes include a variety of native and nonnative grasses, forbs, and shrubs with an emphasis on natives. Throughout Utah, seed mixes are identified that consider GRSG habitat values, particularly sagebrush, and a diverse component of grasses and forbs. Similarly, the Forest Service implements a diverse array of vegetation management approaches to benefit multiple resources, including wildlife habitat. Under Alternative A, most seedings would be maintained by removing competing vegetation in order to prevent the seeding from accomplishing the initial objective of the seeding. Since GRSG habitat objectives are not generally addressed in current LUPs, it is anticipated that such maintenance would not be a direct improvement of GRSG habitat.

Research suggests that GRSG need a minimum range of 50 to 70 percent of the landscape acreage in sagebrush cover for long-term GRSG persistence (Aldridge et al. 2008; Doherty et al. 2010; Wisdom et al. 2011). Sagebrush currently comprises approximately 56 percent of the occupied GRSG habitat in the planning area. Additionally, GRSG often show a preference for heterogeneous stands of sagebrush (Crawford et al. 2004). Dense stands of sagebrush have the potential to reduce the presence of understory forbs and grasses and in the past, these habitats have been treated to increase grass cover (Utah Greater Sage-Grouse Working Group 2013). However, dense stands of sagebrush can be very important for GRSG during the winter, and recent research evaluating the impacts of mechanical, chemical, or fire treatments in occupied GRSG habitats suggest that it is not advisable to treat these areas, especially in Wyoming sagebrush areas (Connelly et al. 2000; Beck and Mitchell 1997; Heath et al. 1997; Beck et al. 2012).

Under Alternative A, most plans do not specify habitat treatments for GRSG but do usually include allowances for continued habitat treatments using a variety of treatment methods. In addition to the treatment methods identified in the existing plans, general impacts associated with vegetative treatments on BLM-administered lands tier to the *Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement* (2007), which analyzes and recommends treatment methods to be used on BLM-administered lands. Methods include mechanical and manual treatments, biological treatments, prescribed burning, chemical applications, and use of livestock. In addition, to authorize vegetative treatments and other range improvement projects, site-specific NEPA analysis and decisions are developed and issued in accordance with BLM and Forest Service regulations and policies. Given the continued allowance of multiple treatment types, combined with the general lack of GRSG objectives in the existing plans, GRSG habitat under Alternative A would continue to receive vegetation treatments. Where those treatments reduce pinyon-juniper encroaching into sagebrush, GRSG habitat quantity and quality could be increased.

Where the treatments reduce areas of dense sagebrush, the impacts on GRSG would depend on the limiting habitat in the area. In some instances, GRSG winter habitat could be reduced, exposing the local GRSG population to lack of winter habitat under certain climactic conditions. In other instances, GRSG brood-rearing habitat would be increased, with closed-canopy sagebrush being opened up to allow for an increase in the grass and forb understory. The effect of the various vegetation treatments would depend on variables such as the type of the treatment, the ecological site potential, and the limiting factor for GRSG in the area.

Impacts from Wild Horse Program Actions

The main impacts on GRSG from the wild horse program would be associated with period gathers of wild horses. Activities associated with wild horse gathers include using low-flying helicopters, operating support vehicles, and constructing a series of fenced holding pens. All these activities generally occur in a relatively small area and can result in direct disturbance to GRSG habitat in proximity to the gather operations. Gather operations that use helicopters are limited to between July 1 and February 28 due to the moratorium on wild horse gathers during the foaling season (March 1 to June 30), which would alleviate any concerns with disturbance to GRSG during the majority of the breeding season. Impacts associated with any change in this timing would be addressed in environmental assessments associated with the specific gather. While gather operations could result in damage or loss of nests and young chicks if wild horses being gathered travel through areas that are being used for nesting and early brood rearing, most hens have hatched their broods by the end of June, and most broods would be old enough to escape such disruption. Disturbances associated with wild horse gathers would be localized around the trap sites, which are typically but not always located in previously disturbed areas.

Recreation

Recreational use of BLM-administered and National Forest System lands can be categorized as dispersed or casual (e.g., camping, bicycling, wildlife viewing, shed gathering, equestrian, fishing, and hunting), concentrated (e.g., OHV use and developed campsites), and permitted (i.e., BLM SRP or Forest Service recreational SUP). The BLM also manages SRMAs where recreation is a primary resource management consideration.

Recreation activities (e.g., OHV use [all-terrain vehicle, motorcycle, and 4 x 4 vehicles], camping, bicycling, and hunting) on federally administered lands that use the extensive network of routes (e.g., double-track and single-track) have an impact on sagebrush and GRSG (also see Infrastructure - Roads). Potential impacts include noise (Blickley et al. 2012a, b), distribution of invasive plants (With 2004; Christen and Matlack 2009; Bradley 2010; Huebner 2010), generation of fugitive dust (Gillies et al. 2005; Lee et al. 2007; Ouren et al. 2007; Padgett et al. 2008), and effects on predator and prey behavior (Gavin and Komers 2006; Poulin and Villard 2011; Whittington et al. 2011). The impacts of recreation within GRSG habitats in Utah are not likely to cause a direct irretrievable loss of sagebrush habitats in the majority of the population areas. However, habitat loss could occur associated with cross-country OHV travel, which is only allowed on some BLM-administered lands.

Recreational activities can degrade GRSG habitat through direct impacts on vegetation and soils, introduction or spread of invasive species and noxious weeds, and habitat fragmentation. This occurs in areas of concentrated use such as developed or dispersed campsites, trailheads,

staging areas, and routes and trails. As use levels increase, the magnitude of these impacts also increases.

The spread of invasive species and noxious weeds is likely to be greater with dispersed recreation compared with permitted activities. This is primarily because the BLM and Forest Service place stipulations on permitted uses to help control the spread of invasive species and noxious weeds on public lands.

Direct disturbance to GRSG resulting from recreational use is most likely to be influenced by type of activity, frequency and magnitude, timing of the activity, and location. OHV use is expected to result in the greatest level of impact due to noise levels generated as compared with hiking or equestrian use. OHV users are most active in the southeastern and central parts of Utah; BLM-administered land is the primary destination, and approximately half prefer to ride off of established roads or trails (Fisher et al. 2002). In addition, increased human use of areas could attract GRSG predators (e.g., ravens) through residual trash and food waste.

Motorized activities are expected to have a larger footprint on the landscape than nonmotorized uses. Cross-country OHV travel, which is permitted in designated areas on BLM-administered lands but not on National Forest System lands, would result in increased potential for soil compaction, loss of perennial grasses and forbs, and reduced canopy cover of sagebrush (Payne et al. 1983). Losses in sagebrush canopy would likely be the result of repeated, high frequency, cross-country OHV use over long periods. Impacts on vegetation communities would likely be greater during the spring and winter months when soil conditions are wet and more susceptible to compaction and rutting. In addition, the chances of wildfire are increased during the summer months when fire dangers are high and recreation is also at its highest.

Under Alternative A, 797,000 acres of GRSG habitat on BLM-administered lands is open to cross-country travel, the majority of which falls within the Hamlin Valley, Bald Hills, Rich, Sheeprocks, and Box Elder Population Areas. All of these population areas are in the western or northern part of the planning area. Many of these habitat areas are also susceptible to impacts from invasive species and fire. Cross-country OHV travel within the BLM-administered portions of these areas could result in the establishment of new motorized vehicle routes and cause fragmentation and loss of GRSG habitat. OHV travel can also result in the spread of invasive species and increase the frequency of fires, thereby causing habitat loss and degradation. The magnitude of these impacts would depend on amount and type of use; however, since sagebrush structure is typically not conducive to cross-country OHV travel, the proliferation of new routes in these areas is expected to be limited. Population areas with BLM-administered lands that are currently open to cross-country motorized use would be expected to have greater impacts than those areas where travel is limited to existing roads and trails or closed to motorized use.

Almost all other GRSG habitat on BLM-administered lands in the planning area would be limited to existing or designated routes. All National Forest System lands would be limited to designated routes. Limited designations reduce or eliminate the creation and proliferation of new routes in GRSG habitat. However, use of designated routes may still cause habitat loss and fragmentation as described above; the magnitude of impacts would depend on the frequency and type of use as well as the density of routes. Noise associated with OHVs in open or limited

areas could result in disruption of birds as described above (Blickley et al. 2012a, 2012b). In areas where there is concentrated use, persistent disruption could eventually result in species displacement and an effective loss of habitat.

BLM SRMAs that overlap GRSG habitat and are specifically designated for OHV recreation include the Sheeprocks/Tintic Mountains and Five Mile Pass SRMAs within the Sheeprocks Population Area. Recreational OHV use is higher in these areas because they are located in the wildland-urban interface and have established route systems. OHV use in these areas is generally limited to designated or existing routes. Based on the amount of use, impacts on GRSG are greater in these locations than in other occupied habitat areas.

Anticipated increased use of BLM and Forest Service existing and designated routes within the planning area under Alternative A due to increasing human populations would have impacts as described above, including habitat avoidance and loss of functional habitat, proliferation of invasive species and associated increased fire risk, and increased predation.

Under the Alterative A, the BLM and Forest Service would continue to issue SRPs and recreational SUPs in GRSG habitat, including permits for motorized events. Issuance of permits for motorized recreation events, including races, would have similar impacts as those described above. These impacts would be short in duration, high in intensity, and limited in extent. Currently the only races that are permitted within GRSG habitat are in the southern portion of the Sheeprocks Population Area in winter habitat. Since race events typically occur during the spring season, the potential for displacement is low, but habitat degradation from trail use could occur.

In addition to impacts from OHV use, there would be impacts from other recreation activities occurring in GRSG habitat. For example, the Uintah, Wyoming-Blacks Fork, and Strawberry Population Areas contain a concentration of recreational sites. Recreational activities include fishing (year-round), camping, hiking, OHV use, winter snowmobile use, and hunting. Increased human activity associated with use of these sites and adjacent areas could result in habitat degradation and species disruption. Impacts from dispersed recreation (e.g., shed collection, hiking, and hunting) would have similar impacts on those that would occur near developed recreation sites; however, these impacts would be lesser in extent due to the dispersed nature of the activities.

Habitat Conversion for Agriculture and Urbanization

USFWS identified habitat conversion for agriculture and urbanization as threats contributing to destruction, modification, or curtailment of GRSG habitat or range. While agricultural conversion or urbanization are not activities permitted on BLM-administered or National Forest System lands, the lands and realty program and travel and recreation management programs could contribute to or be influenced by increasing urbanization levels through increased development, increased energy demands, and increased direct and indirect anthropogenic impacts on GRSG. In Utah, lands generally suitable for agricultural conversion have already been converted. Similarly, conversion of sagebrush habitat to agriculture is not expected on National Forest System lands in Utah. This section will analyze the impacts from land tenure decisions under the lands and realty program. See the Infrastructure section for ROW issuance, the Recreation section for activities authorized under the Travel and Recreation Management

programs, and the Minerals section for more detailed GRSG impacts analyses specific to those programs.

Under Alternative A, 24,400 acres of BLM-administered land within GRSG habitat are available for disposal. No National Forest System lands within GRSG habitat are available for disposal. While disposal of GRSG habitats could contribute to habitat loss, degradation, and disruption to GRSG, lands with sensitive species (including GRSG) would not be disposed of unless there was a net benefit for GRSG.

ACEC Designation

Special management areas such as ACECs and research natural areas can be used as a management tool to provide protection to GRSG and habitats through restrictions on uses and surface-disturbing activities. However, the ACEC designation itself does not inherently prohibit or restrict other uses in the area. Rather, the management of ACECs is focused on the resource or natural hazard of concern, which varies considerably from area to area. In some cases, surface-disturbing activities may be allowed. In contrast, research natural areas are permanently protected and maintained in natural conditions for the purposes of conserving biological diversity, conducting nonmanipulative research and monitoring, and fostering education. In these areas, GRSG habitats would be more likely to be protected over the long term.

Although no existing ACECs or research natural areas include GRSG as a relevant and important value, some existing ACECs and research natural areas overlap GRSG habitat and may provide incidental protection to GRSG and their habitats by restricting land disturbances (e.g., ROWs) within their boundaries. Existing ACECs overlap with small portions of occupied habitat in the Box Elder, Rich, Carbon, and Uintah Population Areas, and research natural areas overlap with occupied habitat within the Rich Population Area (see the Special Designations section of **Chapter 3** for a list of overlapping ACECs and research natural areas).

4.3.3 Alternative B

GRSG Habitat and Disturbance Thresholds

Under Alternative B, 84 percent of the mapped occupied habitat in the Utah planning area would be managed as PHMA. This includes 97 percent of the mapped occupied habitat in the USFWS-identified PACs. Under this alternative, leks associated with 95 percent of the GRSG in the planning area would be managed as PHMA. The areas of GRSG habitat managed as GHMA include areas with poor habitat quality largely due to the presence of existing disturbances or ecological conditions that are not best-suited to maintain GRSG in the long term.

Under Alternative B, disturbances would be limited to an aggregated 3 percent disturbance cap at two spatial levels: 1) within the PHMA (regardless of land ownership); and 2) within each section or one square mile (unless exceeding 3 percent in a section would be a net benefit for GRSG). Disturbance would be calculated in all PHMA in a population area, regardless of land ownership. Disturbances would include discrete anthropogenic disturbances (excluding fire). No new leasing or ROWs would be allowed in PHMA. Therefore, the disturbance cap would primarily apply to valid existing rights. While individuals would be given reasonable access to their valid existing rights, no related disturbances would be allowed within 4 miles of a lek to the extent possible. Application of RDFs and the requirement to complete a Master Development

Plan would additionally minimize surface disturbance on valid and existing rights by proactively planning all the development rather than developing with a piecemeal approach.

In the Uintah and Carbon Population Areas, existing disturbance in PHMA is 1.7 and 1.1 percent, respectively. Thus, less disturbance would be permissible in these population areas under the 3 percent disturbance cap. Other population areas have approximately 1 percent or less existing disturbance. Assuming that the existing disturbances within PHMA do not already equal or exceed 3 percent disturbance, the exclusion of fire in the disturbance calculation would allow for continued disturbances even if fire has decreased available GRSG habitat. Impacts could be particularly pronounced in areas that have the highest occurrence of fire (e.g., Box Elder, Sheeprocks, Ibapah, Hamlin Valley, and Bald Hills). As shown in **Table 3.53**, wildfire has resulted in a loss of 5 percent of sagebrush in mapped occupied habitat statewide. Fire has impacted 8 percent of the sagebrush in the Bald Hills, 4 percent of the GRSG habitat in the Box Elder, and 2 percent of the Ibapah Population Area. Depending on how much occupied sagebrush habitat was lost in the fire, the quality of those habitats, how the birds used the lost habitat, and how much of that specific seasonal habitat type remains, the resiliency of the GRSG population areas could be diminished. Larger impacts may occur in the smaller population areas where a larger percent of the area burned (e.g., Bald Hills).

Minerals

Nonenergy Leasables

Under Alternative B, the BLM and Forest Service would close all PHMA to nonenergy leasable mineral leasing. Under this alternative, new leases to expand existing mines would also not be allowed. This would prevent future impacts from nonenergy leasable mineral development in these areas. For existing leases, RDFs listed in Appendix I, Best Management Practices for Locatable Minerals and Required Design Features for Other Solid Minerals, of the Draft LUPA/EIS would be applied. The primary development potential for nonenergy leasable resources is gilsonite and phosphate, which occur in the Uintah Basin (**Map 3.21-5**). The RDFs are intended to lessen the impact of the development of gilsonite and phosphate within occupied GRSG habitat. They specifically aim to address impacts such as fragmentation, habitat loss disturbance, and habitat degradation associated with roads, operations, and reclamation. Since the RDFs would not be required in GHMA, existing leases on BLM-administered lands in the gilsonite development area may have a larger impact on East Bench area leks. The majority of the area has gas development with wells that range from 2 to 50 wells per square mile. Therefore, GRSG habitat loss, habitat degradation, and disturbance could add to the existing disturbances in the area and affect a small number of birds (10-year average male count is 1 male on BLM-administered lands lek and 4 males on both leks). These impacts would further impact a population that has been declining and already has been substantially impacted by gas development on the landscape.

Solid Minerals - Coal

All surface mining of coal in PHMA would be found unsuitable under Alternative B, including 129,300 and 9,300 acres of high coal development potential areas in the Carbon and Emery (combined), and Panguitch Population Areas, respectively. This action would have more impact on the GRSG population within the Panguitch Population Area, where surface mining of coal is

likely to occur. All current coal mining in the Carbon and Emery Population Areas is accomplished using underground mining methods.

For underground mining, no new leases would be granted unless all related surface disturbances, including appurtenant facilities, could be placed outside of PHMA. Therefore, surface disturbance-related impacts associated new leases described under Alternative A would not occur. The only impacts from underground mining would be those impacts associated with subsidence. The potential impacts from subsidence would be the same as those described under Alternative A.

Where there are existing mining leases, new appurtenant facilities could still be placed near leks, impact nesting, and early brood-rearing habitats in PHMA. Efforts to minimize impacts in GRSG habitat would be made by encouraging new disturbances to be placed outside of PHMA. However, if it is not possible, then new disturbance would be collocated with other existing disturbed areas to the extent possible, which would limit fragmentation and habitat loss. If there are no existing disturbed areas, then the facilities would be built to the minimum standard necessary for operations. Lessening the amount of disturbance associated with appurtenant facilities would reduce both the direct loss of habitat and the functional loss of habitat.

There is limited coal development potential in areas that would be managed as GHMA; however, this alternative would not provide added protection to those areas.

Locatables

In PHMA, all of the locatable minerals (3,650,900 acres) would be proposed for mineral withdrawal. Validity examinations would be conducted to determine which existing mining claims constitute valid existing rights. Those claims lacking discovery would be declared null and void and contested. Those claims determined to be valid (a discovery of valuable minerals) would not be contested and would continue to enjoy all of the rights vested by the Mining Law of 1872, as amended.

Impacts on GRSG would be decreased with plans of operations that require effective GRSG mitigation, in perpetuity, prior to any proposed surface-disturbing activities. Seasonal restrictions would be considered if they would be effective to protect the GRSG. In addition to the above management, under this alternative the BLM and Forest Service would apply all of the BMPs identified in Appendix I of the Draft LUPA/EIS to the extent allowable by law.

All of the actions above would lessen the impact on GRSG in PHMA compared with Alternative A. A mineral withdrawal would provide the maximum protection from future locatable mineral entry, and the measures required in the plan of operations would afford protection to GRSG habitats already authorized in the area recommended for withdrawal. Direct loss of habitat and disruption during certain seasons would be reduced for GRSG within PHMA under this alternative. Functional loss of habitat would also be decreased with the implementation of the BMPs in Appendix I of the Draft LUPA/EIS. While current locatable mining in GRSG habitat in the planning area is minimal, this alternative would decrease the likelihood of impacts on GRSG on federal lands.

Mineral Materials

Under Alternative B, all PHMA (3,340,000 acres) would be closed to mineral material sales. Mineral material pits that are no longer in use would be restored to meet GRSG conservation objectives. The closure of all mineral material sales in PHMA would also eliminate any additional habitat loss, habitat degradation, and disturbance from activities associated with mineral material extraction.

Fluid Minerals (Including Geothermal)

Under Alternative B, all PHMA would be closed to new mineral leasing. Upon expiration or termination of existing leases, nominations/expressions of interest for parcels within PHMA would not be accepted. Closing PHMA to new fluid mineral leasing would have the greatest impact in unleased areas where there is high oil and gas potential, such as the Rich Population Area.

Operations would only be allowed via helicopter-portable drilling operations and in accordance with any seasonal timing restrictions and/or other restrictions to protect GRSG. Closure of PHMA to new leasing could cause developers to look to private, tribal, and state lands within PHMA and develop those areas more heavily if the nonfederal lands are of sufficient size to support economically profitable development. This is most likely to occur in areas where there are mixed landownership patterns, such as in the Rich Population Area and the central Uinta Basin. Impacts could result in direct habitat loss, habitat degradation, and disturbance to birds and may, depending on development proximity to federal mineral estate, cause functional habitat loss on federal lands. This alternative may still result in habitat loss, degradation, and disturbance to birds, but the impacts would be concentrated on nonfederal mineral estate. In areas where there are predominately federal lands, closure to new fluid minerals leasing could discourage new development of nonfederal lands because it may no longer be economically viable to develop nonfederal lands in PHMA. In such areas, closure of federal lands could provide protection for GRSG on nonfederal lands.

In areas of PHMA that have already been leased, the conservation measures listed in **Chapter 2** would be applied through completion of an environmental record of review (43 CFR 3162.5), including appropriate documentation of compliance with NEPA when the BLM or Forest Service approve an APD or Sundry Notice (43 CFR 3101.1-2). Where feasible, application of RDFs, including precluding disturbance within 4 miles of a lek, would reduce most impacts on the lek and the surrounding nesting habitat. A 4-mile buffer maintained by NSO stipulations on existing leases would protect up to 74 percent of the nesting birds (Holloran and Anderson 2005; Holloran et al. 2007). Such buffer requirements may reduce the economic feasibility of leasing in GRSG habitat and result in existing leases not being developed.

To minimize the possibility that disturbance thresholds are exceeded and GRSG populations respond negatively, permitted disturbance would be limited to one disturbance per section and could not exceed 3 percent. In the Uintah and Carbon Population Areas, existing disturbance is 1.7 and 1.1 percent, respectively. This would allow for additional development, similar to the other population areas, but Uintah and Carbon are the population areas most likely to have energy-related development.

As mentioned in Alternative A, research has shown that GRSG are negatively affected when well pad densities within approximately 2 miles of a lek exceed one well pad per section (Tack 2009) or one well pad within 1.2 miles of a lek (Gregory and Beck 2014). Equitable distribution of disturbance across the landscape would prevent development at densities that would impact lek attendance. On the other hand, limiting the disturbance in GRSG habitat to one disturbance within a section, without flexibility, could distribute disturbance across the landscape and increase general fragmentation of PHMA. Other minimization measures would include completing master development plans, requiring unitization, and requiring design features in Appendix J, Required Design Features for Fluid Minerals, of the Draft LUPA/EIS to reduce fragmentation and direct habitat loss of all seasonal habitats. Unitization under this alternative would avoid duplication of infrastructure in GRSG habitat. Master development plans require the project proponent to plan the development as a unit rather than in pieces in order to encourage development designs that minimize impacts on GRSG. Impacts on GRSG within PHMA would also be decreased with the application of seasonal restrictions. Application of RDFs and other GRSG protection measures as COAs would have the greatest impact in leased areas where development is currently occurring, such as the West Tavaputs and Anthro areas.

Under Alternative B, the conservation measures listed in **Chapter 2** in Alternative B and RDFs in Appendix J of the Draft LUPA/EIS would be applied to nonfederal lands with federal mineral interests. This would reduce the impact of fluid mineral development on GRSG located on some private, state, and tribal lands, but may affect the feasibility of drilling on these lands under existing leases.

The RFD scenario for Alternative B decreased to almost half the development anticipated in Alternative A. There are 363 fewer wells and 7,373 acres less total disturbance (approximately 45 percent) projected in GRSG habitat for Alternative B than in Alternative A. The main difference in Alternative B is that wells would likely be strategically located in PHMA to minimize impacts on GRSG. In addition, some existing leases may not be developed due to the restrictions imposed under Alternative B.

The majority of the reasonably foreseeable development would occur in GHMA in the southern portions of the Uintah Population Area, Deadman's Bench, and East Bench, where disturbance is currently 2.5 percent with portions that currently exceed 10 wells per section. This could result in further habitat loss, degradation, and direct disturbance to the small population of birds that occupy this area. Impacts on GRSG in GHMA would be the same as described under Alternative A.

The impacts associated with geothermal leasing and development is essentially the same as those stated above because the acreage is already leased. The Bald Hills Population Area is the only population area where geothermal activity is anticipated. Geothermal activity would be managed constantly with the management described under PHMA.

Infrastructure

New infrastructure development would be substantially limited compared with Alternative A. All GHMA (529,600 acres) would become ROW avoidance areas; all PHMA (2,784,200 acres) would be excluded from new ROW authorizations. New linear ROWs would be allowed only in designated ROW corridors. The inability to site ROWs in PHMA could lead to longer ROW

routes in order to bypass closed areas. Longer routes would increase surface disturbance and other impacts of ROW siting on GRSG habitats, and may result in increased impacts on GRSG populations using habitat on adjacent private lands.

Under Alternative B, all ROW corridors that are not encumbered by an existing ROW would be undesignated. Once undesignated, these areas would be become exclusion areas. Construction of new infrastructure (e.g., roads, pipelines, and power lines) could occur in designated corridors located in PHMA as long as the new ROW is collocated next to an existing ROW and the entire footprint of the new ROW (including construction and staging) can be completed within the existing disturbance associated with the authorized ROWs. Given the restrictive nature of this management decision, construction of new infrastructure adjacent to existing infrastructure in PHMA would be improbable. Any new ROWs constructed would likely be limited to smaller ROWs such as telephone or fiber optic lines. Construction would be subject to TLs. Construction of new ROWs adjacent to existing ROWs could result in slightly higher densities of line. Impacts would be more pronounced in existing corridors that are close to leks. Higher densities of line within 4 miles of a lek negatively influence the probability of lek persistence (Walker et al. 2007a). However, given that new developments would likely be small, would be restricted to areas where direct habitat loss and degradation has already occurred, and would not occur during important seasons, impacts on GRSG would be minor.

Additional protection from infrastructure would be provided by closing PHMA to leasing of nonenergy minerals, leasing of fluid minerals, and mineral material disposal. For coal, PHMA would be closed to new surface mining, and underground mining would only be allowed if aboveground appurtenant facilities are located outside of PHMA. Finally, PHMA would be withdrawn from mineral entry.

On top of prohibiting or restricting new minerals development in PHMA, the BLM and Forest Service, to the extent allowable by law, would protect GRSG from development where there are valid and existing rights (i.e., existing mining claims and leases) through application of either BMPs or RDFs (depending on the mineral program). For example, in areas currently leased in PHMA, there would be a 3 percent disturbance cap on anthropogenic disturbances, and disturbance would be limited to approximately one disturbance per section.

In addition to making PHMA ROW exclusion area, new road development and associated new noise disturbances would not occur in PHMA because OHV use would be limited to existing roads and trails until additional travel management planning is completed. For additional restrictions on mineral development and OHV use, see Mineral Development and Recreation.

Because of restrictions across multiple resource programs, only a minimal loss of habitat within PHMA would occur. Disturbance would primarily be limited to development of existing leases. Some loss of habitat is expected to occur in the Uintah, Carbon, and Emery Population Areas where there is the greatest potential for minerals development.

Loss of habitat within GHMA would be more substantial because there would be fewer restrictions on land uses. However, as previously mentioned, BLM and Forest Service areas identified as GHMA support small GRSG populations, and loss of habitat within GHMA would be expected to occur primarily in the Uintah Population Area where fluid minerals development

is the greatest. Some habitat loss in GHMA may also occur in the Summit and Morgan county areas of the Rich Population Area due to urban development, though these areas are primarily private lands.

Renewable Energy

Under Alternative B, PHMA would be a ROW exclusion area for wind energy development. Prohibiting wind energy development would eliminate the likelihood for habitat loss, degradation, fragmentation, and direct disturbance to birds in these areas.

Fire

Under Alternative B, impacts from fire would be similar to those described under Alternative A but the BLM and Forest Service would designate 2,781,700 acres of GRSG habitat as PHMA. Within PHMA, fuels treatments would be focused on protecting GRSG habitats. Any fuels treatment in sagebrush would carefully consider if there is a net benefit for GRSG prior to implementation, and fuels treatments would not be allowed in wintering habitat. Prescribed fire in low-precipitation areas (less than 12 inches) would also be prohibited. Invasive vegetation would be monitored and controlled (see Invasive Plant Species section). Where appropriate, the use of livestock to strategically remove fine fuels would be considered. Post-fire rehabilitation would be conducted using primarily native seeds, unless availability is low or conditions decrease likelihood for success, and grazing management may require temporary or long-term changes to ensure seeded or native plant persistence. These activities may decrease the likelihood for fire in GRSG habitats and would restore GRSG habitat in fire-affected areas. **Table 4.4** shows the estimated percent change in average annual acres burned over the next 50 years when compared with Alternative A.

Table 4.4
Alternative B VDDT Model Outputs- Average Changes in Fire, Juniper, and Annual Grasses Over 50 Years

Population Area(s)	Percent Change in Average Annual Acres Burned	Percent Juniper	Percent Change in Juniper	Percent Annual Grasses	Percent Change in Annual Grasses
Box Elder	-8	11	57	9	0
Hamlin Valley, Ibapah	-29	26	4	5	-29
Rich, Uintah, Wyoming-Uinta, Wyoming-Blacks Fork	-10	13	0	3	-25
Carbon	-5	27	-7	1	-50
Emery	0	3	0	0	0
Parker Mountain, Panguitch, Bald Hills	-15	19	6	0	-100
Strawberry	-13	12	0	0	0
Sheeprocks	-35	31	-12	15	-12

According to the VDDT modeling, when compared with Alternative A, implementation of fuels and fire management decisions would reduce the number of acres burned annually in all population areas except Emery, where numbers are expected remain the same. Changes in fire

management would have the greatest impact in the Great Basin population areas that are most susceptible to wildfire.

Table 4.5 shows changes in the percent of the modeled sagebrush area in the mid- to late-seral stage. Changes in trends are primarily a result of estimated changes in fire, annual invasive grasses, and juniper encroachment. The effects of management changes under Alternative B are most pronounced in the Sheeprocks Population Area, where at 10 years the modeled decrease in mid- to late-seral sagebrush is only 3 percent under Alternative B compared with 7 percent under Alternative A. This is more pronounced at 50 years, where Alternative B sees a 5 percent decrease in mid- to late-seral sagebrush compared with a 15 percent decrease under Alternative A. The long-term decreases in other population areas are similar, though to a lesser degree.

Table 4.5
Sagebrush Condition and Trend Analysis: Comparing Alternatives by Percent of Sagebrush Area in Mid- or Late-Seral Classes for Population Areas at 10 Years and 50 Years – Alternatives A and B

Population Area	Percent of Sagebrush in Mid- and Late-Seral Class				
	Current Conditions	10 Years		50 Years	
		Alternative A	Alternative B	Alternative A	Alternative B
Uintah	80	76	77	67	69
Carbon	66	57	61	58	59
Emery	77	83	83	85	85
Parker Mountain	70	67	69	68	70
Panguitch	70	67	69	68	70
Bald Hills	70	67	69	68	70
Hamlin Valley	36	45	46	54	59
Ibapah	36	45	46	54	59
Sheeprocks	53	46	50	38	48
Box Elder	55	61	60	70	68
Rich	80	76	77	67	69
Strawberry	76	76	77	78	79
Lucerne	80	76	77	67	69
Wyoming-Uinta	80	76	77	67	69
Wyoming-Blacks Fork	80	76	77	67	69
All	**57**	**60**	**60**	**65**	**66**

At 50 years, the percent of sagebrush that would be mid- to late-seral stage would decrease in the Uintah, Carbon, Sheeprocks, Rich, Lucerne, Wyoming-Uinta, and Wyoming-Blacks Fork Population Areas. The percent sagebrush that would be in the mid- to late-seral stage would remain the same in the Panguitch, Bald Hills, and Parker Mountain Areas. The percent sagebrush that would be in the mid- to late-seral stage would increase in the Hamlin Valley, Ibapah, Box Elder, Strawberry, and Emery Population Areas. According to the model, at 50 years, all population areas except Carbon, Hamlin Valley, Ibapah, and the Sheeprocks would meet the GRSG habitat objective for Alternative B, which is to manage or restore PHMA so that at least 70 percent of the land cover provides adequate sagebrush habitat to meet GRSG needs.

As discussed in the introduction to this GRSG analysis (methodology), information derived from the VDDT model provides valuable information on estimated trends; however, the model also has a number of limitations. While quantitative objectives for treatments were not included under Alternative B, an increase in treatment could be consistent with the goal, objectives, and management actions considered under Alternative B.

Under Alternative B, not all occupied GRSG habitat would be managed as PHMA. Some occupied GRSG habitat in the Carbon, Uintah, Sheeprocks, Box Elder, Wyoming-Uinta, and Wyoming-Blacks Fork Population Areas would be managed as GHMA. GHMA (approximately 16 percent of the mapped occupied habitat in the planning area) are areas that have been determined to have less conservation value than PHMA. Removal of GHMA from the model area would likely result in decreases in percent of juniper and annual grasses and increases in the amount of sagebrush in the mid- to late-seral stage in PHMA. Therefore, population areas that are not currently meeting objectives may be able to meet objectives in the future.

Invasive Plant Species

Weeds

Under Alternative B, the BLM and Forest Service would greatly limit surface-disturbing activities in PHMA and would apply a 3 percent disturbance cap on anthropogenic disturbance. Prohibiting and restricting development would limit the introduction and spread of invasive weeds. In addition, management would be implemented to restore areas infested with invasive plant species. The BLM and Forest Service would require the use of native seeds and would design post-rehabilitation management to ensure the long-term persistence of the rehabilitation efforts. Invasive plant species would be monitored and controlled after fuels treatments and at existing range improvements. In addition, fuels management BMPs would incorporate invasive annual prevention measures. Together, these actions would minimize the likelihood for invasive annual invasion and may reduce the extent of invasive plant species in some areas. The actual change in the probability of invasive annual establishment would depend on the resources available to devote to the effort. Given the extent of existing invasive annual infestations and the lack of effective large-scale control methods, cheatgrass would largely remain a threat to GRSG and continue to spread and degrade habitats.

According to the VDDT model (**Table 4.4**), under Alternative B the percent of annual grasses would remain approximately the same in the Box Elder Population Area during the next 50 years. Based on elevation, invasive annual grasses are not dominant in the Emery and Strawberry Population Areas. Decreases in annual grasses would occur in all other population areas. Again, as shown in **Table 4.5**, when compared with Alternative A, more vegetation would be in the mid- to late-seral stage under Alternative B based on changes in weeds management, when combined with other management decisions.

Conifer Encroachment

Under Alternative B, impacts would be similar to those disclosed in Alternative A; however, habitat restoration would be prioritized in seasonal habitats found to be limiting GRSG population growth. Restoration of sagebrush habitats impacted by conifer encroachment would include habitat guidelines as outlined in Connelly et al. 2000 and Hagen et al. 2007. Managing

sagebrush communities to the habitat parameters outlined in Connelly et al. 2000 and Hagen et al. 2007 may not be appropriate for broad application across the range of GRSG; however, Alternative B allows for site-specific adjustments to habitat guidelines based on documented regional variations of habitat characteristics.

According to the VDDT model (**Table 4.4**), during the next 50 years vegetation treatments, including removal of encroaching conifer, would not be sufficient to prevent some loss of GRSG habitat due to juniper encroachment in the majority of the population areas. However, the amount of juniper would decrease in the Carbon and Sheeprocks Population Areas, which are two of the areas with the highest percent of juniper.

Grazing (Including Wild Horses and Burros)

Impacts from Domestic Livestock Forage Use (Herbivory)

The potential impacts on GRSG habitat from livestock herbivory identified under Alternative A would continue to be potential impacts under Alternative B, with the exception that the likelihood of the impacts would decrease. Under Alternative B, the BLM and Forest Service would manage PHMA to incorporate GRSG-specific habitat objectives and management considerations, including maintaining vegetation diversity and limiting structural range improvements and standing water in GRSG habitat (see **Table 2.4**), into permit renewals, allotment management plans, or annual operating instructions. In addition to including specific objectives for GRSG habitat, land health assessments would be prioritized under Alternative B, increasing the potential to identify site-specific areas where the impacts described under Alternative A could be occurring. By prioritizing land health assessments, such areas, if they exist, would be identified and adjustments to grazing practices could be implemented to eliminate the impact. Efforts to improve GRSG habitat would focus on allotments that have the best opportunity for conservation, enhancement, or restoration of GRSG habitat, working in cooperation with other stakeholders in an integrated ranch planning approach. This proactive approach would manage GRSG habitat on a landscape level with nonfederal and federal areas being managed to improve overall GRSG habitat and identify areas with potential problems quickly. While site-specific impacts may still occur, given the prioritization of assessment and landscape approach, the duration of the impact would likely be short, thereby managing GRSG habitat to meet GRSG objectives.

Biologically, as long as sagebrush communities have not moved beyond an ecological threshold for the site to withstand (based on ESD), whether affected by juniper, annual nonnative grasses (e.g., cheatgrass), or other stressors, good ecological condition can be restored and/or maintained while being grazed (Launchbaugh undated). Even under such conditions, grazing practices need to be carefully managed to ensure that the threshold is not exceeded (e.g., number of animals, duration in the area, season of use, and rotation schedule). However, if sagebrush communities move past an ecological threshold, simply removing livestock grazing would not return the area to its previous state (Cagney et al. 2010; Launchbaugh undated). This is important, because under Alternative B, PHMA would be assessed based on GRSG habitat indicators such as structure, condition, cover, and composition, based on recommendations from Connelly et al. (2000) and Hagen et al. (2007) or locally derived habitat objectives. There are currently no local or statewide specific habitat objectives that address these metrics.

Therefore, PHMA would be managed based on guidelines set forth in habitat studies conducted in GRSG habitat outside of Utah, which may or may not provide for local vegetation community variations and site capabilities within Utah. While ESDs and ecological site potential would be used as a baseline to determine if rangeland health standards are being met, adjusting grazing to meet habitat guidelines based on studies from Oregon, Montana, Wyoming, Colorado, and Idaho may not be ecologically possible in Utah. In those areas where meeting such standards would not be possible, grazing would likely have to be reduced or removed. Reduced grazing may or may not help the area meet the Connelly and Hagen guidelines, given potential variations in the ESD. Alternative B does direct the BLM and Forest Service to develop specific objectives to conserve, enhance, or restore PHMA based on ESDs. While Connelly and Hagen guidelines may not be possible in all areas, moving vegetation toward ESD and ecological site potential would likely improve habitat components for GRSG, such as by increasing local grasses.

While active AUMs available for livestock grazing under Alternative B would be the same as under Alternative A, adding requirements for GRSG habitat objectives and implementing management to meet seasonal GRSG habitat requirements, specifically guided by ESDs and Connelly and Hagen guidelines, would require the application of a variety of grazing management measures identified under Alternative B. During assessment of habitat condition and Rangeland Health Standards, annual adjustments would likely have to be made to meet the new requirements, reducing the average annual AUMs used by livestock. While Alternative B could result in 100 percent of the permitted use being used, such use would only be permitted if climatic and environmental conditions resulted in forage production capable of supporting this level of use while meeting GRSG objectives. Since that may not be ecologically possible in some areas, it is anticipated that the average annual AUM usage would decline compared with Alternative A. In the short term, this would likely increase the amount and height of grasses on the landscape, improving brood-rearing habitat.

During periods of drought, impacts under Alternative B would be similar to those described under Alternative A because management is consistent with policies currently available to the BLM and the Forest Service that allow for adjustments to grazing practices to maintain rangeland health. However, because Alternative B includes specific objectives for GRSG and prioritization for assessments in PHMA, the likelihood that problems related to the drought would be identified and measures taken to correct problems would be greater under Alternative B. Additionally, under Alternative B, it would be expected that the impacts associated with drought within PHMA may provide assurances that actions are being taken in regards to livestock management to minimize the effects of drought and may provide for greater chance of recovery of vegetation communities impacted. Therefore, PHMA values would likely continue to meet food and cover needs during and following drought, and the likelihood for habitat loss or degradation caused by livestock grazing during drought would be reduced.

Continuing to manage riparian areas and wet meadows for proper functioning condition would protect GRSG brood-rearing habitat, similar to Alternative A. However, Alternative B would reduce hot season grazing within PHMA in riparian and meadow complexes through fencing and herding of livestock, season of use changes, or livestock distribution. While these same actions are provided for under Alternative A, they are not required. Therefore greater and more rapid

improvement would be expected for the maintenance and improvement of riparian and meadow complexes within PHMA.

Riparian areas and wet meadows would be managed for a reference state condition based on the ESD rather than PFC (or any Forest Service equivalent). This could reduce grazing further beyond just meeting PFC, resulting in additional growth within these areas. Some research indicates that GRSG preferred grazed over ungrazed wet meadows where protective cover conditions were otherwise equal (Neel 1980). This is likely due to overstories being maintained at a level that does not crowd out understory forbs. No similar literature exists for GRSG use of grazed or ungrazed riparian areas.

Collectively, the requirements to protect GRSG habitat in Alternative B would maintain or improve GRSG habitat compared with Alternative A. With the restrictions of Alternative B and the changes in riparian management, combined with the considerations of GRSG habitat, it is expected that over the life of the plan, the quality of GRSG seasonal habitats would improve given the focus on meeting GRSG habitat objectives. In the long term, reducing livestock grazing could result in some areas decreasing in productivity, resulting in the same impacts on the grass heights as described under Alternative A. Changes in productivity may not occur if increases in grazing by wild ungulates and other small mammals offset decreases in use by livestock.

Impacts from Wild Horse Forage Use (Herbivory)

Continuing to manage wild horse levels within established AMLs would result in similar impacts on GRSG habitat from wild horse herbivory as those described under Alternative A. However, evaluation of land health assessments in wild horse HMAs could identify vegetation conditions that could prompt gathers, reducing wild horse numbers and the associated impacts on GRSG habitats.

Impacts from Wild Ungulate Forage Use (Herbivory)

The impacts from wild ungulates would be the same as under Alternative A.

Impacts from Livestock Grazing Program Actions

Under Alternative B, new spring or seep development for livestock or wild horse water in PHMA would only be authorized if it would benefit GRSG. In addition, modifications to springs, seeps, and pipelines would be considered where it is determined necessary to provide continuity of the pre-development riparian area within PHMA when such modifications are neutral or beneficial to GRSG. Water developments or modification of existing water developments would incorporate BMPs to mitigate potential impacts from West Nile Virus. Therefore, riparian habitats would be maintained and would not result in long-term habitat degradation or loss within PHMA.

Alternative B would require that fences located in high-risk areas be removed, modified, or marked. This would reduce the potential for GRSG injury or death from incidental strikes compared with Alternative A, though the potential would remain in areas of moderate and low potential for strike. This would reduce the loss of individual birds, and reduce this threat to the population. Other structural range improvements would be designed and located to conserve, enhance, or restore GRSG habitat through an improved livestock grazing management system relative to GRSG objectives. Range improvement projects that are designed and located in

consideration of impacts on GRSG would reduce the likelihood of long-term habitat degradation, habitat loss, or disruption to GRSG movements or habitat quality.

Under Alternative B, introduced perennial grass seedings (e.g., crested wheatgrass, smooth brome) would be evaluated within and adjacent to PHMA and considered in regards to their compatibility with GRSG habitat. In addition, monitoring and treating invasive species associated with range improvements would reduce the potential for invasive or introduced species to further reduce the quality of adjacent GRSG habitats.

One of the larger differences between Alternative A and Alternative B is that range vegetation treatments must conserve, enhance, or restore GRSG habitat. The impact on GRSG is contained in the decision itself, in that only treatments that improve the quality or quantity of GRSG habitat would be permitted. This would eliminate potential vegetation treatments that could reduce winter habitats or convert sagebrush into perennial grasslands or other treatments that would have been implemented for livestock grazing or other wildlife species. This decision would increase the likelihood that the 50 to 70 percent sagebrush cover requirements that GRSG need would be maintained.

Impacts from Wild Horse Program Actions

Alternative B would prioritize wild horse gathers within PHMA, unless removals are necessary to address other issues such as public safety, nuisance animals, court orders, and population growth suppression. Impacts from wild horse grazing would be similar to Alternative A; however, prioritizing wild horse gathers within PHMA would increase the likelihood that wild horse AMLs are being maintained, which would not result in long-term habitat degradation, loss, or disruption to GRSG. Herd management plans and evaluations for wild horse AMLs would take into consideration GRSG habitat objectives, which would provide indicators for measuring structure, condition, and composition of vegetation for maintenance of GRSG habitat, thereby establishing a framework for assessing GRSG habitat within HMAs. Range improvement projects for wild horses would have similar impacts as addressed in livestock under Alternative B.

Recreation

Under Alternative B, areas in PHMA that are currently open to cross-country OHV travel on BLM-administered lands would be changed to a limited category. All National Forest System lands would remain limited to designated routes. Changes in OHV area designation may reduce proliferation of new routes. However, given that sagebrush-dominated landscapes are not conducive to cross-country travel, changes in management would not necessarily result in changes in use on the landscape.

In most circumstances, impacts from OHV use would be the same as those described under Alternative A. However, the BLM would be required to complete activity-level plans designating routes in PHMA within 5 years. Route evaluations that take into consideration impacts on GRSG could result in use limitations, realignments, or closures, thereby reducing the likelihood of impacts on GRSG such as habitat loss, habitat degradation, and disturbance to the birds.

Under Alternative B, recreational permits would only be issued in PHMA where the permitted activity would have neutral or beneficial effects. Therefore, issuance of recreational permits would not result in long-term degradation, disruption, or loss of GRSG habitat in PHMA.

Impacts from other types of recreation, including recreation at developed recreation sites and dispersed recreation, would be the same as those described under Alternative A.

Habitat Conversion for Agriculture and Urbanization

Under Alternative B, management would designate 2,781,700 acres as PHMA, and those areas would be retained unless an exchange was deemed a benefit for GRSG.

ACEC Designation

No special management areas would be designated to provide protection for GRSG under Alternative B. Any incidental protections under Alternative A would continue to occur.

4.3.4 Alternative C

GRSG Habitat and Disturbance Thresholds

Under Alternative C, all mapped occupied habitat would be managed as PHMA. This includes 100 percent of the mapped occupied habitat included in the USFWS-identified PACs. Similarly, Alternative C would include 100 percent of the birds in PHMA. In concert with the management and associated impacts described below, the allocation decisions under Alternative C would limit land uses and provide for no disturbances associated with new leases or permits, but restrictions on fire and vegetation management would also preclude some proactive actions that could improve and maintain GRSG habitat.

Under Alternative C, cumulative disturbances would be limited to 3 percent of GRSG habitat and would include all of the types of disturbances noted under Alternative B, as well as vegetation treatments that result in the loss of sagebrush, severely burned areas, and heavily grazed areas. Land uses that could introduce new direct disturbance would largely be precluded (e.g., minerals and ROWs). Management for livestock grazing associated with Alternatives C1 and C2 would preclude the potential for grazing to result in heavy use by either complete closure or through a substantial reduction in livestock grazing. As a result, the only potential for new disturbances in GRSG habitat would be from development of valid existing mineral rights, maintaining and realigning existing ROWs, vegetation treatments, and wildfire. As shown in **Table 3.53**, wildfire has resulted in a loss of 8 percent of sagebrush in the Bald Hills, 1 percent in the Sheeprocks, 4 percent of the GRSG habitat in the Box Elder, and 2 percent of the Ibapah Population Area. Because wildfire is included in the disturbance cap, and assuming that areas burned within the past 10 years have not been restored to a point where they have regained GRSG habitat value, no new surface disturbance associated with discretionary uses would be allowed in any of these population areas on federal lands because they currently exceed the amount of allowable disturbance due to wildfire. Once burn areas are suitable GRSG habitat again, those acreages are subtracted from the disturbance acreage, and if the disturbance percentage drops below 3 percent at that time, some discretionary activities would then be possible in that GRSG population area. In the Bald Hills and Box Elder Population Areas, disturbance already exceeds 3 percent of land area when fire history is taken into account. Bald Hills has over 12 percent disturbance. These areas would face greatly reduced potential for development under this alternative. Other population areas have less than 3 percent existing disturbance when fire is taken into account; however, the inclusion of fire in the disturbance

threshold places the total allowable disturbance very near the 3 percent disturbance cap in several population areas, including Uintah, Carbon, and Hamlin Valley.

Measures to protect GRSG can be considered in association with development on valid existing rights and maintenance associated with existing ROWs, which could adjust the timing and nature in which the valid existing rights and ROWs are developed and maintained. However, the BLM and Forest Service cannot preclude reasonable access to valid existing rights or maintenance of ROWs according to the permit terms. As a result, while the disturbance cap could result in consolidating some disturbances, it is anticipated that some areas would continue to see disturbance, regardless of existing disturbance levels (e.g., south and southeast sides of the Uintah Population Area). This could result in areas where disturbance exceeds levels that are needed to maintain GRSG populations, and as such, some areas could continue to see population declines even with the disturbance cap.

Only allowing treatment methods that retain sagebrush cover could maintain GRSG habitat in some areas (e.g., winter habitat), but in others, the reduction in treatments could result in habitat decreasing in quality (e.g., closed-canopy sagebrush, invasion by nonnative species) or quantity (e.g., dominance of nonnative species, areas encroached by pinyon-juniper). In these areas, natural processes would be used to manage vegetation, which could result in loss of GRSG habitat over time.

Minerals

Nonenergy Leasables

Impacts under Alternative C would be the same as those described for Alternative B but would close a larger area to development. All occupied GRSG habitat (4,008,580 acres) would be closed to new nonenergy mineral leases. This would further reduce impacts on GRSG habitat caused by nonenergy leasable development, specifically on East Bench and in wintering habitat on Deadman's Bench, where there is gilsonite development occurring.

Although these areas would be managed as PHMA rather than GHMA under Alternative C, and new leasing would not be allowed, development could still occur from existing leases. Where possible, RDFs would be required when developing existing leases.

As mentioned in other sections, East Bench has gas development that ranges from 2 to 50 wells per square mile, and the GRSG population has declined from 34 males in 2005 to 1 male in the last 3 years. The wintering area in the Deadman's Bench area could be affected, but the only occupied lek has a 10-year average male lek count of 3 males, and an average of 1 male from 2010 to 2013. Given the amount of existing leases and development in the area, it is unlikely that the additional protections included under Alternative C would be sufficient to stop continued population decline.

Solid Materials - Coal

Management for solid mineral leasing and development under Alternative C would be similar to that described for Alternative B. While decisions would apply to all occupied habitat (4,008,580 acres), the impacts on GRSG habitat would be essentially the same as described for Alternative B.

Locatables

Management for locatable minerals under Alternative C would be similar to that described for Alternative B. Decisions would apply to all occupied habitat (4,008,580 acres) instead of 3,650,900 acres proposed under Alternative B; however, the impacts on GRSG habitat would be qualitatively the same as described for Alternative B.

Mineral Materials

Management for mineral materials under Alternative C would be similar to that described for Alternative B. While decisions would apply to all occupied habitat (4,008,580 acres), the impacts on GRSG habitat would be essentially the same as described for Alternative B.

Fluid Minerals (Including Geothermal)

Impacts on GRSG from fluid minerals would be similar to those described under Alternative B with a few exceptions. First, under Alternative C, all GRSG occupied habitat would be managed as PHMA, which means additional GRSG habitat would be closed to new fluid mineral leasing (16 percent). Second, no exploration would be allowed within occupied GRSG habitat. When compared with Alternative B, this could protect leks associated with an additional 1.3 percent of the GRSG in the planning area.

Under Alternative C, approximately 2,330 wells would be drilled from 616 well pads in GRSG habitat. This is 870 fewer wells and 1,028 fewer pads than would be drilled under Alternative A. Total disturbance associated with new oil and gas development would be approximately 7,386 acres, which is 8,899 acres (55 percent) less than Alternative A. All new development on federal lands or lands with federal mineral interest would be from existing leases. Under Alternative C, fire would be counted as disturbance. This could mean that in some areas there would be fewer acres available for mineral development; for example, Uintah would only be able to add 0.2 percent additional disturbance. In the Bald Hills and Box Elder Population Areas, no more surface disturbance would be allowed with their 12.8 and 5.9 percent disturbance, respectively. In addition, Hamlin Valley would be very close to exceeding allowable disturbance with 2.9 percent. However, as discussed above, the BLM and Forest Service cannot preclude reasonable access to valid existing rights. As a result, it is anticipated that some areas would continue to see disturbance, regardless of existing disturbance levels (e.g., south and southeast sides of the Uintah Population Area).

The impacts associated with geothermal leasing and development is essentially the same as those stated in Alternative B.

Infrastructure

Similar to Alternative B, new infrastructure development would be substantially limited compared with Alternative A. All occupied GRSG habitat would be closed to new ROW authorizations, including renewable energy development. In addition, all ROW corridors would be undesignated. The inability to site ROWs in GRSG habitat could lead to longer ROW routes in order to bypass closed areas. Longer routes would increase surface disturbance and other impacts of ROW siting and may result in increased impacts on GRSG habitat on adjacent private lands. Additional protection would be provided through restrictions on mineral development and OHV use (see Mineral Development and Recreation). GRSG habitat (both federal lands and nonfederal land with mineral interests) would be closed to leasing of nonenergy minerals.

Habitat would also be protected from any new surface coal mining and from underground coal mining leases, because no supporting surface infrastructure would be allowed in GRSG habitat. In addition, GRSG habitat would be withdrawn from locatable mineral entry, and all GRSG habitat would be closed to mineral material sales. A 3 percent disturbance cap that would apply to all disturbances (including fire) and disturbance would be limited to one disturbance per section.

Under Alternative C, 523,500 acres of BLM-administered lands that are currently open to cross-country travel or limited to existing or designated routes would be closed to OHV use. Identification of closed areas would reduce direct loss, degradation, and fragmentation of GRSG habitat. Identification of closed areas could result in closure of some existing or designated routes, including routes that may currently impact GRSG. The impact of individual route closures would depend on a number of variables, including the size of the route, type of use, and frequency of use. Most areas that would be identified as closed areas currently do not have roads. The primary benefit of designating areas as closed to OHV use would be that intact habitat would remain protected from OHV-related impacts such as noise and bird strikes. The effects on GRSG would depend on the type of habitat (season). Impacts on GRSG would be greatest in nesting and brooding habitat because OHV use typically occurs during the spring, summer, and fall seasons.

In addition to designating OHV closed areas, no new roads would be allowed within 4 miles of a lek under Alternative C. This would further limit the amount of disturbance to GRSG nesting and brood-rearing habitat, as well as limit the amount of direct disruption (noise and bird strikes) associated with development and use of future roads in these areas. These measures would maintain GRSG habitats and minimize new impacts on GRSG populations from infrastructure development such as roads to an even greater extent than Alternative B.

Because of restrictions on ROW development, road building, and application of the 3 percent disturbance cap across multiple resource programs, only minimal loss of GRSG habitat would occur from development of infrastructure. Habitat loss would be limited to those areas where existing leases and authorizations are present. For example, some habitat loss would be expected to occur in the Uintah and Carbon Population Areas because these areas have the greatest potential for minerals development.

Renewable Energy

Under Alternative C, although exclusion restrictions to wind energy development would apply to a larger area, development would likely only occur in areas included as priority under Alternative B. Therefore, the impacts on GRSG would be the same.

Fire

Under Alternative C, there would be less surface disturbance allowed than under any other alternative because all occupied GRSG habitat would be subject to a 3 percent disturbance cap, which would include existing disturbance and fire under this alternative. In addition, most land uses would be prohibited (e.g., closed to new minerals development). Under this alternative, the BLM has identified OHV closed areas. Reductions in the amount of human activity from both permitted and recreation/casual uses in GRSG habitat could result in fewer human-caused fire starts.

Removal of grazing as proposed under Alternative C-1 and reductions in grazing as proposed under Alternative C-2 could have varied results. In already degraded sites, there could be an increase in undesirable fine-fuel grasses (Strand and Launchbaugh 2013). Under those circumstances, livestock grazing could be keeping fine fuels from grasses from building up. In areas dominated by cheatgrass, Diamond and others (2009) found that targeted or prescribed livestock grazing can be used as a tool to decrease these areas from carrying fire. However, this type of targeted grazing is generally not the way permitted livestock grazing on public lands is managed and would require more resources to implement (e.g., more people to move the livestock at greater intervals). Some research has identified that the removal of livestock grazing may exacerbate the influence of cheatgrass (Young and Allen 1997) due to increases in fine fuel and increased potential for sagebrush stand-replacing wildfire (Peters and Bunting 1994; West 1999). The influence on fire spread, severity, and intensity would depend on factors such as weather, fuel characteristics, and landscape features, though evidence suggests that the potential role of grazing on fire behavior is limited under extreme burning conditions (i.e., low fuel moisture and relative humidity, high temperature, and wind speed) (Strand and Launchbaugh 2013), though the number of lower-intensity fires could increase given the abundance of fine fuels remaining from removing livestock grazing. In addition to making BLM-administered and National Forest System lands unavailable for permitted livestock grazing, short-term or temporary targeted livestock grazing would not be considered as a fine-fuel management tool. The impacts of prohibiting temporary grazing as a fine-fuel management tool would be the same as those described above; namely, this could allow for buildup of fine fuels from grasses that could be consumed by livestock.

In addition to changes in grazing management under Alternative C, an emphasis would be placed on passive restoration as opposed to active restoration. As such, there would be fewer vegetation treatments, including juniper reduction projects. Less emphasis would be placed on the construction of fuelbreaks or green strips than under other alternatives such as Alternatives D and E.

Table 4.6 shows the estimated changes in the average annual acres burned under Alternative C when compared with Alternative A. Despite the fact the BLM and Forest Service would prioritize fires suppression in GRSG habitat, reductions in the acres of treatment and cuts in the number of fuelbreaks constructed could result in increases in the number of acres burned annually during the next 50 years. It should be noted that the VDDT modeling completed for this project does not take into consideration changes in development; rather the model is primarily based on changes in vegetation treatment, fire management, and potential for overgrazing. As such, some of the estimated increases in fire could potentially be offset by decreases in human-caused fires.

Table 4.7 shows changes in the percent of the modeled sagebrush in the mid- to late-seral stage. This shows that the modeled trends for GRSG habitat would be similar to those described for Alternative A at 10 years, though several population areas have slightly lower percentages of sagebrush in the mid- to late seral stage compared with Alternative A. At the 50-year mark, the model indicates that the lack of proactive vegetation treatments in areas affected by fire, invasive annual grasses, and juniper encroachment would result in decreases in mid- to

Table 4.6
Alternative C VDDT Model Outputs- Average Changes in Fire, Juniper, and Annual Grasses Over 50 Years

Population Area(s)	Percent Change in Average Annual Acres Burned	Percent Juniper	Percent Change in Juniper	Percent Annual Grasses	Percent Change in Annual Grasses
Box Elder	7	11	57	15	67
Hamlin Valley, Ibapah	16	25	0	8	14
Rich, Uintah, Wyoming-Uinta, Wyoming-Blacks Fork	6	16	23	6	50
Carbon	2	30	3	3	50
Emery	0	18	500	0	0
Parker Mountain, Panguitch, Bald Hills	6	22	22	1	0
Strawberry	0	19	58	0	0
Sheeprocks	18	34	-3	19	12

Table 4.7
Sagebrush Condition and Trend Analysis: Comparing Alternatives by Percent of Sagebrush Area in Mid- or Late-Seral Classes for Population Areas at 10 Years and 50 Years – Alternatives A and C

Population Area	Percent of Sagebrush in Mid- and Late-Seral Class				
	Current Conditions	10 Years		50 Years	
		Alternative A	Alternative C*	Alternative A	Alternative C*
Uintah	80	76	75	67	59
Carbon	66	57	59	58	53
Emery	77	83	72	85	69
Parker Mountain	70	67	66	68	62
Panguitch	70	67	66	68	62
Bald Hills	70	67	66	68	62
Hamlin Valley	36	45	45	54	50
Ibapah	36	45	45	54	50
Sheeprocks	53	46	46	38	36
Box Elder	55	61	58	70	58
Rich	80	76	75	67	59
Strawberry	76	76	73	78	67
Lucerne	80	76	75	67	59
Wyoming-Uinta	80	76	75	67	59
Wyoming-Blacks Fork	80	76	75	67	59
All	**57**	**60**	**58**	**65**	**56**

*This table addresses both Alternative C1 and Alternative C2. Because the only difference is the level of livestock grazing, either no grazing or a substantially reduced grazing alternative would effectively eliminate the associated risk for potential incidental overgrazing.

late-seral stage sagebrush in all population areas. The decreases compared with Alternative A vary from 2 percent in the Sheeprocks Population Area to 12 percent and 16 percent in the Box Elder and Emery Population Areas, respectively.

It is important to note that the modeled risk of overgrazing was the same under both Alternative C1 and Alternative C2. This reflects the impact that a substantial reduction in livestock grazing would have in eliminating the risk of incidental overgrazing.

According to the model, at 50 years no population areas would have 70 percent sagebrush cover; however, all population areas except the Sheeprocks would have at least 50 percent sagebrush land cover. The minimum amount of sagebrush that has been determined to be necessary to meet GRSG needs is 50 to 70 percent land cover (Aldridge et al. 2008; Doherty et al. 2010; Wisdom et al. 2010).

As mentioned under Alternative B, information derived from the VDDT model provides valuable information on estimated trends; however, the model also has a number of limitations. Quantitative objectives for treatments were not included under Alternative C; because passive restoration is emphasized under Alternative C, it was assumed that the amount of treatments conducted in GRSG habitat would be less than during the past 10 years. Expanding the amount of treatment beyond modeled level could increase the estimated percent of habitat in mid- to late-seral condition at 50 years. Given the restrictions on the types and locations of vegetation treatments, increases in treatment above current levels would be unlikely.

Invasive Plant Species

Weeds

Under Alternative C, the BLM and Forest Service would apply a 3 percent disturbance cap to all disturbances, including fire. In addition, many land uses would be prohibited in mapped occupied GRSG habitat. The combination of closures and the disturbance cap would reduce the likelihood for introduction and spread of invasive plant species from human activity (e.g., motorized vehicle use, including OHVs) compared with Alternative B. Despite reductions in human activity, as shown in **Table 4.7** and discussed in the preceding section, implementation of Alternative C is estimated to increase the average annual acres burned in all population areas except Strawberry and Emery during the next 50 years. Increases in fires would result in the expansion of annual grasses. As discussed under Alternative A, annual grasses could replace and outcompete desirable native species. Impacts would be the greatest in the Sheeprocks, Hamlin Valley, Ibapah, and Box Elder Population Areas based on the susceptibility of these areas to wildfire.

Conifer Encroachment

Alternative C would place additional restrictions on vegetation/range treatments compared with Alternatives A or B. Under Alternative C, only treatment methods that retain sagebrush cover would not be counted as disturbance against the 3 percent disturbance cap. In addition, treatments would be required to retain sagebrush height and cover. When compared with other alternatives, Alternative C places greater emphasis on passive restoration. These requirements would limit the type and acreage of treatments possible. In some areas, this could maintain GRSG habitat, but in others, the lack of treatments could result in habitat decreasing in quality (e.g., closed-canopy sagebrush, and invasion by nonnative species) or quantity (e.g., lack

of fuelbreaks to slow large fires, invasion by nonnative species, and areas encroached with pinyon-juniper). According to the VDDT model, using natural processes to manage vegetation could result in loss of GRSG habitat over time. As shown in **Table 4.7**, over the next 50 years the percent of juniper on the landscape in occupied GRSG habitat would be expected to increase or remain stable, compared with Alternative A, in all population areas except the Sheeprocks, where a minor decrease in juniper is expected. A reduction in juniper in the Sheeprocks is likely due to increases in fire and associated increases in annual grasses.

Grazing (Including Wild Horses and Burros)

Alternative C1

Impacts from Domestic Livestock Forage Use (Herbivory)

Under Alternative C1, GRSG occupied habitat would be made unavailable for livestock grazing for the life of the plan. The effects of livestock exclusion would depend on site conditions, including climate, soils, fire history, and disturbance and grazing history (Strand and Launchbaugh 2013). While studies have examined the effects of reductions or changes to livestock grazing, limited literature is available regarding effects of the complete removal of livestock grazing from the range at a landscape level. Grazing is associated with direct and indirect impacts on GRSG, as described in Alternative A above, including livestock disturbance or trampling of nesting birds (Rasmussen and Griner 1938; Patterson 1952; Call and Maser 1985; Coates 2007), competition for resources, and loss of important herbaceous cover from livestock herbivory. These impacts specifically associated with livestock would be eliminated under Alternative C1. Cessation of grazing could remove the impacts noted in Alternative A and could allow for recovery of native and nonnative understory perennials and an increase in sagebrush (if the area is grazed during the winter with sheep) and herbaceous vegetation cover (Strand and Launchbaugh 2013), thereby improving habitat components important to nest success, including cover and forage (by increasing the insect population) (Anderson and Holte 1981).

It is important to note that the majority of the studies that evaluate the impacts of removing livestock grazing were conducted by evaluating small exclosures over various periods of time (Robertson 1971; Vale 1974; Rice and Westoby 1978; West et al. 1984; Yorks et al. 1992; Angell 1997; Bork et al. 1998; Courtois et al. 2004; Manier and Hobbs 2006; Yeo 2005; Davies et al. 2010), instead of evaluating the impacts of removing livestock at a landscape scale. The results from these studies were varied, which is expected considering that the site history, precipitation, soils, elevation, plant species within the sagebrush community, and duration of livestock exclusion varied.

Studies have varied results, depending on the site history (e.g., fire), previous livestock grazing (including timing, duration, and stocking levels), type and abundance of species (native or nonnative), and the other (wild) herbivores using the vegetation. Long-term evaluations to determine the effects of livestock removal are limited. Existing research suggests there are a variety of results from removing livestock, including no change in the vegetation (West et al. 1984; Yeo 2005), an increase in herbaceous understory and species diversity (Anderson and Inouye 2001), an increase in desirable grasses (York et al. 1992; Manier and Hobbs 2006) or in

already degraded sites, and an increase in undesirable fine-fuel grasses (Strand and Launchbaugh 2013).

The one landscape-scale study that explored the changes to vegetation following the long-term removal of livestock indicated a steady increase in the richness of shrubs, perennial grasses and forbs, and vegetative heterogeneity through 45 years post-removal of livestock in southwestern Idaho (Anderson and Inouye 2001). Other small exclosure research, which compared grazed and ungrazed (not grazed for 25 to 40 years) big sagebrush communities in Utah and Idaho, found that sagebrush canopy increased in percent cover from 13 to 54 percent (Beck and Mitchell 2000). However, this research did not find any increases in total herbaceous standing crop after livestock were removed for 13 years (Beck and Mitchell 2000). Studies tracking changes in vegetation over 15 years after livestock were removed from sagebrush systems reported that a minimum of 10 to 15 years were required for seed production, seedling establishment, and growth to occur beyond the initial proportions of the different growth forms (Connelly et al. 2004; Pyke 2011). In Utah, exclusion of grazing in the Pine Valley documented a 10-fold increase in perennial grasses and found that shrub cover increased where grazing still occurred (York et al. 1992).

In some situations, habitats throughout Utah may not respond any more favorably to eliminating livestock grazing than a continuation of light to moderate grazing intensities (Holechek et al. 2006). Some research suggests removing livestock grazing could result in a lack of increase in understory herbaceous productivity in areas with currently depleted sagebrush areas (Beck and Mitchell 2000). The influence of livestock grazing on sagebrush cover may have resulted in increases in sagebrush as use of perennial grasses and forbs increased; however, once sagebrush cover reaches an upper threshold, livestock exclusion may have little effect on reversing the immediate trend (Johnson and Payne 1968; Rice and Westoby 1978; Sanders and Voth 1983; Wambolt and Payne 1986). In such areas, passive restoration may not be sufficient to improve GRSG habitat, and active restoration may be necessary (Davies et al. 2011). In areas where sagebrush communities have moved past an ecological threshold, simply removing livestock grazing would not return the area to its previous state (Cagney et al. 2010). In such situations, vegetation communities within GRSG occupied habitat would continue to be influenced by land uses, wild horse and wild ungulate grazing, fire and disturbance regimes, and climatic conditions (which have likely altered vegetation communities across the allotments), reducing herbaceous perennial grasses and forbs and increasing woody species.

Changes to vegetation communities resulting from the removal of livestock grazing may favor a particular component of GRSG seasonal habitat. For example, livestock grazing has been removed within the Brown's Park area of the Uintah Population Area, which was providing favorable winter habitat for GRSG when livestock were present. In the years following removal of livestock, the ecosystem has resulted in a shift of shrub/perennial grassland to a perennial grassland-dominated vegetation community. In instances such as these, removing properly managed livestock from vegetation communities may result in increased ground cover and could reduce vegetation diversity. This could result in the area's vegetation shifting from providing winter habitat to becoming more suitable for brood-rearing habitat.

Removal of grazing could allow for buildup of fine fuels from grasses, especially in degraded shrublands, that could otherwise be consumed by livestock, potentially causing an increase in the likelihood of a fire that could result in stand replacement and loss of GRSG habitat over large areas. Some research has identified that the removal of livestock grazing may exacerbate the influence of cheatgrass (Young and Allen 1997) due to increases in fine fuel and increased potential for sagebrush stand-replacing wildfire (Peters and Bunting 1994, West 1999). The influence on fire spread, severity, and intensity would depend on factors such as weather, fuel characteristics, and landscape features. Evidence suggests that the potential role of grazing on fire behavior is limited under extreme burning conditions (i.e., low fuel moisture and relative humidity, high temperature, and wind speed) (Strand and Launchbaugh 2013), though the number of lower-intensity fires could increase given the abundance of fine fuels remaining from removing livestock grazing.

Unintended adverse effects could also occur to GRSG and their habitat from increased livestock use of private and state lands in response to a reduction in AUMs and/or season of use on federal lands. Removal of livestock grazing on federal lands could lead to overgrazing and habitat fragmentation on adjacent private lands to compensate for loss of forage on federal lands. In addition, private lands with livestock operations dependent upon public land grazing are often located in more productive valley bottoms, which are often used as brood-rearing habitat by GRSG. Producers may convert these valley bottoms or other private lands to introduce forage species (e.g., crested wheatgrass), in order to provide enough livestock feed to continue in business without access to federal lands. Others may go out of business and sell their land, potentially for development, causing permanent loss of GRSG habitat.

Riparian and wetland areas that have been altered by grazing-associated water developments would be restored, thereby improving and potentially increasing late brood-rearing habitat for GRSG. Similarly, where there are livestock water developments that are not associated with existing riparian, wetland, or springs, the removal of water developments could benefit GRSG. Kirol and others (2015) found that presence of water developments (associated with energy development) was the primary factor attributed to decreased nest success. However, in some riparian areas, complete removal of grazing can result in increased tree and shrub cover and reduced forb cover important to late brood rearing. Some research indicates that GRSG preferred grazed over ungrazed wet meadows where protective cover conditions were otherwise equal (Neel 1980). However, even given the removal of domestic livestock, impacts from wildlife and wild horse use of riparian and wetland areas would continue.

Impacts from Wild Horse Forage Use (Herbivory)
Impacts from wild horse herbivory would be the same as described under Alternative B.

Impacts from Wild Ungulate Forage Use (Herbivory)
The impacts from wild ungulates would be the same as described under Alternative A.

Impacts from Livestock Grazing Program Actions
Removal of grazing would also be accompanied by an associated removal of grazing-related infrastructure, including fences, livestock water troughs, pipelines, and wells. Removal of fences would reduce threats from GRSG collisions. However, in some areas with checkerboard land ownership, more fences may be needed to separate BLM-administered and National Forest

System lands unavailable for livestock grazing from private or state lands that would be available for livestock grazing. In this instance, though fence marking would be required for any new fences constructed in GRSG habitat, there may be a potential for bird mortality from fence strikes.

Impacts from Wild Horse Program Actions
Impacts from wild horse program actions would be the same as described under Alternative B.

Alternative C2

Impacts from Domestic Livestock Forage Use (Herbivory)
Impacts from livestock herbivory under Alternative C2 would be the same as those described under Alternative B, with three differences: 1) active AUMs available for livestock grazing would be reduced by approximately 40 percent in occupied GRSG habitat; 2) livestock grazing that occurs during the growing season would be changed so no grazing occurs until after the spring; and 3) the BLM and Forest Service would establish and maintain areas free of livestock as reference areas. While the impacts from livestock grazing that were described in Alternative B would still be possible, the likelihood of the impacts occurring in GRSG habitat is reduced.

The reductions in AUMs would not be implemented evenly across the decision area but would be addressed through an evaluation of allotment-specific information, which would result in reductions in AUMs on allotments showing high use levels, poor habitat conditions, or with trends away from desired conditions. This would focus reductions on areas needing them instead of complete closures prescribed under Alternative C1. Reduction may be made across an entire allotment or in part during the permit renewal process or other evaluation process depending on need. In either case, active AUMs would be lowered to approximately 14 percent under average billed use on BLM-administered lands and 39 percent under average billed use on National Forest System lands. According to research conducted in sagebrush steppe, applying light use standards helps ensure a healthy plant community (Cagney et al. 2010 in Manier et al. 2013). As such, reducing AUMs throughout GRSG habitat would result in increased grass and forb occurrence and height, improving nesting and brood-rearing habitats. Closing GRSG habitat to spring use would ensure that early grass growth would be available to provide screening for brood rearing. Waiting to graze forbs would allow hens and broods to take advantage of increased production and the associated increases in invertebrate populations. In general, these changes from Alternative B would improve brood success and would likely lead to increases in GRSG populations.

Alternative C2 would decrease grazing pressure on vegetation communities while still allowing grazing to continue. Allowing grazing to continue would retain the ability for certain areas to be strategically grazed, maintaining the productivity of bunch grasses and improving GRSG habitats where needed, based on ecological conditions. Closing areas to spring grazing would eliminate the potential for nests to be damaged by incidental trampling, and it would reduce soil compaction associated with livestock congregating and trailing during wet soil conditions.

The decreased numbers of livestock in GRSG habitat would also decrease the likelihood for overgrazing at the beginning of droughts. Given the lag time between the beginning of a drought and when monitoring identifies an impact for habitat conditions, the reduced levels of grazing

would limit grazing, decreasing potential impacts on habitats (e.g., decreased grass and forb cover.

Precluding spring grazing could result in grasses and forbs increasing in winter habitat. In some areas, the increase in grasses and forbs could increase competition for water and nutrients and, over time, could reduce sagebrush density. While this process would likely take decades to occur, GRSG populations where winter habitat is the limiting factor could be affected.

Alternative C2 would establish and maintain large areas free of livestock grazing; this would allow rehabilitation and reclamation efforts to use these exclosures as reference points to monitor the progress of the efforts in light of ecological norms. Although fences would be marked, this increase in fences in areas to keep livestock out of the exclosures could increase the potential for bird strikes.

Impacts from Wild Horse Forage Use (Herbivory)
Under Alternative C2, wild horse AMLs would be reduced by 25 percent. While impacts from wild horses would remain, this would reduce the effects of wild horses described under Alternative A. More residual grasses and forbs would likely remain in three population areas where GRSG habitat overlaps HMAs.

Impacts from Livestock Grazing Program Actions
While similar to Alternative B, Alternative C2 proposes different actions with resulting impacts under the livestock grazing program. To start with, the combination of focusing on GRSG objectives, reducing active AUMs, and closing spring grazing would likely reduce the need for many rangeland improvement projects since most projects are designed to improve livestock distribution or improve available AUMs. As a result, loss or fragmentation of habitat from rangeland improvements would be decreased from those described in Alternatives A and B.

No new water developments would be authorized, which would reduce both the loss of habitat from the development itself and the impacts on the vegetation and soils associated with livestock traveling to and congregating at these areas. New watering opportunities for predators would also be precluded. Any GRSG habitat improvement due to forbs or insects associated with water developments would also be precluded. Beyond water developments, any other new structural range development (e.g., cattle guards and nutrient supplements) would be avoided unless research indicates it would benefit GRSG.

Compared with Alternative B, the threat of impacts from fences would be reduced, since under Alternative C2 fences in moderate- and high-risk areas would be removed, modified, or marked. This would increase the number of fences affected and would correspondingly reduce the likelihood of bird strikes and mortality.

Alternative C2 would place additional restrictions on vegetation/range treatments compared with Alternatives A or B. Under Alternative C2, only treatment methods that retain sagebrush cover would not be counted as disturbance against the 3 percent disturbance cap. In addition, treatments would be required to retain sagebrush height and cover. While vegetation treatments with demonstrated benefit to GRSG could be considered, these requirements would limit the type and acreage of treatments possible. In some areas, this could maintain GRSG

habitat, but in others, the lack of treatments could result in habitat decreasing in quality (e.g., closed-canopy sagebrush or invasion by nonnative species) or quantity (e.g., lack of fuelbreaks to slow large fires, invasion by nonnative species, or areas encroached with pinyon-juniper). In these areas, natural processes would be used to manage vegetation, which could result in loss of GRSG habitat over time.

Impacts from Wild Horse Program Actions

By reducing wild horse AMLs by 25 percent, the need for wild horse gathers would increase since the AML would be met on a more frequent basis. In addition, of the 5 HMAs in GRSG occupied habitat, a 25 percent reduction could result in 3 HMAs dropping below viability levels. These combined issues would increase the frequency of the disturbances associated with the gathers and other management intervention, as well as the areas of habitat affected by the gather staging areas.

Recreation

Under Alternative C, GRSG habitat that is open to cross-country OHV travel on BLM-administered land would be changed to either closed to OHV travel or to a limited area designation category. In addition, some areas currently designated as limited (both to existing and designated) would closed. Impacts from designation of OHV closed areas were discussed under the Infrastructure section, above. All National Forest System lands would remain limited to designated routes. As previously discussed, this would reduce or eliminate the proliferation of new routes. Management actions under Alternative C would be similar to those under Alternative B, with the exceptions described below.

Within PHMA, camping and other nonmotorized recreation would be prohibited during certain seasons within 4 miles of a lek. Implementation of this decision would reduce human activity in nesting and brood-rearing habitat, thereby reducing disturbance to the bird, potential for habitat degradation, and predation potential. However, there is limited literature linking nest and brood success rates to dispersed and nonmotorized recreational activities. Impacts from dispersed and nonmotorized activities are usually temporary. This would effectively result in large area closures that may be difficult to enforce and may require public disclosure of sensitive information, including lek locations. Given the mixed land ownership pattern in certain population areas, enforcement of this decision would be difficult. This alternative would provide additional protection for breeding and nesting habitat by limiting route construction within a 4-mile buffer of leks, and compensatory mitigation would be required to offset impacts on GRSG. Together, these actions would further reduce impacts that are described in Alternative B.

Impacts from issuance of recreational permits would be similar to those described for Alternative B but would be applied to a larger area, all occupied habitat. Therefore, issuance of recreational permits would not contribute to GRSG habitat loss, degradation, or disruption to birds.

Habitat Conversion for Agriculture and Urbanization

Under Alternative C, management is similar to Alternative B except that all occupied GRSG habitat would designated as PHMA (3,313,800 acres) and retained in public ownership, without exception. While this would result in retention of existing GRSG habitat, it would limit the BLM and Forest Service's ability to pursue exchanges in areas where there is mixed land ownership

(e.g., Box Elder and Rich Population Areas). Exchanges that result in more contiguous federal ownership could improve the consistency of management and ensure protection of important GRSG habitat.

ACEC and Zoological Area Designations

Under Alternative C, the BLM and Forest Service would designate 15 ACECs and GRSG Zoological Areas to protect sagebrush and GRSG habitat. Large portions of most population areas would be covered by one or both of these special designations, particularly in the Box Elder, Sheeprocks, Uintah, Ibapah, Hamlin Valley, Bald Hills, Panguitch, and Parker Mountain Population Areas. Management within these areas would focus on reducing anthropogenic surface disturbances and removing unneeded infrastructure. Such management would result in the removal of unneeded infrastructure in GRSG habitats (e.g., fencing, water structures, roads, and power lines). The benefits of removing unnecessary infrastructure in GRSG habitats could vary depending on a range of factors, including the extent of the infrastructure, the location of the infrastructure in GRSG habitat, and the magnitude that the infrastructure is impacting GRSG. Removal of fencing would generally decrease fence strike mortalities. Removal of power line infrastructure would likely increase the quality or connectivity of habitats and decrease predation rates by decreasing perching opportunities for avian predators. Removal of roads may result in many benefits to GRSG, including increasing habitat connectivity, decreased human disturbance, and decreased likelihood of spreading invasive weeds. Removal of water structures would decrease the likelihood of West Nile virus by removing the habitat water source for the vector, mosquitoes.

4.3.5 Alternative D

GRSG Habitat and Disturbance Thresholds

Under Alternative D, 83 percent of the mapped occupied habitat in the Utah planning area would be managed as PHMA. This includes 97.5 percent of the mapped occupied habitat included in the USFWS-identified PACs. Under this alternative, leks associated with 95 percent of the GRSG in the planning area would be in PHMA. Under Alternative D, the BLM and Forest Service would not manage the southern portion of the Panguitch as a PHMA. This area includes the southernmost lek and southern wintering areas. The Alton area lek has low annual attendance and is affected by ongoing surface coal mining operations on private lands. The southern wintering areas are used by birds from as far away as the central portions of the population area. The next lek to the north is a larger lek that has had consistent lek attendance but is presumed to be reliant on habitat that is being impacted by coal mining to the south. The PHMA area would also exclude the southern portion of the Sheeprocks Population Area and includes a portion of the Emma Park-western Gordon Creek area and the Pilot Mountain portion of the southern Box Elder Population Area.

In regards to the Panguitch area, as more data is gathered on bird movements throughout the area, there could be an overall adverse impact on the Panguitch population if the southern portion of the population area is not protected as PHMA due to the potential importance of the winter habitats and the patches of habitat that link the southern wintering habitat to the central portions of the population area.

It is unknown what the potential impacts of excluding the southern portion of the Sheeprocks area may be since the existing limited data do not indicate whether there are movements between them.

In the Carbon Population Area, the inclusion of the Gordon Creek area is expected to increase the overall amount of disturbance calculated in the area due to the density of wells that exist in the area. As a result, fewer disturbances will likely be allowed in the Carbon area, which will presumably be beneficial for GRSG.

The impacts of including the Pilot Mountain portion of the Box Elder Population Area as PHMA is unknown at this time since very little is known about bird movements between the primary Box Elder area and the Pilot Peak area and how important the Pilot Peak area may be to the primary Box Elder area.

Unlike Alternatives B and C, this alternative would allow some new disturbances in PHMA outside protective lek buffers. Discrete anthropogenic disturbances would be limited to an aggregated 5 percent disturbance cap calculated for PHMA, regardless of land ownership. Fire is not counted as a discrete disturbance that is part of the 5 percent disturbance cap; however, fires, especially if substantial in size, would decrease the baseline acreage on which the 5 percent disturbance cap is calculated. For instance, if there is a 2,000-acre PHMA with no existing disturbance, 100 acres of disturbance would be allowed. If a 1,000-acre fire occurs in that PHMA, the burn area is subtracted from the baseline PHMA area until habitat functionality is restored. If a project were proposed in the remaining unburned habitat, allowable disturbance would be calculated using the remaining 1,000 acres. As a result, 50 acres of disturbance would be allowed. While fire is considered, in part, when determining how much additional disturbance would be allowed in a PHMA, in areas where there are many fires and recovery is slow, the amount of available habitat to birds could decrease substantially. Although Kirol (2012) did not include fire in his disturbance calculations, GRSG risk of daily brood loss started rapidly, increasing at 4 percent disturbance and no longer used an area once disturbance reached 8 percent.

As shown in **Table 3.53**, wildfire has resulted in a loss of 8 percent of sagebrush in the Bald Hills, 1 percent in the Sheeprocks, 4 percent of the GRSG habitat in the Box Elder, and 2 percent of the Ibapah Population Area. Depending on how much occupied sagebrush habitat was lost in the fire, the quality of those habitats, how the birds used the lost habitat, and how much of that specific seasonal habitat type remained, the resiliency of the GRSG population areas could be diminished. Larger impacts may occur in the smaller population areas with a higher percentage that has burned (e.g., Bald Hills and Sheeprocks).

In the Uintah and Carbon Population Areas, existing disturbance is already 1.7 and 1.1 percent, respectively. This would allow for additional development, up to 5 percent, similar to the other population areas, but Uintah and Carbon are the areas most likely to have energy-related development.

Minerals

Nonenergy Leasables

Under Alternative D, PHMA would be closed to new surface mining associated with new leasing or modifications to existing leases. Therefore, impacts from surface mining described under Alternative A would not occur. PHMA would still be available for underground mining, which primary would apply to the phosphate and gilsonite in Uintah Basin, the developable nonenergy leasable resources in GRSG habitats in the state. Impacts on GRSG could occur from underground phosphate mining in the Diamond Mountain area from construction of surface ancillary facilities (e.g., air vents, roads, power lines), but those activities and maintenance activities would not be allowed during GRSG sensitive time periods in associated habitats. Impacts from underground mining would be less than those described under Alternative A because additional stipulations would be attached to any new leases in PHMA. For example, no surface facilities or structures would be allowed within 1 mile of a lek. Structures or facilities located outside of the 1-mile lek buffer but in PHMA would have to meet noise and tall structure requirements and comply with the 5 percent disturbance cap. Application of RDFs and compliance with TLs would also lessen the impacts from disturbance-associated development of nonenergy leasable minerals.

Prospecting operations in PHMA could still result in surface disturbance within PHMA; however, prospectors would be required to follow many of the same avoidance and minimization measures discussed above. For example, prospectors would be required to remove all facilities associated with prospecting before the next breeding season in an attempt to reduce functional habitat loss. Prospecting activities in PHMA would be subject to TLs and the 5 percent disturbance cap. Impacts would further be reduced in PHMA under this alternative by requiring RDFs in Appendix I of the Draft LUPA/EIS to be applied to any lease.

Based on the analysis above, implementation of Alternative D would protect all GRSG habitats in PHMA from the effects of new leases for surface mining. While some disturbance associated with new leases for underground mining could occur in PHMA in the Diamond Mountain area, direct lek protection, requiring stipulations and restrictions, and compensatory mitigation would minimize impacts on existing GRSG populations in Diamond Mountain, especially given the limited amount of nonenergy solid minerals development within this area.

Within GHMA, areas within 1 mile of GRSG leks would be subject to no surface disturbance and seasonal stipulations (construction and maintenance). These stipulations could be waived in exchange for mitigation that directly benefits GRSG in PHMA. Gilsonite mining could occur in the East Bench and Deadman's Bench areas, but lek buffers would only apply in East Bench since the gilsonite development only overlaps with leks in that population. The inclusion of lek buffers and associated conservation measures in the East Bench area would prevent additional disturbance within that area but would allow noise and tall structures outside the buffers and in winter habitat in Deadman's Bench. Since there is already substantial development in the East Bench area (see Alternatives B and C) and the 10-year average lek counts for East Bench is 4 males, additional development is not likely to substantially change the declining status of this population. Similarly, by allowing gilsonite development with or without noise and tall structure

requirements in wintering habitat in Deadman's Bench, there will be more impacts on an already declining population (10-year average male count of 3 males).

Solid Material - Coal

All GRSG habitat outside of WSAs under Alternative D would be suitable for surface and underground mining of coal. The high coal development areas overlap portions of the Carbon, Emery, and Panguitch Population Areas (**Map 3.21-7**); impacts from leasing and subsequent mining activities would be reduced by applying stipulations. The restrictions on coal development and the impacts on the landscape would be similar to those described under the nonenergy leasable section for PHMA and GHMA, though the location of coal and subsequent impacts at a population level would be different from the nonenergy leasable resources.

The only area where surface mining of coal is anticipated is in the Panguitch Population Area. Because this area would be managed as GHMA, fewer stipulations would be attached to new leases. Areas within 1 mile of GRSG leks would be subject to no surface disturbance and TL stipulations (construction and maintenance). These stipulations could be waived in exchange for mitigation that directly benefits GRSG in PHMA. Given the above information, Alternative D provides less protection for birds and GRSG habitat in the Alton area than any other alternative except Alternative A. As a result, the birds using the Alton area may cease using the area and may be impeded from using the southern wintering areas if the Alton area habitat is important for connectivity to access the southern wintering areas. Due to the limited information on how much of the Panguitch population relies on the southern wintering areas (especially in high snow years), it is unknown how this may adversely affect the rest of the Panguitch, but there could be an adverse impact on some portion of the birds.

There would be some impacts within the PHMA in the Emery Population Area from development of new and existing subsurface coal leases. For discussion of existing leases, refer to Alternative A, Solid Minerals – Coal. New leases would be subject to a 1-mile no surface disturbance stipulation, noise and tall structure restrictions, seasonal restrictions (construction and maintenance), and required mitigation. As such, the impacts would be less than under Alternative A. Even though the impacts associated with aboveground ancillary infrastructure for underground coal is minimal, small impacts could adversely impact birds and decrease the likelihood of persistence for the Emery GRSG populations due to the limited amount of habitat available to this population and because the local GRSG rely on the same habitat for all aspects of their life cycle.

Locatables

Under Alternative D, all PHMA and GHMA would remain available for mineral entry unless it is already withdrawn or recommended for withdrawal. Efforts would specifically be made to work with claimants to decrease impacts on GRSG by recognizing spatial buffers, complying with seasonal restrictions, and maintaining disturbance under the 5 percent disturbance cap. In addition, the agencies would apply the BMPs, as described in Appendix I of the Draft LUPA/EIS, to notices and plans of operations. If applicants are willing to comply with GRSG conservation measures proposed by the BLM and the Forest Service the loss and fragmentation of habitat would be less than under Alternative A. However, since these things are voluntary, it is unknown how regularly these protection measures would be applied. As such, the impacts on

GRSG would likely be similar to those described in Alternative A. The amount of mining in the Utah planning area is relatively small compared with other mineral developments, and future development trends are expected to be similar to past development trends (see the Minerals - Locatables section of **Chapter 3**). As such, impacts from locatable mineral development are not expected to affect GRSG persistence.

Mineral Materials

Under Alternative D, PHMA would be closed to commercial mineral material development. All GRSG habitats would be open to noncommercial mineral material development outside a 1-mile buffer from leks. In PHMA, noncommercial mineral material development would only be allowed within 0.25 mile of an existing road. In addition, those operating sites would be required to meet noise restrictions, adhere to tall structure restrictions, avoid extraction during seasonally sensitive times for GRSG, and comply with the 5 percent disturbance cap.

By allowing development outside of 1-mile lek buffers in PHMA, some of the nesting and early brood-rearing habitat could have noncommercial mineral material development but only under a 5 percent disturbance cap. In addition, fragmentation is minimized by keeping development near existing roads (0.25 mile from an existing road).

Developments in PHMA may lead to habitat loss, habitat degradation, and disturbance to GRSG in nesting, brood-rearing, and wintering habitat. While these impacts may decrease nest success, chick survival, and adult survival, the scale and frequency of these types of developments are relatively small compared with other mineral developments, and future development trends are expected to be similar to past development trends. For context, throughout Utah in PHMA, there are 704 acres of disturbance from mineral material development. This type of mineral development is anticipated to be low and have a minimal impact on overall GRSG persistence.

The impacts on GHMA would be similar, but commercial mineral material development would also be allowed outside of 1 mile of a lek. Therefore, the magnitude and intensity of individual mineral material development impacts could increase. Commercial mineral materials developments are typically larger in size than noncommercial developments; however, there are currently few commercial operations in GRSG habitat. The agencies would implement BMPs such as anti-perch devices for raptors to reduce impacts on GRSG within GHMA, but all stipulations could be waived.

Fluid Minerals (Including Geothermal)

Under Alternative D, within GRSG occupied habitat, 1,829,980 acres would be open to fluid minerals with moderate constraints, 1,853,100 acres would be open with major constraints, and 138,500 acres would be closed to leasing. Under Alternative D, outside of GRSG occupied habitat but within population areas, 761,100 acres would be open to fluid mineral leasing, 765,300 acres would be open with minor constraints, 598,800 acres would be open with major constraints, and 196,800 acres would be closed.

When compared with Alternatives B and C, Alternative D would allow more development from new leases in PHMA; however, there would be a 4-mile buffer maintained by NSO stipulations around occupied leks. The 4-mile buffer would protect the majority of nesting and brood-rearing habitat from new leasing and associated development. In addition to providing

protections for brood-rearing and nesting habitat, based on the overlapping seasonal habitats in the Utah planning area, over 60 percent of winter habitat would be protected by the 4-mile buffer.

In PHMA but outside of the 4-mile lek buffer, restrictions listed in **Chapter 2** and discussed in the preceding sections would apply to fluid mineral development, which would provide additional protection to GRSG. For example, development outside of the 4-mile buffer would be subject to seasonal restrictions (construction and maintenance), noise and tall structure restrictions, as well as the 5 percent disturbance cap. In the Uintah and Carbon Population Areas, existing disturbance is already 1.7 and 1.3 percent, respectively, so additional disturbance would be limited under the proposed disturbance cap. Other population areas have approximately 1 percent or less of existing disturbance.

While some new development could occur in late brood-rearing, transition, and wintering areas, the disturbance cap would keep development at a level that research has indicated maintains brood and nest success, while limiting fragmentation and maintaining habitat. Application of TLs and other CSU stipulations would reduce the amount of disruption and effective habitat loss. Development of some existing leases in PHMA might become infeasible under the restrictions in this alternative.

RDFs (as identified in Appendix J of the Draft LUPA/EIS) would be attached as COAs to all development unless there are special circumstances that, through a NEPA analysis, are shown to be more protective of GRSG. The same RDFs would be applied to surface activities where the federal agencies own the surface but the mineral estate is in nonfederal ownership. This would lessen the amount of habitat loss, habitat degradation, disturbance to birds, and general fragmentation.

Development and associated disturbance would also be limited in PHMA because the BLM would only issue leases that are at least 640 acres in size or larger. BLM is required to allow for at least one well per lease. By increasing lease size, BLM has the ability to limit well density to one well per section (640 acres). In addition, operators would be required to submit site-specific plans of development prior to the agencies authorizing oil and gas-related actions in PHMA. In addition, unitization would be encouraged. By maximizing the size of new leases, requiring plans of development, and encouraging unitization, the BLM and Forest Service would have more flexibility in determining the appropriate location of wells and ancillary facilities and may be able to consolidate development. Strategic placement and consolidation of development on new leases could decrease loss, degradation, and fragmentation of habitat.

Smaller parcels may be leased based on noncompetitive regulations or when 640 contiguous acres of federal mineral estate is not available and leasing is necessary to remain in compliance with laws, regulations, and policy. As such, in limited circumstances, leases could be as small as 40 acres. Development of small leases could have some negative impact on the GRSG within PHMA, including disturbance at a density that typically exceeds one well per section. On the contrary, if smaller leases were issued to commit federal mineral estate to unit or communitization agreements, impacts on GRSG and the development could be reduced because there may less duplicate infrastructure.

Unique to Alternative D, the BLM and Forest Service would place stipulations on new leases outside of PHMA to provide protection for leks that are located in PHMA but on the periphery of the mapped occupied habitat. No other alternative considers changes to management decisions outside of mapped occupied habitat. On new leases, all areas that are outside of mapped occupied habitat but within 1 mile of an occupied lek that is in PHMA would be managed with an NSO stipulation. Applying this NSO stipulation would provide leks on the edge of mapped occupied habitat with direct protection from fluid minerals development. In addition to a 1-mile NSO stipulation, lands that are within 4 miles of a lek that is in PHMA would be subject to CSU stipulations for tall structures and noise. These stipulations would minimize impacts of tall structures or disruptive noise on nesting hens and chicks.

Restrictions placed on new leases in PHMA could cause developers to look to private, tribal, and state lands within PHMA and develop those areas more heavily. Development of nonfederal lands could result in direct habitat loss, habitat degradation, and disturbance to birds and may cause functional habitat loss on federal lands. On the contrary, restriction placed on new fluid minerals leasing in PHMA could discourage new development of nonfederal lands because it may no longer be economically viable to develop nonfederal lands in PHMA. In such areas, restrictions on federal lands could provide protection for GRSG on nonfederal lands.

As has been discussed in previous sections, many areas with high oil and gas potential in GRSG habitats have already been leased. For existing undeveloped leases in PHMA, impacts on GRSG would be the same as those analyzed under Alternative B, where impacts would be reduced through the application of RDFs, which would be applied as COAs to APDs and other approvals. The agencies would strive to conserve GRSG habitat within PHMA and GHMA with the goal of minimizing habitat loss, fragmentation, and direct and indirect effects on GRSG and habitat. Written Orders (43 CFR 3161.2) may be used to require reasonable protective measures to avoid or minimize impacts on GRSG and habitat. The effectiveness of these actions cannot be assessed at this time because they would have to be consistent with the terms and conditions of the lease. Since each lease is different, the effectiveness of these could be different in each area. Overall, Written Orders would decrease impacts on GRSG, but the degree to which they would protect GRSG and increase likelihood of persistence is unknown. The agencies would also work to reduce the occurrence of West Nile virus by applying appropriate mitigation measures under their authority to decrease or eliminate the disposal of produced water on federal lands.

Restrictions on new leases in GHMA would be less than those described above for the PHMA (e.g., 1-mile buffer NSO stipulation) and may not be sufficient to maintain local population persistence. Within GHMA, waivers could be allowed for all stipulations except the seasonal stipulations, which would assist in reducing the temporary impacts of development during sensitive periods for GRSG but would not prevent permanent loss or degradation of their habitat. Waivers to restrictions in GHMA could be granted in exchange for mitigation that benefits GRSG in PHMA. Despite these limitations, when compared with other alternatives, Alternative D provides greater protection for GRSG in GHMA than Alternatives A, B, or E.

There are 238 fewer wells expected to be drilled under Alternative D than Alternative A, resulting in approximately 57 percent or 7,000 acres less of total disturbance (including well

pads, seismic lines, pipelines, roads, and ancillary features). Similar to all alternatives, the majority of the development under this alternative is expected to occur in the southern portion of the Uintah Population Area and Carbon Population Area. Most of the impacts would be similar to Alternative B, but Alternative D includes more areas in PHMA with existing undeveloped leases. Under this alternative, in contrast to Alternative B, some of the existing undeveloped leases in the West Tavaputs and the Brundage Canyon development areas are within PHMA and would receive additional protection because of the mandatory COAs and the 5 percent disturbance cap. Existing undeveloped leases in the southern portion of the Uintah Population Area and the Gasco area of the Carbon Population Area would be GHMA and would not receive any additional protections. Fluid mineral development impacts are expected to be the greatest in these areas, but actual impacts on GRSG are expected to be low because these populations already have been substantially impacted by development.

The impacts associated with geothermal leasing and development is essentially the same as those stated above because the acreage is already leased. The Bald Hills Population Area is the only population area where geothermal activity is anticipated. Geothermal activity would be managed consistently with the management described under PHMA. Impacts are not anticipated to be substantial.

Infrastructure

As discussed in preceding sections, new infrastructure development can occur in conjunction with many different BLM and Forest Service programs, including lands and realty, minerals, grazing, travel and transportation management, and recreation. Impacts from minerals, grazing, travel and transportation, and recreation are discussed in detail in other sections. Therefore, this analysis is primarily focused on impacts from land and realty decisions.

Under Alternative D, many of the same restrictions that would be placed on minerals development would be placed on new ROWs. As such, impacts from new ROWs would be similar to impacts from minerals, which were described in the preceding section.

For example, aboveground linear ROWs would be excluded within 4 miles of active leks located in PHMA. Excluding new ROWs would protect breeding, nesting, and early brood-rearing habitat from habitat loss and fragmentation and maintain lek attendance and nest success rates. As discussed under Alternative A, impacts on leks are most severe near the lek, remained discernible out to distances of approximately 4 miles. In addition to protecting nesting and brood-rearing habitat, the 4-mile exclusion buffer would protect more than 50 percent of winter habitat due to the amount of overlapping seasonal habitats in the Utah Sub-regional planning area. These impacts are similar to those that were described under the fluid minerals section.

Areas beyond 4 miles of a lek in PHMA would be managed as avoidance areas for aboveground linear ROWs. ROWs in these areas would be avoided unless they could meet the criteria noted in **Chapter 2** (stable GRSG population trend, seasonal restrictions, limitations on tall structures and noise, less than 5 percent disturbance, and mitigation to offset impacts). Based on research conducted by Kirol (2012) in Wyoming, risk of population decline started increasing at 4 percent surface disturbance, and birds no longer used an area once disturbance reached 8 percent (fire was not included since fire did not occur in the study area). As such, compliance

with a 5 percent disturbance cap in areas beyond 4 miles in conjunction with other minimization measures would stop population decline.

Similar to fluid minerals management, the BLM and Forest Service would place restrictions on development of new aboveground linear ROWs outside of PHMA to provide protection for leks that are located in PHMA but on the periphery of the mapped occupied habitat. No other alternative considers changes to management decisions outside of mapped occupied habitat. All areas that are outside of mapped occupied habitat but within 1 mile of an occupied lek that is in PHMA would be ROW exclusion. This exclusion would provide leks on the edge of mapped occupied habitat with direct protection from infrastructure development. By extending the exclusion area for aboveground linear and ROWs outside of PHMA, breeding birds on the lek would be protected from noise and the potential for increased predation. In addition to a 1-mile exclusion, lands that are within 4 miles of a lek that is in PHMA would be ROW avoidance. Tall structures or disruptive noise would not be allowed, which would minimize impacts on nesting hens and chicks.

Under Alternative D, no site-type ROWs would be allowed in PHMA within 1 mile of a lek. The 1-mile exclusion buffer would provide direct protection to the lek itself; however, some disturbance could occur within nesting and early brood-rearing habitat. Outside of the 1-mile lek buffer, site-type ROWs would be avoided. The same avoidance criteria that would apply to aboveground linear ROWs would apply to site-type ROWs. Adherence to these criteria would provide direct protection from habitat loss, as well as protection from disruptions and increases in predation associated with tall structures.

With respect to on-the-ground or underground ROWs (e.g., roads, pipelines, fiber optics lines), all PHMA would be ROW avoidance. New authorization of actions would be subject to the same avoidance criteria discussed above (e.g., seasonal restrictions, stable population trends, and 5 percent disturbance cap). Authorization of linear underground ROWs could result in loss of sagebrush cover, increased opportunities for predation, and increased opportunities for spread of invasive species. These impacts could occur in nesting, brood-rearing, and winter habitats. While some maintenance of underground ROWs could be required, over time these areas would be restored and may recover to the point where they provide some habitat value. Impacts would be greatest in winter habitat, because of the amount of time it takes to restore sagebrush, and in areas where lack of winter habitat is a limiting factor. Impacts from human activity would not occur, because construction would not occur during seasons of use.

Impacts from new aboveground ROWs would be similar to those from underground ROWs; however, new roads would result in permanent habitat loss and fragmentation. In addition, there would be impacts associated with human activity. The magnitude of the impacts would depend on the size of the road as well as the frequency of use. Under Alternative D, some additional restrictions would be placed on new ROWs, which would minimize impacts. For example, new FLPMA Title V ROWs would only be granted for existing roads as long as they would remain in the same condition. ROWs would be collocated with existing ROWs where possible.

Construction of new linear ROWs (underground and aboveground) would be likely in designated corridors. In PHMA, the BLM would undesignate corridors that are not currently encumbered by existing linear ROWs. In addition, no aboveground linear ROWs would be

allowed in areas where there are currently only underground ROWs. Construction of new linear ROWs, and, in particular, construction of aboveground transmission lines, would have similar effects to those described under Alternative A. These effects would be most evident in areas close to leks, because research indicates that higher densities of transmission lines within 4 miles of a lek negatively influences likelihood of lek persistence (Walker et al. 2007a). To minimize the effects of new ROWs, new aboveground ROWs in designated corridors would be constructed as close as technically feasible to existing aboveground lines. In addition, construction of new lines would be subject to the 5 percent disturbance cap, seasonal restrictions would apply, and mitigation would be required. Placement of infrastructure as close as technically feasible to existing infrastructure would reduce the amount of new fragmentation and habitat loss. Direct disturbance would primarily occur in areas that are already indirectly impacted by existing infrastructure. The magnitude of impacts from new ROW authorizations would depend on whether or not birds are using an area and size of the proposed project. If existing ROWs in a corridor have indirectly impacted an area to a point where there is effective habitat loss, construction of a new ROW would have limited effect. On the other hand, if birds are acclimated to an existing ROW and use adjacent habitat for aspects of their life cycle, construction of new ROWs adjacent to an existing ROW could result in direct habitat loss, fragmentation, and displacement of GRSG. Construction of small ROWs adjacent to larger ROWs would result in less direct disturbance than construction of large ROWs adjacent to small ROWs. Construction of large ROWs next to small ROWs could also result in behavioral avoidance due to the presence of tall structures and increased predation.

Under Alternative D, the BLM and Forest Service would also designate new corridors. In all cases the new corridors would be designated in areas where there are existing linear ROWs. Construction of new infrastructure in designated ROW corridors would result in similar impacts to those described above.

In addition to restrictions on new ROWs, restrictions on minerals development discussed in the preceding section would prevent or limit the amount of infrastructure in PHMA.

Impacts from infrastructure in PHMA would also be reduced by limiting motorized vehicle travel to existing roads and trails until additional travel management planning/route designation is completed. See the Minerals and Recreation sections for more discussion of infrastructure impacts from mineral development and OHV use.

Leks within GHMA would be protected by a 1-mile ROW avoidance area buffer. New ROWs would only be allowed in the 1-mile buffer if they meet noise and tall structure restrictions, impacts are offset by mitigation, and it complies with seasonal restrictions. Restrictions on new ROWs in GHMA could be waived in exchange for mitigation in PHMA. Areas outside of the 1-mile lek buffer would be open to new ROWs. Mitigation would be considered on a case-by-case basis, similar to current practices. Research suggests that conservation measures in GHMA would be insufficient to protect GRSG in GHMA. In addition to insufficient lek protections, disturbance would be allowed to occur at levels where population decline is expected.

Impacts for infrastructure development would be greatest in areas managed as PHMA such as the southern-central portions of the Uintah Population Area where there is the greatest potential for minerals, road, pipeline, and transmission line development. Impacts would also

occur in portions of the Sheeprocks Population Area, based on transmission development. Both of these areas currently have low population numbers and poor habitat quality.

Renewable Energy

Impacts from wind energy development under Alternative D would be similar to those described under Alternative B. However, avoidance restrictions would also be applied to areas outside GRSG habitat that fall within 4 miles of a lek that is inside PHMA. This would decrease the likelihood that wind developments outside, but adjacent to, breeding, nesting, and brood-rearing habitat would be avoided by GRSG because of their proximity to the noise or presence of tall structures. Wind energy development within that avoidance area would be allowed if noise restrictions and tall structure restrictions are met. As a result, impacts that could occur from wind development outside PHMA but within 4 miles of a lek would be addressed to eliminate impacts over a larger area than Alternative B.

Fire

Under Alternative D, impacts from fire would largely be the same as Alternative B. Fire would not be included as part of the 5 percent disturbance cap. Suppression would be focused on protecting the largest blocks of contiguous sagebrush. The BLM and Forest Service would construct fuelbreaks to protect GRSG habitat; however, efforts would be made to avoid creating breaks in large, contiguous sagebrush areas. These decisions would decrease direct removal of sagebrush associated with fire management activities, as well as potentially reduce the likelihood for fire in GRSG habitats.

Similar to Alternative B, according to the VDDT model (**Table 4.8**), during the next 50 years implementation of Alternative D would result in a reduction in the average annual acres of GRSG habitat burned. Impacts would be the greatest in the population areas that are most prone to wildfire, which are generally the areas in the Great Basin region. Restrictions placed on development would reduce the amount of human activity in GRSG habitat, which could reduce the number of human-caused fire starts. However, more human activity would be allowed in GRSG habitat under Alternative D than under Alternatives B and C.

Table 4.9 shows changes in the percent of the modeled sagebrush in the mid- to late-seral stage. Under Alternative D, the VDDT modeling effort resulted in trends for GRSG habitat similar to those described for Alternative A, except that an emphasis on fire prevention and preparation of proactive fires lines would result in a smaller loss of habitat. This is most pronounced in the Sheeprocks Population Area, where at 10 years the modeled decrease in mid- to late-seral stage sagebrush is only 3 percent under Alternative D compared with 7 percent under Alternative A. This is more pronounced at 50 years, where Alternative D sees a 4 percent decrease in mid- to late-seral stage sagebrush compared with a 15 percent decrease under Alternative A. The long-term decreases in other population areas would be similarly reduced, though to a lesser degree.

When compared with current conditions, the percent of sagebrush that would be in the mid- to late-seral stage at 50 years would decrease in the Uintah, Carbon, Sheeprocks, Rich, Lucerne, Wyoming-Uinta, and Wyoming-Blacks Fork Population Areas. The percent sagebrush that would be in the mid- to late-seral stage would remain the same in the Panguitch, Bald Hills, and Parker

Table 4.8
Alternative D VDDT Model Outputs- Average Changes in Fire, Juniper, and Annual Grasses Compared with Alternative A Over 50 Years

Population Area(s)	Percent Change in Average Annual Acres Burned	Percent Juniper	Percent Change in Juniper	Percent Annual Grasses	Percent Change in Annual Grasses
Box Elder	-13	10	43	9	0
Hamlin Valley, Ibapah	-29	26	4	5	-29
Rich, Uintah, Wyoming-Uinta, Wyoming-Blacks Fork	-11	13	0	3	-25
Carbon	-5	27	-7	1	-50
Emery	0	3	0	0	0
Parker, Panguitch, Bald Hills	-15	18	0	0	-100
Strawberry	-13	12	0	0	0
Sheeprocks	-35	30	-15	15	-12

Table 4.9
Sagebrush Condition and Trend Analysis: Comparing Alternatives by Percent of Sagebrush in Mid- or Late-Seral Classes for Population Areas at 10 Years and 50 Years – Alternatives A and D

Population Area	Percent of Sagebrush in Mid- and Late-Seral Class				
	Current Conditions	10 Years		50 Years	
		Alternative A	Alternative D	Alternative A	Alternative D
Uintah	80	76	77	67	69
Carbon	66	57	61	58	60
Emery	77	83	83	85	85
Parker Mountain	70	67	68	68	70
Panguitch	70	67	68	68	70
Bald Hills	70	67	68	68	70
Hamlin Valley	36	45	46	54	59
Ibapah	36	45	46	54	59
Sheeprocks	53	46	50	38	49
Box Elder	55	61	60	70	68
Rich	80	76	77	67	69
Strawberry	76	76	77	78	79
Lucerne	80	76	77	67	69
Wyoming-Uinta	80	76	77	67	69
Wyoming-Blacks Fork	80	76	77	67	69
All	**57**	**60**	**60**	**65**	**66**

Mountain Population Areas. The percent sagebrush that would be in the mid- to late-seral stage would increase in the Hamlin Valley, Ibapah, Box Elder, Strawberry, and Emery Population Areas. According to the model, at 50 years, all population areas would meet the GRSG habitat objective considered under Alternative D, which is to manage or restore PHMA so that at least 50 percent of the land cover provides adequate sagebrush habitat to meet GRSG needs.

As discussed in **Section 4.3.1**, Methods and Assumptions, information derived from the VDDT model provides valuable information on estimated trends; however, the model also has a number of limitations. While quantitative objectives for treatments were not included under Alternative D, an increase in treatment could be consistent with the goal, objectives, and management actions considered under Alternative D.

Under Alternative D, not all occupied GRSG habitat would be managed as PHMA. Some occupied GRSG habitat in the Carbon, Uintah, Sheeprocks, Panguitch, Wyoming-Uinta, and Wyoming-Blacks Fork Population Areas would be managed as GHMA. GHMA (approximately 17 percent of the mapped occupied habitat in the planning area) are areas that have been determined to have less conservation value than PHMA. Removal of GHMA from the model area would likely result in decreases in percent of juniper and annual grasses and increases in the amount of sagebrush in the mid- to late-seral stage in PHMA. Therefore, population areas that are not currently meeting objectives may be able to meet objectives in the future.

Invasive Plant Species

Weeds

Impacts from Alternative D would be similar to those described for Alternative B. However, the BLM and Forest Service would apply a 5 percent disturbance cap to anthropogenic disturbances in PHMA. This disturbance cap would not include fire. The spread of cheatgrass has increased the frequency and intensity of fires, and cheatgrass readily invades disturbed sites after wildfire, especially in drier, lower-elevation sites (Balch et al. 2013). Under Alternative D, there would be less surface disturbance in GRSG habitat than under Alternative A but more surface disturbance than Alternative B. As a result, the likelihood for introduction and spread of invasive plant species due to human activity would be slightly higher than under Alternative B. As shown in **Table 4.9**, the percent of annual grasses would decrease in the next 50 years under Alternative D compared with Alternative A. Estimated decreases in annual grasses closely correspond to estimated decreases in wildfire. Changes in annual grasses due to development were not accounted for in the model.

Conifer Encroachment

Impacts from Alternative D would be similar to those analyzed under Alternative B. **Table 4.9** shows changes in the percent of juniper in GRSG mapped occupied habitat. Treatment of encroaching juniper is expected to reduce the percent of juniper on the landscape in the Carbon Population Area. Despite efforts to prevent juniper encroachment, the percent of juniper is expected to increase in the Box Elder, Hamlin Valley, and Ibapah Population Areas. Reductions in juniper are expected in the Sheeprocks Population Area; however, these reductions are likely tied to increases in fire and annual grasses. The percent of juniper on the landscape is expected to remain stable in all other population areas.

Grazing (Including Wild Horses and Burros)

Impacts from Domestic Livestock Forage Use (Herbivory)

Impacts from livestock herbivory associated with Alternative D would be similar to those identified under Alternative B, except for adjustments in emphasis and prioritization that are noted below. Under Alternative D, specific objectives would be included for management of GRSG habitats, like under Alternative B, except that while the habitat indicators would use scientific literature (e.g., Connelly and Hagen), they would be adjusted, as applicable, based on documented regional variation of habitat characteristics, quantitative data from population and habitat monitoring, and evaluation of local research. This would allow GRSG habitat objectives to be tailored to the variations in the local vegetation communities (e.g., the differences between high-elevation areas like Rich and Parker Mountain Population Areas and lower elevation areas like Bald Hills and Hamlin Valley Population Areas). The approach would allow the habitat objectives to be tailored to reflect the biological capabilities of the area and allow adjustments to livestock grazing to be suited to those capabilities. Over time, this tailoring would result in livestock grazing being managed to maintain healthy GRSG habitat based on the local vegetation characteristics and ecological responses.

As with Alternative B, the BLM and Forest Service would manage PHMA to incorporate GRSG-specific habitat objectives and management considerations into permit renewals, allotment management plans, or annual operating instructions. However, under Alternative D, the allotments in PHMA would be assessed to determine if they are meeting the GRSG objectives, but the rangeland health standards evaluations would be focused on allotments that are not currently achieving rangeland health standards. During the assessment of habitat condition and rangeland health standards, annual adjustments would likely have to be made to meet the new GRSG objectives, which could result in changes to current grazing practices. While Alternative D could result in 100 percent of the permitted use being used, such use would only be permitted if climatic and environmental conditions resulted in forage production capable of supporting this level of use while meeting GRSG objectives. By not prioritizing habitat assessments in all GRSG habitat, as proposed under Alternative B, some GRSG habitats could be impacted by livestock grazing, as described under Alternative A, for several years until the regular assessment cycle results in a review of the area. This could result in GRSG habitat in some areas being affected in a negative trend before the issue is identified and steps are implemented to correct the trend. However, by focusing resources on allotments not meeting rangeland health standards, the areas most in need of evaluation and correction would receive the primary focus.

Under Alternative D, the ecological potential of various sites would be taken into account when determining livestock grazing management strategies, considering the different vegetative states capable of being supported in an area based on ESDs. Areas within PHMA that currently provide or could be managed to become GRSG habitat would be managed as such. This would maintain areas that currently provide habitat and would move areas that ecologically could become habitat to that end. Over time, this would increase the amount of GRSG habitat that meets the site-specific GRSG habitat objectives.

Managing grazing practices (e.g., rest-rotation, season of use, distribution, and intensity) to meet rangeland health standards and GRSG habitat objectives would result in a decrease in the potential for the impacts identified under Alternative A to occur. To align grazing practices with the needs of GRSG habitat, applicable terms and conditions would be added to grazing permits, based on the site-specific ecological conditions, to ensure that GRSG habitat objectives are met. This would ensure that GRSG habitat needs are considered during multiple levels of grazing administration, providing for maintaining or improving the quality of GRSG seasonal habitats.

Compared with Alternative B, livestock grazing in riparian and meadow complexes would not automatically be reduced. Instead, Alternative D would require assessing grazing in these areas to ensure they are maintained or are recovered. If recovery is not occurring and livestock grazing is identified as the causal factor, grazing pressure would be reduced through adjusting grazing management practices. Assessing areas rather than directly reducing use could result in some brood-rearing areas being reduced in quality while they are assessed and grazing adjustments are identified and implemented. These impacts would generally last only a season to two, and over the life of the plan, riparian and meadow complexes within PHMA would be maintained or improved.

Collectively, the requirements to protect GRSG habitat in Alternative D would maintain or improve GRSG habitat compared with Alternative A. Compared with Alternatives B and C, there could be impacts on GRSG habitat in portions of the decision area during periods between monitoring cycles. When the impacted areas are identified, however, actions would be implemented to resolve the issue and bring the area back to meeting GRSG objectives. Over the life of the plan, the quality of GRSG seasonal habitats would be maintained or improved given the focus on meeting GRSG habitat objectives.

Impacts from Wild Horse Forage Use (Herbivory)
Impacts from wild horse herbivory would be the same as described under Alternative B.

Impacts from Wild Ungulate Forage Use (Herbivory)
The impacts from wild ungulates would be the same as described under Alternative A.

Impacts from Livestock Grazing Program Actions
Impacts from livestock grazing program action associated with Alternative D would be similar to those identified under Alternative B, except for adjustments in emphasis and prioritization that are noted below.

Impacts on GRSG habitat from riparian management and water developments would be similar to those described under Alternative B, except that under Alternative D, new water developments that have neutral effects on GRSG would be allowed. This could result in more water developments within GRSG habitat compared with Alternative B (since that alternative only allows developments that are beneficial), but since an evaluation would have to determine that new development would be either beneficial or have no effect on GRSG, no change in impact is anticipated. In addition, Alternative D would require the evaluation of existing water developments to determine if modifications are necessary to maintain or improve wetlands (e.g., riparian areas, mesic areas, and wet meadows) and GRSG habitat. Requiring modifications to livestock water developments where necessary would allow for the improvement of areas

currently impacted by existing development, improving GRSG brood-rearing habitat in areas where this may occur.

Alternative D does not include specific language related to the location of livestock supplements. While supplement location is used to improve distribution of livestock and use levels in an area, they can also result in livestock congregating near the supplement location. Small areas of increased livestock density would result in localized increases in use and trampling, with corresponding reductions in grasses, forbs, and shrub cover and reduced functionality of GRSG habitat. Although Alternative D does not include a specific requirement to "conserve, enhance, or restore" GRSG habitat in relation to placement of supplements, it does include specific GRSG habitat objectives that must be met under the various grazing practices, including supplement location. Under Alternative D, there would be a potential for site-specific impacts associated with use of the areas surrounding the supplement locality during the period the supplement is available. These impacts could be greater than those anticipated for Alternative B because of the lack of specific requirements related to supplements, but application of the GRSG habitat objectives would provide for the long-term maintenance of GRSG habitat quality across the population area.

Impacts from Wild Horse Program Actions
Impacts from wild horse herbivory would be the same as described under Alternative B.

Recreation
Under Alternative D, impacts from area designations would be similar to those described under Alternative B. On BLM-administered lands, areas would be prioritized and activity-level travel plans would be completed based on where OHV use is having the greatest impact on GRSG, in accordance with BLM's Travel and Transportation Management Planning timeline strategy. This would allow the BLM to reduce or eliminate impacts by changing area management in those areas where OHV use is having the greatest impact. Management would be focused on meeting access needs while emphasizing having a neutral or positive impact on GRSG habitat. Impacts would be reduced compared with Alternative A.

Impacts from recreational permits would be the same as those described for Alternative B.

Impacts from other types of recreation, including recreation at developed recreation sites and dispersed recreation would be the same as those described under Alternative A.

Habitat Conversion for Agriculture and Urbanization
Under Alternative D, management would be similar to Alternative B, except that 2,760,300 acres of GRSG habitat would be designated as PHMA, and potential land tenure adjustments would emphasize that it must be a net benefit for GRSG.

ACEC Designation
No special management areas would be designated to provide protection for GRSG under Alternative D. Any incidental protections under Alternative A would continue to occur.

4.3.6 Alternative E

GRSG Habitat and Disturbance Thresholds

Under Alternative E, 82 percent of the mapped occupied habitat in the Utah planning area would be managed as SGMAs/core areas. This includes 100 percent of the mapped occupied habitat included in the USFWS-identified PACs. Under this alternative, 94 percent of the birds would be in SGMAs. Unique to Alternative E, SGMAs would not include the Anthro Mountain and West Tavaputs populations. These populations may be important for redundancy and may provide connectivity to northeastern Utah GRSG populations. While there is documented movement between these two areas and other population areas (e.g., Emma Park and portions of the Uintah Population Area on private and tribal lands), it is unknown what level of connectively is necessary to prevent isolation of populations and how important these areas are to maintaining genetic viability.

Under Alternative E1, new disturbances on state and federal lands within SGMA would be limited by a 5 percent disturbance cap (not including existing disturbances). Impacts on GRSG would be avoided. When avoidance is not possible, minimization measures and mitigation at a 4 to 1 ratio would be required. In addition, similar to Alternative C, fires would be counted towards the disturbance cap. In the Bald Hills (12.8) and Box Elder (5.9) Population Areas, disturbance already exceed 5 percent of land area when fire history is taken into account. These areas would face greatly reduced potential for development under this alternative.

The inclusion of fire as a type of habitat loss counted in the disturbance cap would incentivize project proponents to restore burn areas, along with other disturbances, when the disturbance cap limit has been reached. Thus, under this alternative, when new disturbances reach 5 percent, industry may commit additional resources to assist with restoration efforts of GRSG habitat affected by wildfire as a way of ensuring disturbance would remain under the disturbance cap, thereby allowing development to be able to continue. Since there are already varying levels of existing disturbance in SGMAs, that would not count against the cap, and because the plan is not clear on whether disturbance on private lands would be counted against the disturbance cap, disturbance could surpass 5 percent in some areas. Based on research conducted by Kirol (2012) in Wyoming, risk of population decline started increasing at 4 percent disturbance and birds no longer used an area once disturbance reached 8 percent. Given the information above, allowable disturbances could exceed disturbance levels that the literature considers necessary to maintain GRSG habitats and populations, and could lead to population declines or abandonment of portions of a SGMAs (e.g., Alton, Wildcat Knolls).

Under Alternative E1, disturbance limits would be calculated across the SGMA. When there are multiple GRSG populations within a SGMA, disturbance could be disproportionately focused on one population. In this situation, the impacted population could decline. Declines in individual populations, as well as in individual SGMAs, are allowable under Alternative E so long as the statewide population objectives are met and each SGMA maintains a viable population.

Disturbance in GRSG habitat within SGMAs would be avoided unless the development cannot be moved outside of the GRSG habitat or SGMA based on resource constraints (e.g., high potential for mineral development). Exceptions to the avoidance requirements would be

evaluated on a case-by-case basis in coordination with the State. When compared with other alternatives, Alternative E would provide the BLM and Forest Service with more flexibility to authorize actions in SGMAs. While development levels in GRSG habitats would be less than under Alternative A because of the avoidance requirement, exceptions could result in some development in the nesting and early brood-rearing habitats, which could directly decrease reproductive success and potentially decrease population growth rates (Kirol 2012). In addition, disturbances in winter habitats could decrease winter habitat use.

Although Alternative E1 could result in greater disturbance in GRSG habitat than is allowed under other action alternatives, the BLM and Forest Service would focus on expanding occupied GRSG habitat by enhancing an average of 25,000 acres per year and requiring mitigation (4:1 ratio) for all long-term surface-disturbing actions in SGMAs. Expansion of GRSG habitat in opportunity areas that are directly adjacent to occupied habitat would increase the amount of habitat available for GRSG. Expansion of habitat, tied to proactive restoration or project-specific mitigation could provide new seasonal habitat for contemporaneous GRSG populations supplanting habitat lost due to disturbance, fragmentation, or distressing events. For example, vegetation treatments that have reduced juniper encroachment in the Panguitch SGMA have resulted in documented use by GRSG within 2 years of the treatment (Frey et al. 2013). The success of mitigation efforts may depend on the quality of the habitat that is lost in juxtaposition to the quality of the habitat that is created. For example, creation of 4 acres of transitional habitat in exchange for 1 acre of frequently used winter habitat may not provide benefit to the local population. On the contrary, improving 4 acres of brood-rearing habitat in exchange for loss of 1 acre of transitional habitat could provide a net benefit to GRSG. Expansion of GRSG habitat has the potential to result in increases in GRSG populations within SGMAs; however, empirical evidence suggests that GRSG populations within Utah have slightly declined or held steady despite the fact that the BLM, Forest Service, NRCS, and the State of Utah have been actively treating GRSG habitat. Based on current knowledge, there has been limited success in restoring lost GRSG habitat (USFWS 2013). The likelihood of success would depend upon a number of variables, including the type and location of treatment. For example, vegetation treatments have been more successful in increasing the amount and quality of GRSG habitat at higher elevations than in low elevations. In addition, removal of juniper in areas where there is still a sagebrush understory has shown success.

For the National Forest System lands within the Utah EIS project boundary that extend into Wyoming, under Alternative E2, disturbances from oil, gas and mining activities would be limited to no more than an average of 1 location per 640 acres. Further, all surface disturbance, in any program area, would be limited to no more than 5 percent within core areas. This would be calculated using the Density Disturbance Calculation Tool developed by the Wyoming SGIT Team. Disturbance impacts on GRSG from Alternative E2 would be similar to those described for Alternative D. This limit to activities within core areas would help protect against further habitat loss, habitat degradation, and disruption to the GRSG. A recent study conducted by Copeland et al. (2013) determined that the Wyoming core area strategy would reduce declines in GRSG populations by approximately half when compared to a policy that would employ no GRSG protection measures. However, the study also concluded that under the core area strategy GRSG populations in Wyoming would decrease in the long term by 9 to 15 percent.

Minerals

The key to minerals management under Alternative E1 is avoiding disturbance in GRSG habitat within SGMAs. As part of the avoidance requirements, new permanent disturbance would not be allowed within 1 mile of a lek, unless it is not visible from the lek. Outside of the 1 mile lek buffer, if avoidance is not possible, project proponents must demonstrate why it is not, and the BLM/Forest Service Authorized Officer would determine whether such demonstration is sufficient on a case-by-case basis. Where avoidance is not possible and minerals development in GRSG habitat occurs, the impacts must be minimized and mitigated. The combination of avoidance, minimization, and application of compensatory mitigation would provide protection to GRSG habitat, though protection would not be ensured since there are exceptions to the avoidance requirement.

Unlike other action alternatives, under Alternative EI, the BLM and Forest Service would not require existing leaseholders to implement RDFs for nonenergy leasable or fluid minerals developments. Existing uses are explicitly recognized and are not affected by the implementation of this alternative. Conservation measures that protect GRSG habitat would be considered on a case-by-case basis. Because the majority of the reasonably foreseeable development anticipated in the planning area is associated with development on valid and existing rights, impacts from minerals development on existing leases would be the same as those described under Alternative A.

Another way in which Alternative E1 differs from other action alternatives is that no protections are afforded to GRSG habitat located outside of SGMAs. As such, habitat outside of SGMAs would be afforded a lesser level of protection that is currently provided under Alternative A. Any surface use or seasonal restrictions currently in place (see **Table 4.1**) would be eliminated. This would result in no protection from minerals development for approximately 18 percent of the occupied habitat in the planning area and 3 percent of the statewide GRSG population. Given the amount of existing and proposed development in GRSG habitat outside of SGMAs, extirpation of small local populations could occur.

Under Alternative E2, the Forest Service would stipulate NSO within 0.6 miles of a lek within core areas and 0.25 miles within noncore areas. The Forest Service would work with development project proponents to site projects in locations that would allow for development but contain the least sensitive habitats, whether inside or outside of core areas. According to the literature, Alternative E2 may include insufficient lek protections and could result in population declines. A recent study conducted by Copeland and others (2013) determined that the Wyoming core area strategy would reduce declines in GRSG populations by approximately half when compared to a policy that would employ no GRSG protection measures. The study also concluded that under the core area strategy GRSG populations in Wyoming would decrease in the long term by 9 to 15 percent. However, the USFWS has determined that lek protections, in combination with the Wyoming Governor's Core Strategy of protecting all lands within core areas, provides an acceptable level of protection for GRSG.

Nonenergy Leasables

Impacts from acres open to nonenergy leasable mineral leasing would be the same as those described for Alternative A. Any stipulations, COAs, or conservation measure proposed under

this alternative would only apply to GRSG habitat in SGMAs/core areas. Since the primary development potential for nonenergy leasable resources is gilsonite and phosphate which occur in the Uintah Basin (**Map 3.21-5**), the majority of the impacts would occur where those resources exist. Phosphate resources in the Diamond Mountain area could be further developed in SGMA, as it is still open for leasing. GRSG habitat outside of the SGMAs/noncore areas (East Bench and Deadman's Bench) would not be managed for the conservation of the species; therefore, impacts from such development could occur. The majority of the area has gas development with wells that ranging from 2 to 50 wells per square mile. Therefore, GRSG habitat loss, habitat degradation, and disturbance could add to the existing disturbances in the area and affect a small number of birds (10-year average male count is 1 male on BLM-administered lands lek and 4 males on both leks). These impacts would further impact a population that has been declining and already has substantial impacts from gas development on the landscape.

As mentioned in under Minerals, Alternative E would require ROW avoidance within GRSG habitat within SGMAs. As part of the avoidance requirements, no permanent disturbance is allowed within 1 mile of occupied leks, and disturbance in other areas of the SGMAs would be avoided. Avoidance requirements, including the 1-mile restriction, can be excepted.

Research suggests that 1 mile is not sufficient to adequately protect GRSG nesting habitat surrounding lek sites from oil and gas related infrastructure because between 75 percent (Doherty et al. 2010) and 95 percent (Coates et al. 2013) of a populations habitat use occurs within 3.1 miles of a lek. Allowing disturbance within 3.1 mile buffers of the lek could lead to decreased reproductive success and population declines in the Diamond Mountain area, specifically. For example, studies have shown negative effects on lek attendance from well sites and haul roads within 2 to 3 miles of a lek (Walker et al. 2007a, Johnson et al. 2011). In addition, natural gas development within 0.6 to 3 miles of occupied GRSG leks could lead to declines in breeding populations, lower nest initiation, and lower annual survival of chicks (Lyon and Anderson 2003; Holloran 2005; Aldridge and Boyce 2007; Walker et al. 2007a; Holloran et al. 2010).

TLs and CSU stipulations would be applied to new leases and geophysical operations within GRSG habitat in SGMAs/core areas. Avoiding activities during the important seasons would lessen the impacts on the birds for that season. Many of the impacts within GRSG habitat in SGMAs/core areas would be lessened through the application of the CSU stipulations (e.g., time of day and noise restrictions). These stipulations would protect the lek site itself and displaying males and may protect some of the nesting and early brood-rearing habitat depended upon how much they overlap temporally and spatially.

Despite efforts to reduce or eliminate impacts on GRSG through application of CSU and TL stipulations, oil and gas research suggests that GRSG persistence is negatively affected when well density within approximately 2 miles of a lek exceeds one disturbance per section and when infrastructure is placed in proximity to a lek (Tack 2009). Considering the characteristics that disturb GRSG from oil and gas well development and the similar nature of mineral facilities (e.g., direct habitat loss, roads, vehicle traffic, and noise), impacts from mineral facilities is anticipated to be similar.

While Alternative E1 would provide the BLM and Forest Service with greater flexibility in determining which actions would be allowed in SGMAs than is provided under other alternatives, the ability to accommodate development and grant exceptions to stipulations makes it difficult to determine the effectiveness of Alternative E1 at protecting GRSG populations from impacts of nonenergy development.

Under Alternative E, the BLM and Forest Service would attempt to offset impacts associated with actions authorized in SGMAs through proactive habitat restoration and compensatory mitigation. There have been instances where projects have been aimed to increase habitat for GRSG, for example, by removing pinyon-juniper adjacent to occupied GRSG habitat and documenting GRSG use (Frey et al. 2013). However, the effectiveness of impacting habitats and offsetting the loss of those habitats with restoration of other habitats has not been evaluated at a population-level. Therefore, assuming that compensatory mitigation would be required to offset the impacts of a disturbance, we must assume that it would be effective. The effectiveness of these management actions would be the same as discussed in the introduction of to the Alternative E analysis (GRSG Habitat and Disturbance Thresholds).

Based on the information above, decreased population growth is expected to continue to occur in the Uintah Population Area outside of the Uintah SGMA, East Bench and Deadman's Bench, and inside the Uintah SGMA, Diamond Mountain, where there is there is high potential for development of phosphate and gilsonite.

Under Alternative E2, impacts on nonenergy leasable minerals would be similar to those described under Alternative E1 except impacts on GRSG habitat in core areas would be limited by the 5 percent disturbance cap, as calculated by the Wyoming density disturbance calculation tool. Research suggests that maintaining disturbance at or near this level may be sufficient to maintain GRSG habitats and populations.

Solid Material - Coal

Under Alternative E1, the same acreage would be suitable for surface and underground mining of coal as under Alternative A. Both surface and underground mining would be allowed in both GRSG habitat in SGMAs and GRSG habitat outside of SGMAs, but there are no stipulations or conservation measures associated with GRSG habitat outside of SGMAs. As discussed in preceding sections, under Alternative E1, the BLM and Forest Service would avoid development in SGMAs. As part of this avoidance, no permanent disturbance would be allowed within 1 mile of occupied leks. The effectiveness of Alternative E at reducing impact from coal development would be similar to those described in the Nonenergy Leasable Mineral section. Under this alternative, future habitat loss, degradation, and disturbance are expected to continue to occur within the Carbon, Emery, and Panguitch Population Areas where coal potential is most likely to occur. Habitat loss in the Carbon and Emery Population Areas would be minimal because only underground mining occurs in these areas. Any habitat loss would be limited to construction of appurtenant facilities.

Under Alternative E2, surface and underground coal mining would be allowed in both core and noncore areas. On a site-specific basis, each project would be reviewed and after consultation with the State of Wyoming, Forest Service, and the BLM. Certain stipulations would be applied to minimize impacts on GRSG. Impacts from coal development would be similar to those

described under Alternative E1, except disturbance would be limited by the 5 percent disturbance as calculated by the Wyoming density disturbance calculation tool. Research suggests that maintaining disturbance at or near this level may be sufficient to maintain GRSG habitats and populations.

Locatables

Under Alternative E1, the same acreage would be suitable for locatable minerals as under Alternative A. Locatable mineral activities would be allowed in both GRSG habitat in SGMAs and GRSG habitat outside of SGMAs. However, the BLM and Forest Service would work with claimants to apply conservation measures to minimize impacts from activities in GRSG habitat in SGMAs. If claimants agree to implement conservation measures discussed in **Chapter 2**, impacts on GRSG habitat in SGMAs would be similar to those described in the Nonenergy Leasable Mineral section above. If claimants do not agree to implement conservation measures, there would be a loss of GRSG habitat and impacts would be similar to those described under Alternative A. Actual impacts from locatable minerals development in GRSG habitat would be low based on the amount of existing and projected development in the planning area.

There would be no impacts from locatable mineral development in the Wyoming-Blacks Fork Population Area because the Flaming George NRA is congressionally withdrawn from mineral entry. Under Alternative E2, within the Wyoming-Uinta Population Area, withdrawals could be considered if locatable mineral development poses a risk to GRSG. If lands are withdrawn, there would be no impacts from locatable mineral development. If lands remain open for entry, impacts would be same as those described above under Alternative E1. No mineral withdrawals would be considered within noncore areas; therefore, there could be a loss of GRSG habitat from locatable development.

Mineral Materials

Under Alternative E1, mineral materials disposal would be allowed in both GRSG habitat in SGMAs and GRSG habitat outside of SGMAs, but development in GRSG habitat in SGMAs would have stipulations and conservation measures. Impacts on GRSG and their habitat would be similar to those describe in the Nonenergy Leasable Minerals section above.

Under Alternative E2, mineral materials exploration, sales, and extraction would be allowed in both core and noncore areas. Mineral material extraction or crushing operations would be prohibited in core areas during seasonal restriction times; however, removal of material from existing stockpiles would be allowed. Under this alternative, future habitat loss, degradation, and disturbance in core and noncore areas are expected to continue throughout the decision area and would be similar to Alternative A. While these impacts may decrease nest success, chick survival, and adult survival; the scale and frequency of these types of developments are small compared with other mineral developments in GRSG habitats and future development trends are expected to be similar to past development trends of few, small scale mineral material development sites. Therefore, this type of mineral development is anticipated to be low and have a minimal impact on overall GRSG persistence.

Fluid Minerals (Including Geothermal)

Under Alternative E1, 247,200 acres within GRSG habitat would be open to leasing, subject to standard stipulations; 2,637,600 acres would be open to leasing, with minor constraint; 688,100

acres would be open to leasing, subject to NSO stipulations; and 138,500 acres would be closed to leasing. All GRSG habitats that would remain open with standard stipulation are located outside of SGMAs. Impacts on these areas would be the same as described under Alternative A. Within SGMAs, areas within 1 mile of an occupied lek would be managed with an NSO stipulation; all other areas would have CSU and TL stipulations similar to those discussed above under Nonenergy Leasable Minerals section. As such, impacts on GRSG and their habitat would be similar to those describe in the Nonenergy Leasable Minerals section, above.

As discussed in the General Minerals section above, some existing leases may be affected by management actions considered under Alternative E1. Mitigation would be considered during the site-specific NEPA process, which is the current practice under the No Action Alternative. Application of mitigation measures identified through site-specific NEPA analysis that intended to reduce or eliminate impacts on GRSG have been inconsistent from project to project and resulted in varying levels of success.

The RFD scenario under Alternative E1 is the same as the reasonably foreseeable development under Alternative A. Impacts from fluid minerals would be greatest in the Carbon Population Area and southern portion of the Wyoming-Uinta Population Area. Specifically, development is most likely to occur in areas such as the existing West Tavaputs, Brundage Canyon, and Gasco fields. Impacts would be the greatest in these areas because they have high oil and gas potential, the majority of the lands have already been leased, and they include GRSG habitat outside of SGMAs and not afforded any protection under this alternative.

The impacts associated with geothermal leasing and development is essentially the same as those stated above because the acreage is already leased. The Bald Hills Population Area is the only population area where geothermal activity is anticipated. Geothermal activity would be managed constantly with the management described under GRSG habitat in SGMAs/core areas. Impacts are not anticipated to be substantial.

Under Alternative E2, core areas within 0.6 miles of lek would be managed with an NSO stipulation. In noncore areas within 0.25 miles of a lek would be managed with an NSO stipulation. Outside of these lek buffers, there would be CSU and TL stipulations. Impacts from fluid mineral development would be similar to those described under Alternative E1 except impacts on GRSG habitat in core areas would be limited by the 5 percent disturbance cap, as calculated by the Wyoming density disturbance calculation tool and no more than more than an average of 1 location per 640 acres would be allowed. Research suggests that maintaining disturbance at or near this level may be sufficient to maintain GRSG habitats and populations.

Infrastructure

As noted elsewhere, infrastructure development could include authorizations such as transmission lines, fences, roads, and appurtenant facilities associated with minerals development. This broad category of actions stems across many BLM and Forest Service programs including lands and realty, minerals, comprehensive travel and transportation management, and livestock grazing. As such, impacts on GRSG from many infrastructure related authorizations are discussed in other sections. This section is primarily focused on impacts tied to lands and realty related decisions.

Under Alternative E, new infrastructure development would be more restrictive than Alternative A, but the least restrictive of all the action alternatives. Approximately 632,200 acres of GRSG habitat would be open to new ROWs, 2,654,000 acres would be avoidance areas, and 27,600 acres would be excluded.

All GRSG habitats open to ROW development would be outside of SGMAs. Construction of new infrastructure could result in additional habitat loss and fragmentation in these areas. Because of the amount of disturbance and fragmentation that already exists in many of these areas, population declines would be expected to continue. This would impact approximately 18 percent of the total GRSG habitat in the planning area and approximately 3 percent of the birds.

Under Alternative E1, construction of new infrastructure, including authorization of new ROWs in GRSG habitat in SGMAs would be avoided when possible. As part of the avoidance requirements, no permanent disturbance would be allowed within 1 mile of occupied leks. Avoidance requirements, including the 1 mile restriction, could be excepted. Construction of new ROWs/ is most likely to occur adjacent to existing ROWs/. All designated corridors would be retained. It is unclear whether or not the restrictions outlined under Alternative (e.g., avoidance or disturbance cap) would apply to proposed developments in designated corridors.

As discussed in the Minerals section above, research has shown that 1 mile is not sufficient to adequately protect GRSG nesting habitat surrounding lek sites, and could lead to decreased reproductive success and population declines in these areas.

Under Alternative E1, the 5 percent disturbance limit would be applied only to new disturbance, which could result in the loss of additional GRSG habitat in SGMAs/core areas. In some cases, population persistence may be compromised when disturbance is greater than 5 percent (Kirol 2012).

TLs and CSU stipulations would be applied to any authorizations within GRSG habitat in SGMAs. Avoiding activities during the important seasons would lessen the impacts on the birds for that season. Many of the impacts within GRSG habitat in SGMAs would be lessened through the application of the surface use restrictions (e.g., time of day and noise). These restrictions would protect the lek site itself and some of the nesting and early brood-rearing habitat. Additional measures such as collocating new ROWs next to existing ROWs may minimize and, in some cases, offset habitat impacts in GRSG habitat in SGMAs.

Despite efforts to reduce or eliminate impacts on GRSG through application of surface use and timing restrictions, research suggests that GRSG persistence is negatively affected when facilities occur within approximately 2 miles of a lek exceed 1 disturbance per section and when infrastructure is placed in proximity to a lek (Naugle et al. 2011).

While Alternative E1 provides the BLM and Forest Service with greater flexibility in determining which actions would be allowed in SGMAs than is provided under other alternatives, the ability to accommodate development and grant variances to stipulations makes it difficult to determine the effectiveness of Alternative E1 at protecting GRSG populations from infrastructure development.

Under Alternative E, the BLM and Forest Service would attempt to offset impacts associated with actions authorized in SGMAs through proactive habitat restoration and compensatory mitigation. The effectiveness of these management actions would be the same as discussed in the introduction of to the Alternative E analysis (GRSG Habitat and Disturbance Thresholds).

Under Alternative E1, some loss of nesting, brood-rearing and wintering habitat in GRSG habitat in SGMAs could occur. This habitat loss would primarily occur in areas where existing leases and infrastructure are present. This includes areas such as the Sheeprocks, Uintah, and Carbon Population Areas where the greatest potential for minerals, road, pipeline, and energy-related transmission line infrastructure development exists. Neither of the high development potential areas in the Uintah or Carbon Population Areas fall within SGMAs.

Under Alternative E2, core areas would be an exclusion area for new SUAs, with the following exceptions: New transmission lines would be considered within core areas where it can be demonstrated that declines in GRSG populations could be avoided. New transmission lines would be allowed within 0.5 miles on either side of existing 115-kV or larger transmission lines, creating a disturbance corridor no wider than 1 mile. Under Alternative E2, exiting routes within core areas would not be upgraded to a point that the route category would be improved to the next level of development, unless there would be minimal impact on GRSG or there is a public safety issue. Additionally, new primary and secondary roads would avoid areas within 1.9 miles of the perimeter of occupied GRSG leks. Construction would not be allowed during important seasons.

Noncore areas would be managed as an avoidance area for SUAs. Additionally, new primary and secondary roads would avoid areas within 0.6 miles of occupied leks.

The environmental consequences of implementing Alternative E2 would be similar to those described under Alternative E1. Namely, authorization of infrastructure development would be allowed to occur under certain conditions, which could result in loss and fragmentation of nesting, breeding, and winter GRSG habitat. According to the literature, Alternative E2 may include insufficient lek protections and could result in population declines. A recent study conducted by Copeland and others (2013) determined that the Wyoming core area strategy would reduce declines in GRSG populations by approximately half when compared to a policy that would employ no GRSG protection measures. The study also concluded that under the core area strategy GRSG populations in Wyoming would decrease in the long term by 9 to 15 percent. However, the USFWS has determined that lek protections, in combination with the Wyoming Governor's Core Strategy of protecting all lands within core areas, provides an acceptable level of protection for GRSG.

On the contrary, any authorizations would be required to comply with the 5 percent disturbance cap, which includes existing disturbance. Research suggests that maintaining disturbance at or near this level may be sufficient to maintain GRSG habitats and populations.

Renewable Energy

Under Alternative E, GRSG habitat in SGMAs/core areas would be designated as an avoidance area for wind energy development. While permanent wind energy development facilities are discouraged from directly impacting leks, nesting, brood-rearing, and wintering habitats, there is

no guarantee that these protections would be implemented. Given the availability of areas with high potential for wind energy development outside of GRSG habitat, it is likely that development within GRSG habitat could be avoided by simply locating the development elsewhere.

Alternative E1 does not allow permanent disturbance within 1 mile of occupied leks, which can be waived if the development is not visible from the lek. In addition, the same seasonal and surface use restrictions that would be applied to other lands and minerals actions would be employed. Beyond these restrictions, no more than 5 percent new surface disturbances would be allowed and minimization and compensatory mitigation would be required of any actions authorized in SGMAs. The effectiveness of these management actions would be the same as discussed in the sections above.

Under Alternative E2, wind energy development would not be allowed inside core areas unless it could be sufficiently demonstrated that the development activity would not result in declines in GRSG populations or loss or disruption to habitat.

Fire

Under Alternative E, impacts from fire would largely be the same as described under all other alternatives. Approximately 2,711,200 of GRSG habitat within SGMAs and core areas would be prioritized for suppression. The BLM and Forest Service would emphasize reducing wildland fire in GRSG habitat through fuels treatments, construction of fuelbreaks (especially around important GRSG habitat), and using targeted livestock to reduce fine fuels. These activities would decrease the likelihood of large fires in GRSG habitats.

Impacts from fire management actions under Alternative E would be similar to the impacts from Alternative D. Based on the similarities between the fire management decisions under Alternatives D and E, they were not modeled separately (see **Table 4.9**). Under Alternative E, an emphasis on fire prevention and preparation of proactive fire lines would result in a smaller loss of habitat. This is most pronounced in the Sheeprocks Population Area, where at 10 years the modeled decrease in habitat is only 3 percent under Alternative E compared with 7 percent under Alternative A. This is more pronounced at 50 years, where Alternative E sees a 4 percent decrease in habitat compared with a 15 percent decrease under Alternative A. The long-term decreases in habitat in other population areas would be similarly reduced, though to a lesser degree. Alternative E and the Proposed Plans are the only alternatives that include quantifiable treatment objectives. The treatment of objectives considered under the Proposed Plans are slightly more specific than those included under Alternative E, in that they are broken out by land ownership and by population area. Nonetheless, the cumulative number of acres that the BLM, Forest Service, and the State of Utah propose to treat (working in cooperation with other agencies, private landowners, and partners) under these alternatives is very similar. VDDT modeling conducted for the Proposed Plans indicate the improvement of 25,000 acres of GRSG habitat within SGMAs and expansion of 50,000 acres of GRSG habitat within and outside of SGMAs should be sufficient to maintain a minimum of 70 percent of land capable of producing sagebrush with 10 to 30 percent sagebrush canopy cover. Research indicates that when 50-70 percent of the landscape includes sagebrush, the likelihood of GRSG persistence increases (Aldridge et al. 2008; Wisdom et al. 2011). Given the amount of treatment that is proposed

under Alternative E, it is anticipated that there would be a slight reduction in the amount of wildland fire when compared to Alternative D.

As previously discussed, all alternatives were modeled using GRSG mapped occupied habitat, which provides a consistent baseline for impact analysis. However, under Alternative E, not all areas would be managed as SGMAs/core areas (approximately 18 percent of the mapped occupied habitat in the planning area). Removal of lands outside of SGMAs/noncore areas from the model area would likely result in decreases in percent of juniper and annual grasses and increases in the amount of sagebrush in the mid- to late-seral stage.

Invasive Plant Species

Weeds

Impacts from Alternative E1 would be similar to those described for Alternative D. However, the addition of existing surface disturbance would allow result in more than 5 percent disturbance. Because more surface disturbance is allowed under Alternative EI, the likelihood for introduction and spread of invasive plant species would be also higher. Under Alternative E1, newly reported weed infestations would be aggressively responded to keep the species from spreading. By focusing on infestations while they are still small, the amount of GRSG habitat degraded or lost to conversion to invasive species would be limited. For existing infestations located in or near sagebrush habitat, the strategy would be to contain and limit further spread. The more an invasive species becomes a component of a vegetation community, the more the ability to remove it decreases. By curtailing existing infestations and averting the spread of new infestations, the amount of GRSG habitat degraded or lost to conversion to invasive species would be decreased. Further, rehabilitating areas currently affected by invasive species, including cheatgrass, would provide for additional GRSG habitat and limit the loss of adjacent areas from changed vegetation composition and fire regimes.

Under Alternative E2, effects on GRSG with respect to treatment of invasive weeds would be the similar to Alternative D. The actions would minimize the likelihood for exotic annual weed invasions in some areas. However, cheatgrass and the subsequent annual grass fire cycle would remain a major threat to GRSG. Nevertheless, there are no expected losses or degradation of GRSG habitats or disruption of populations due to the treatment of invasive weeds, rather, it is anticipated that treatment of these area would improve habitat conditions. Further, Alterative E2 gives priority to GRSG habitat restoration projects on areas infested with exotic annual grasses.

As shown in **Table 4.9**, the percent of annual grasses would decrease in the next 50 years under Alternative E when compared with Alternative A. Estimated decreases in annual grasses closely correspond to estimated decreases in wildfire. Changes in annual grasses due to development were not accounted for in the model.

Conifer Encroachment

Under Alternative E1, impacts would be similar to Alternative D. Habitat improvement projects would be conducted specifically for GRSG each year, with particular emphasis on areas where conifers are encroaching. Encroaching conifers and other plant species would be treated to expand GRSG habitat where ecologically possible (emphasis would be placed on treatments in

Phase I and Phase II juniper encroached areas). Sagebrush treatment projects within nesting and winter habitat in SGMAs could be limited to maintain these areas of sensitive habitat. Any treatments in these areas would require consultation with the State of Utah to ensure that the treatment is conducted in a manner that would maintain the habitat components necessary for the GRSG in the treatment area. Sagebrush treatment projects would also be encouraged to maintain 80 percent of the available habitat as sagebrush within the project area, with 20 percent of the habitat to be treated and managed for younger age classes of sagebrush. This would maintain larger areas of sagebrush and the existing GRSG habitat values while building a mosaic into the landscape's vegetation. Since dense stands of sagebrush reduce the biodiversity of forbs and grasses in the understory (West 1993 *in* Utah Greater Sage-Grouse Working Group 2013), allowing areas of sagebrush to be treated and creating a mosaic would provide additional cover and nutrition for GRSG, increasing the potential for survival of GRSG. Coordination requirements with the State of Utah would ensure broader biological considerations could be taken into account during project design (e.g., if areas proposed for treatment where necessary for winter habitat). This would eliminate potential vegetation treatments that could reduce winter habitats. Alternative E and the Proposed Plans are the only alternatives that include quantifiable treatment objectives. The treatment of objectives considered under the Proposed Plans are slightly more specific than those included under Alternative E, in that they are broken out by land ownership and by population area. Nonetheless, the cumulative number of acres that the BLM, Forest Service, and the State of Utah propose to treat (working in cooperation with other agencies, private landowners, and partners) under these alternatives is very similar. VDDT modeling conducted for the Proposed Plans indicate the improvement of 25,000 acres of GRSG habitat within SGMAs and expansion of 50,000 acres of GRSG habitat within and outside of SGMAs should be sufficient to maintain a minimum of 70 percent of land capable of producing sagebrush with 10 to 30 percent sagebrush canopy cover. Research indicates that when 50-70 percent of the landscape includes sagebrush, the likelihood of GRSG persistence increases (Aldridge et al. 2008, Wisdom et al. 2011). Given the amount of treatment that is proposed under Alternative E, it is anticipated that there would be a slight reduction in the amount of wildland fire when compared to Alternative D. Under Alternative E2, there are no specific management actions with regard to the encroachment of conifers. However, habitat improvement projects specific to restoring GRSG habitat is encouraged. Therefore, impacts on GRSG would be similar to those described for Alternative D. Under Alternative E2, vegetation treatments in sagebrush within core areas would be required to use WGFDs Protocols for Treating Sagebrush to Benefit Sage-Grouse. These protocols would be used to determine whether the proposed treatment constitutes a "disturbance" that would contribute toward the 5 percent disturbance cap for habitat maintenance. Additionally, these protocols would help determine whether the proposed treatment configuration would be expected to have neutral or beneficial impacts for priority populations or if they represent additional habitat loss or fragmentation. With these evaluations, the potential for vegetation treatments to improve the quality and quantity of GRSG habitat would be high. Alternative E2 also includes a decision that encourages consideration of changes to seasons of use before or after the summer growing season to manage riparian areas for GRSG habitat needs. Where implemented, this could result in increases in forbs and invertebrates necessary for early- and late-brood-rearing habitats.

Table 4.9 shows changes in the percent of juniper in GRSG mapped occupied habitat. Treatment of encroaching juniper is expected to reduce the percent of juniper on the landscape

in the Carbon Population Area. Despite efforts to prevent juniper encroachment, the percent of juniper is expected to increase in the Box Elder, Hamlin Valley, and Ibapah Population Areas. Reductions in juniper are expected in the Sheeprocks Population Area; however, these reductions are likely tied to increases in fire and annual grasses. The percent of juniper on the landscape is expected to remain stable in all other population areas.

Grazing (Including Wild Horses and Burros)

Impacts from Domestic Livestock Forage Use (Herbivory)

The impacts on GRSG habitat from livestock herbivory described under Alternative A would continue to have potential to occur under Alternative E. Active livestock AUMs would continue to be made available within GRSG habitat at the same levels identified for Alternative A. Adjustments to active AUMs would continue to be made through annual authorizations and would be based on site-specific evaluations to respond to variations in vegetation conditions (e.g., climactic trends, allotment conditions, and permittee operational considerations drought). Grazing strategies that are incompatible with the maintenance of GRSG habitat would be addressed through the established rangeland management practices (e.g., Rangeland Health Standards and State of Utah's BMPs identified by the Department of Agriculture and Food's Grazing Improvement Program). Making these annual adjustments could maintain or improve GRSG habitat insofar as such habitat is benefitted by rangelands that meet Rangeland Health Standards and guidelines for livestock grazing in Utah.

Alternative E1 does not include specific GRSG habitat objectives (e.g., sagebrush percent cover in different seasonal habitats, grass/forb percent cover, or residual grass heights) or the framework for such to be developed. However, it does include information to guide livestock grazing in seasonal GRSG habitats (i.e., leks, nesting/early brood-rearing, late brood-rearing, winter), and identifies general descriptions of each seasonal habitat and guidance and considerations when grazing in each habitat type. Though there are no specific management actions in regards to GRSG habitat, consideration of the general guidance for GRSG habitat could provide direction to the types of grazing practices. While the average annual use number would not be anticipated to change, the grazing strategies could be adjusted to accommodate the guidance. Based on this, the current trends in seasonal GRSG habitat conditions could be improved as the grazing strategies are adjusted to consider GRSG habitat.

Under Alternative E1, livestock grazing practices in GRSG habitat would be managed to consider the time (duration), timing (season of use), and intensity of livestock use to address special needs or weak links in GRSG biological year. Where time-controlled grazing is not an option at the site-specific level, livestock use would be managed for moderate use (40 percent) after the period of rapid vegetation growth. Rather than focusing on the number of authorized livestock, the emphasis would be on improving GRSG habitat through rest and deferment, or in some cases, specific use levels. In addition, if possible, up to 20 percent of nesting and early brood-rearing habitat would be left ungrazed periodically. As described under Alternative A, carefully managing timing, deferment, and use levels could result in improved habitat conditions in some seasonal habitats and areas, based on site-specific conditions. However, to facilitate this type of range management, rangeland improvements (e.g., fences, watering facilities, or supplement blocks) could be more common to ensure grazing takes place when and where it is appropriate.

While this could displace some birds from preferred locations, the encouragement to leave some areas ungrazed (periodically) could, if the timing of no grazing aligned, provide areas for birds to select. Depending on how frequently areas are periodically left ungrazed, this could provide for increased grass and forb presence and resulting improved clutch success. In addition, use levels would minimize forage competition and help provide hiding cover for GRSG.

Alternative E1 would encourage the use of short-duration high-intensity grazing strategies in areas where comprehensive grazing strategies are in place. While the other alternatives would not prohibit this grazing strategy, Alternative E1 would specifically provide for this strategy under conditions that the areas of higher use have areas of rested vegetation nearby. Implementing a short-duration high-intensity rotational landscape-level grazing system may require construction of fences and/or water developments to facilitate its proper execution. Increased herding requirements could be substituted for increases in infrastructure if the livestock herds were large enough to justify the required investment in full-time personnel. In either instance, increased human presence in the form of infrastructure or riders could affect the use of specific areas by birds. Implementing this type of grazing strategy in a portion of the Rich Population Area (Deseret Land and Livestock Ranch) has tended to result in healthy GRSG habitat, maintaining sagebrush while providing grasses and forbs for nesting and brood-rearing habitat. As with most grazing strategies, site-specific ecology, soils, and vegetation condition could affect whether this type of strategy would result in improvements to GRSG habitats.

The potential for maintaining and improving GRSG habitat, as described above, would be reduced by other decisions in Alternative E1. One decision notes that if site-specific concerns are raised about the effect of grazing in GRSG habitat, the effects must be documented over a sufficiently long period. The alternative language is not clear on how long impacts must be documented. In addition, there are no requirements to perform assessments on the condition of GRSG habitat and no prioritization or focus for completing Rangeland Health Standards evaluations in SGMAs. As a result, Rangeland Health Standards evaluations would be conducted on a case-by-case basis, usually associated with permit renewals. When the evaluations would be completed, the lack of a GRSG habitat assessment could result in insufficient information to determine whether the existing grazing practices are incompatible with the maintenance or enhancement of GRSG habitat. Further, the lack of specific habitat objectives would result in a lack of clarity of what type of vegetation conditions would be needed to lead to the maintenance or enhancement of GRSG habitat. These decisions would have the combined effect of delaying the identification of potential areas that are being impacted by livestock grazing, as well as the implementation of revised grazing strategies to eliminate the impact. This could result in GRSG habitat in some areas being affected by livestock grazing, resulting in a negative trend in habitat condition. Depending on the length of time between the initiation of the negative habitat trend and the implementation of corrective grazing strategies, the size of the area affected could continue to increase and the degree to which key habitat components and functionality are affected could increase.

Under Alternative E2, site-specific adjustments to active AUMs would continue to be made through annual authorizations and would be based on practices outlined in Grazing Influence, Management, and Objective Development in Wyoming's Greater Sage-Grouse Habitat, and Wyoming Executive Order 2013-03. Within core areas, GRSG habitat objectives would be

incorporated into allotment management plans, permit renewals and annual operating instructions. Because this alternative includes GRSG habitat objectives, the impacts would be similar to those described under Alternative D.

Impacts from Wild Horse Forage Use (Herbivory)
Under Alternative E1, impacts from wild horse herbivory would be the same as that described under Alternative A. There are no wild horses or burros on the National Forest System lands in Wyoming within this project area (Wyoming-Blacks Fork or Wyoming-Uinta Population Areas), therefore there would be no impacts on GRSG from decisions within this resource area.

Impacts from Wild Ungulate Forage Use (Herbivory)
The impacts from wild ungulates would be the same as under Alternative A.

Impacts from Livestock Grazing Program Actions
Compared with Alternative A, impacts from the livestock grazing program would be decreased under Alternative E. Alternative E would result in water developments that provide for GRSG brood-rearing habitat needs. In addition to designing developments that enhance mesic habitats and maintain adequate vegetation in wet meadows, consideration of GRSG needs in these areas would take precedence over stipulations for other species, if conflicts occur. This prioritization of GRSG habitat needs would provide assurance that brood-rearing habitat components would be provided for. This could increase the success of brooding and an increase in the number of chicks that survive to adulthood.

The impact of fences described under Alternative A would be reduced under Alternative E1 by locating livestock fences away from leks and employing the NRCS fence standards. The language in this alternative is not specific to how far away from leks a fence should be located or what modifications would be applied, so while the risk of GRSG collision would be reduced compared with Alternative A, the potential for continued bird strikes would not be removed. Employing the NRCS fence standards under Alternative E1 would also reduce the risk of bird strikes and associated mortalities.

Under Alternative E1, the number of fences could increase based on the grazing practices implemented. Increasing the number of fences in GRSG habitat could also increase the potential or bird strikes, though until specific grazing strategies are identified, the magnitude of this impact on GRSG populations is not known. Regardless of the level, by locating fences "away from leks" and employing NRCS fence standards would decrease the potential for bird strikes compared with Alternative A.

Impacts from Wild Horse Program Actions
Impacts from wild horse program actions would be the same as that described under Alternative A. There are no wild horses or burros on the National Forest System lands in Wyoming within this project area (Wyoming-Blacks Fork or Wyoming-Uinta Population Areas), therefore there would be no impacts on GRSG from decisions within this resource area.

Recreation
Under Alternative E1, the BLM would manage 351,700 acres as open to cross-country travel. All National Forest System lands would remain limited to designated routes. Within GRSG habitat

in SGMAs, nesting and winter habitat areas open under Alternative A would be changed to limited to existing routes. GRSG habitats outside of nesting and winter habitats would be open. Impacts associated with cross-country travel would be similar to those described under Alternative A, though a smaller area would be subject to those impacts. Open travel impacts would be reduced in the Box Elder, Rich, Hamlin Valley, and Bald Hills Population Areas.

Under Alternative E1, some restrictions would be placed on permitted uses, including recreation, including seasonal and time of day restrictions. This would reduce the likelihood of direct disturbance to birds but would not likely change the amount of habitat loss or degradation compared with Alternative A.

Impacts from other types of recreation, including recreation at developed recreation sites and dispersed recreation, would be the same as those described under Alternative A.

All acres within the planning area in Wyoming are on National Forest System lands. These lands are open to travel on designated routes only, and are closed to cross-country travel. Under Alternative E2, exiting routes within core areas would not be upgraded to a point that the route category would be improved to the next level of development, unless there would be minimal impact on GRSG or there is a public safety issue. Additionally, new primary and secondary roads would avoid areas within 1.9 miles of the perimeter of occupied GRSG leks within core areas and 0.6 miles of occupied leks within noncore areas. Further, Forest Service SUAs would not be issued within core areas if there are anticipated impacts on GRSG, or unless impacts can be mitigated. Therefore, loss of GRSG habitat or habitat degradation and disruption are not expected to occur from the management actions within Recreation and Transportation resource area.

Habitat Conversion for Agriculture and Urbanization

Under Alternative E1, management would be similar to Alternative A. Lands currently available for FLPMA 203 sales would remain available.

Under Alternative E2, there would be no impacts from agricultural conversion or urbanization. National Forest System lands with core GRSG habitat would be retained in public ownership. Land exchanges would be considered only if GRSG were improved through more contiguous federal ownership or private conservation easement. Therefore, there would be no loss of GRSG habitat, habitat degradation, or disruption to GRSG through land tenure decisions and the possible conversion of sagebrush habitat to agricultural lands or urbanization.

ACEC and Zoological Area Designation

No special management areas would be designated to provide protection for GRSG under Alternative E. Any incidental protections under Alternative A would continue to occur.

There are no Zoological Area designations proposed for the National Forest System lands in Wyoming within this project area (Wyoming-Blacks Fork or Wyoming-Uinta Population Areas), therefore there would be no impacts on GRSG from decisions within regard to new ACEC designations.

4.3.7 Proposed Plans

GRSG Habitat and Disturbance Thresholds

Under the Proposed Plans, 72 percent of the mapped occupied habitat in the planning area would be managed as PHMA. This includes 72 percent of the mapped occupied habitat included in the USFWS-identified PACs. Under this alternative, leks associated with 96 percent of the GRSG in the planning area would be in PHMA. In most cases, the lands managed as PHMA in individual population areas are the same as what was considered in one or more of the alternatives in the Draft EIS. However, in a few instances, the lands identified as PHMA vary slightly from what was considered under any alternative. A brief description of the PHMA in each population area as it relates to other alternatives is included below. The total acreage for each of these areas is included in **Section 2.6.2**, BLM Proposed Plan Amendment, (MA-GRSG-1). These areas are also shown on **Map 2.6**.

- *Box Elder.* Areas managed as PHMA would be the same as the areas managed as SGMAs under Alternative EI. A portion of the population area would include additional SFA management.
- *Rich.* The area would be managed the same under Alternative D with two exceptions. First, west of Bear Lake, near the Idaho Utah border, the PHMA boundary was adjusted to be the same as the SGMA boundary considered under Alternative E1. Second, an area that was not previously identified as mapped occupied habitat east of Ant Flat, covering portions of the Monte Cristo mountain range, would be treated as PHMA, with SFA management.
- *Sheeprocks*. The area managed as PHMA would be the same as under Alternative D.
- *Ibapah.* The area managed as PHMA would be the same as under Alternatives B and D.
- *Hamlin Valley*. The area managed as PHMA would be the same as under Alternatives B, C, and D.
- *Bald Hills*. The area managed as PHMA would be the same as Alternatives B and D with one exception; a small area that includes primarily private agricultural lands was changed from GHMA to PHMA. GPS collar information indicates GRSG are currently using this area.
- *Panguitch*. The area would be managed the same as under Alternatives B and C. The southern portion of the population area, which includes the Alton coal mine, would be managed as PHMA.
- *Parker Mountain*. The area would be managed the same as under Alternatives B and D with one exception; approximately 30,400 acres of lands near the town of Loa were removed because they are no longer considered occupied habitat by the State, BLM, or Forest Service.
- *Emery*. The area would be managed the same as Alternatives B and D with one exception. A small segment of disconnected habitat located west of Horn Mountain was changed from PHMA to GHMA.

- *Carbon*. The Emma Park and Gordon Creek areas would be managed the same as under Alternatives D and E. In the West Tavaputs and Anthro Mountain areas, mapped occupied habitat within 3.1 miles of occupied leks would be managed as PHMA. The remainder of these areas would be managed as GHMA. The alignment of PHMA and GHMA is different from under any alternatives, but is within the range of alternatives considered in the Draft EIS. During the development of the Proposed Plans, the BLM and Forest Service met with the State of Utah to discuss management options for the West Tavaputs and Anthro Mountain area. The State of Utah's *Conservation Plan for Greater Sage-Grouse in Utah* does not identify these areas as SGMAs because the State does not consider them as essential for connectivity. In addition, these areas, to varying degrees, have and will continue to be impacted by oil and gas development. The West Tavaputs and Anthro Mountain areas were not identified as PACs in the USFWS in the COT report. PACs, as identified in the COT report, are synonymous with the SGMAs. Despite the fact that these areas are not within a PAC, the BLM, Forest Service, and the Utah USFWS consider these areas to be important GRSG habitat because they have stable to increasing GRSG populations of comparable size to other populations that are identified as PACs within the COT report. Based on disagreement regarding the importance of these areas to GRSG, the BLM and Forest Service, in consultation with the State of Utah, have decided to manage occupied habitat within 3.1 miles of GRSG leks as PHMA and the remainder of the occupied habitat as GHMA.
- *Uintah*. The same areas would be managed as PHMA as under Alternative D with one exception. The PHMA in the Halfway Hollow area was expanded to include three additional leks that are located on private and tribal lands.
- *Strawberry*. The area that would be managed as PHMA would be the same as under Alternatives B and D.
- *Lucerne*. The area that would be managed as PHMA would be the same as under Alternatives B and D.
- *Wyoming-Blacks Fork*. The area that would be managed as PHMA would be the same as under Alternatives B, D, and E2[1].
- *Wyoming- Uinta*. The area that would be managed as PHMA would be the same as under Alternatives B, D, and E2[1].

With regards to management, the Proposed Plans include elements of all action alternatives considered in the Draft EIS. In addition, the Proposed Plans include some new management actions, which were developed in response to public comments, to ensure greater levels of consistency across GRSG habitat in other sub-regions, and to account for new scientific information published after completion of the Draft EIS. Some notable decisions included under the Proposed Plans not specifically considered in other alternatives are discussed below.

[1] Under Alternative E2 the Wyoming-Blacks Fork and Wyoming-Uinta population areas were identified as core areas.

- The Proposed Plans include quantifiable treatment objectives. Previously, Alternative E was the only alternative that included quantifiable treatment objectives. The acres that the BLM and Forest Service would attempt to treat is equal to the number of acres that the VDDT model indicates are necessary to maintain a minimum of 70 percent of land capable of producing sagebrush with 10 to 30 percent sagebrush canopy cover. Research indicates that when 50-70 percent of the landscape includes sagebrush, the likelihood of GRSG persistence increases (Aldridge et al. 2008; Wisdom et al. 2011).
- The Proposed Plans include more specific vegetation objectives, which are included in vegetation objectives tables. These objectives are based on the ecology of GRSG population areas within the planning area. In developing these objectives, the BLM and Forest Service started with guidelines included in Connelly et al. 2000 and made adjustments based on local nesting and brood-rearing data that have been collected in conjunction with research projects conducted in Utah. In the Draft EIS, the BLM and Forest Service had included a more generalized objective for desired cover percentages and heights for sagebrush, grasses, and forbs in seasonal habitats. The general objectives included under Alternatives B and D stated that seasonal habitats would be managed to meet habitat guidelines from scientific literature (e.g., Connelly et al. 2000 and Hagen et al. 2007). Inclusion of more specific objectives could result in increased certainty and greater levels of consistency when considering implementation-level actions, such as term permit renewals. Following these objectives could prevent improper grazing practices. In addition, following more specific vegetation objectives may, in some cases, improve the quality of habitat and decrease opportunities for predation. Improved habitat conditions and decreases in predation should increase nest success and chick survival.
- The Proposed Plans include some lands that have been identified as SFA. SFA are areas that have been determined to be highly important landscapes across the GRSG range. Management that is more restrictive has been placed on lands within SFA to emphasize protection of GRSG in these areas. SFA include approximately 228,500 acres surface estate and 4,900 acres of split-estate federal minerals in the Box Elder and Rich Population Areas.
- The Proposed Plan include lek buffers that will be applied to PHMA and GHMA. For lands managed according to the BLM and the Forest Service-Utah Proposed Plans, these buffers are consistent with the lek buffer distances identified in the USGS Report, *Conservation Buffer Distance Estimates for Greater Sage-Grouse - A Review* (see **Appendix F**, Applying Lek Buffer Distances). The buffer distances identified in the USGS report are based upon the best available scientific information and are summarized to provide an easy guide for land managers and inform management decisions in GRSG habitats. Modifications to the buffer distances could be made if such modifications meet the criteria outlined in **Appendix F**. On National Forest System lands in the Wyoming portion of the planning area a lek buffer of 0.6 miles in PHMA and 0.25 miles on GHMA will be applied. Following this guidance for lek buffers will reduce disruption to GRSG, minimize habitat loss, and reduce habitat degradation, which should result in maintaining nesting habitat effectiveness and brood survival over conditions described in Alternative A.

- On National Forest System lands in the Wyoming portion of the planning area, a 5 percent disturbance cap would be applied, using the Density Disturbance Calculation Tool process or its replacement, as described in Appendix I of the WY-9 Plan (incorporated in this analysis by reference). For lands managed according to the BLM and the Forest Service-Utah Proposed Plans, a 3 percent disturbance cap would be applied at two levels. Disturbance would be calculated at the project level, meaning that the amount of disturbance allowed could not exceed 3 percent of the site-specific project area. Project level disturbance would be calculated using a density disturbance calculation tool (**Appendix E**, Greater Sage-Grouse Disturbance Cap Guidance) that is similar to the tool that is currently used in Wyoming. In addition to calculating disturbance at the project-level, disturbance would also be calculated for each BSU. In Utah, the BSU is synonymous with the PHMA boundary in each population area (in other words, the BSU in the Carbon Population Area is the same as PHMA in the Carbon Population Area). No alternative in the Draft EIS considered this multi-step approach. Alternatives B and C do not specify how disturbance would be calculated. In general, Alternatives D and E specify that disturbance will be calculated only at the BSU level. Calculating disturbance at the project-level may prevent some development that could occur if disturbance is only calculated at the BSU level. Relative to other alternatives that provide protection for GRSG at a larger population level, the Proposed Plans include protection for both the larger population and individual leks and their surrounding habitat.
- The Proposed Plans include hard and soft adaptive management triggers for population decline and habitat loss within PHMA and specifies appropriate management responses (**Appendix B**, Adaptive Management)**.** For example, if a hard trigger is reached in the Sheeprocks Population Area, the BLM would expand the PHMA boundary to include the southern portion of the Sheeprocks (Tintic). By expanding the PHMA, more restrictive management would be applied in this area and it would be prioritized for fuels reduction treatments, habitat improvement and restoration, which could benefit GRSG habitat. In addition, the 3 percent disturbance cap would apply at the project level and the larger Sheeprocks BSU.

While the management actions described for the Proposed Plans are anticipated to reduce impacts on GRSG, an adaptive management approach is included in the event that habitat or populations continue to decline to the point that triggers are met. In that event, measures that are more restrictive could be applied. The goal of adaptive management is to detect effects on GRSG and take action in an appropriate timeframe to effectively offset impacts.

The Proposed Plans would incorporate an adaptive management strategy composed of soft and hard triggers that are based on population and habitat changes. The BLM and Forest Service would rely on data from several sources to track and identify population changes to assess the population trigger in the adaptive management approach. Triggers would be determined by population area, making the strategy more locally responsive than if triggers were determined on a sub-regional or statewide basis. Responses to soft triggers may require the adjustment of future project level/plan implementation activities in the short or long term, as consistent with the individual site-specific NEPA analyses. Soft trigger responses can come in the form of terms,

conditions, RDFs, or site-specific mitigation measures. Hard triggers represent a threshold indicating that immediate action is necessary to stop a severe deviation from GRSG conservation objectives set forth in the Proposed Plans. As such, the Proposed Plans include a "hard-wired" plan-level response; that is, it provides that, upon reaching the trigger, a more restrictive alternative, or an appropriate component of a more restrictive alternative analyzed in the EIS will be implemented in the area where the trigger is reached. **Appendix B** provides more detail on the adaptive management approaches, triggers, and responses. The use of adaptive management would benefit GRSG by allowing flexible resource management decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood.

Except in limited circumstances (e.g., wind development), the Proposed Plans do not include allocation based decisions that extend beyond PHMA boundaries. However, during the implementation level planning process, if a project is proposed in an area adjacent to PHMA (either within the SGMA/PAC or within 4 miles of a lek located in PHMA), the BLM and Forest Service would evaluate those lands to determine whether there is any GRSG habitat present using the process described in the Proposed Plans for GRSG management outside of PHMA/GHMA. If habitat is present, the BLM and Forest Service would consider the impacts of the proposed action on that habitat and consider whether mitigation is needed to minimize impacts on the habitat or protect GRSG that may use the area. Similar requirements were considered under Alternatives D and E in the Draft EIS. The impacts of this decision would generally be the same as described in those sections.

Minerals

Nonenergy Leasables

In PHMA, on National Forest System lands in the Wyoming portion of the planning area, federal mineral interests would remain open to leasing while on lands managed according to the BLM and the Forest Service-Utah Proposed Plans, federal mineral interests would be closed to leasing. However, expansion of existing operations could be considered if the new lease is contiguous with an existing operation and includes all conservation measures (e.g., net conservation gain, disturbance cap, density of energy/mining facilities, restrictions for noise, tall structures, and season of use, and lek buffers).

The impacts from this alternative would be similar to Alternative B, except in areas where new developments, contiguous with existing development, could occur. Where additional development is allowed to occur, impacts would be similar to those described under Alternative D.

Currently the phosphate mines located north of Vernal in the Diamond Mountain area are the only existing nonenergy leasable mineral operations in PHMA. Under the Proposed Plans, operators of existing mines could potentially be allowed to obtain new leases and expand their operations; however, given the amount of disturbance associated with existing operations, and the proximity of those operations to occupied leks on Diamond Mountain, it may be difficult for operators to expand their mining operations while meeting the GRSG conservation measures.

Should the BLM and Forest Service issue new leases in the area, conservation measures would limit the intensity of development and avoid, minimize, and mitigate impacts on GRSG.

The requirement to be adjacent to an existing operation will expand disturbance but would not introduce additional noise (though noise would be in a different location), different visual disturbances, or increased operational traffic (though it could be in a different location). Each of these measures, as well as the 3 percent disturbance cap (5 percent on National Forest System lands in the Wyoming portion of the planning area), would ensure that mining activities remain consolidated and that contiguous areas of habitat remain available for GRSG.

Prior to initiating development on any new leases, onsite or near-location compensatory mitigation will be required to offset the impacts of additional habitat loss. Mitigation ratios would be determined on a case-by-case basis and depend on quality and quantity of habitat lost. Requiring the mitigation to be completed prior to project initiation would negate the loss of habitat. Individual GRSG may be displaced by new development adjacent to the existing operations; however, new areas of suitable habitat may be established (previously pinyon-juniper dominated) to produce a long-term net gain in available habitat acreage.

Existing phosphate development in PHMA is occurring primarily on state and private lands. The BLM anticipates that there are sufficient phosphate reserves on existing leases for development to continue at the current rate for the next approximately 15 years. As such, impacts on GRSG that are currently occurring from phosphate development are likely to continue regardless of the alternative selected. There are pending leases on federal minerals adjacent to the existing development. If approved, they would be subject to conservation measures (e.g., net conservation gain, lek buffers, and RDFs). Because of the existing development, while not on federal minerals, the disturbance in the project area would likely not be under the disturbance cap. There would, however, be opportunities for underground mining. In either case, the leases, if approved in the future, would not result in additional surface disturbance that would impact GRSG.

Under the Proposed Plan in GHMA, leasing and development could occur under conservation measures.

Lek buffers would be applied to new development, subject to applicable laws, regulations, and valid existing rights. Because PHMA would be closed to nonenergy mineral leasing the lek buffers would de facto be applied in GHMA and for new development associated with existing leases or operations in PHMA. Application of lek buffers would provide protection for the lek and some surrounding nesting and brooding habitat from the impacts of new development. Seasonal restrictions would minimize operational impacts such as noise, traffic, and human activity, thereby preventing displacement of GRSG during seasons of use. Requiring compensatory mitigation to achieve a net conservation gain would improve habitat conditions. Depending on the location of the mitigation (on- or off-site), this could improve habitat conditions for the population directly impacted by development or for other larger populations located in other parts of the State.

Continued gilsonite development in southern portions of Deadman's Bench and northern portions of East Bench is anticipated to be the only area where nonenergy leasable mineral

development occurs in GHMA. Despite the above-mentioned GRSG conservation measures, leasing and development in these areas could result in human alteration, direct loss, and fragmentation of seasonal GRSG habitats, which, in most cases, have already been fragmented by mineral development activities. Fragmentation could further limit the amount of usable habitat available for the small and declining population of GRSG (3 leks with a combined 10-year average of 7 males and a 3-year average of 2 males) that occupy this area.

Solid Material - Coal

Surface Coal Mining

In PHMA, the 22,900 acres with coal potential that is currently unacceptable for further consideration for coal leasing would continue to be unacceptable for further consideration for coal leasing. In the remainder of PHMA, unsuitability determinations would be made when the BLM conducts environmental analysis for specific lease applications (43 CFR 3461.3). If during the leasing application process the BLM or Forest Service decide to issue a new lease allowing surface mining, the lease would include all conservation measures (e.g., net conservation gain, disturbance cap, density of energy/mining facilities, restrictions for noise, tall structures, and season of use, and lek buffers). Impacts from surface coal mining would be less than those described under Alternative D, because conservation measures attached to any new lease issued under the Proposed Plans would be more restrictive. In particular, implementation of lek buffers (unless justifiable departures exist); seasonal, noise, and tall structure restrictions; limiting the amount and density of energy development; and requiring compensatory mitigation that results in a net conservation gain would minimize the impacts of any new development.

Despite these conservation measures, surface coal mining could result in the localized fragmentation and direct loss of existing occupied seasonal habitats. The general effects of fragmentation and habitat loss are discussed under **Section 4.3.2**, Alternative A.

The Alton coal mine, an existing operation located on state and private lands in the Panguitch Population Area, is currently the only surface coal mine operating in the planning area. Expansion of the existing operation, which is currently being considered in an EIS being prepared by the BLM, is the only reasonably foreseeable surface coal mining action in PHMA. Site-specific impacts on GRSG are considered in that EIS.

Under the Proposed Plans, the operator of the Alton coal mine could potentially obtain new leases and expand their operations. However, given the amount of disturbance associated with the existing operation, and the proximity of the current operation to occupied leks, there would likely be size and locational constraints on the expansion of any surface mining activity, especially in the short term. Based on current mining practices, as well as information included in the Alton Coal Draft EIS (2011), there may be opportunities for continued coal mining using other extractive methods, including high wall and underground mining methods. Both of these activities would result in fewer disturbances than surface mining.

Regardless of which mining method is employed, the expansion of the existing coal operation into existing occupied GRSG seasonal habitats would result in displacement of GRSG from current use areas. As discussed in **Chapter 3**, coal mining has been occurring since 2010 in this area. Surface mining has resulted in a presumed shift of the Sink Valley lek from private to BLM-

administered land. In addition, limited GPS data indicates that GRSG from the central Panguitch area are using the habitat around and south of the existing mine operations for wintering habitat. Mitigation (some connected and some unassociated with the mining operation) has been and is currently occurring to expand and improve existing habitat and improve connectivity with other GRSG habitats north of the Alton mining area. Despite the direct habitat loss of yearlong seasonal habitats, and proximity of the mining operations to the Sink Valley lek, populations have remained relatively stable (see **Section 3.3.5**, Conditions in Population Areas).

Although data collected to date shows that GRSG using the Alton area have persisted, it is unknown how past and ongoing operations will impact the birds in the long term. Literature indicates that the impacts from oil and gas development may not have an immediate impact, but that impacts could be realized between 2 and 10 years (Harju et al. 2010; Naugle et al. 2011). A similar lag effect could occur in the Alton area.

As previously mentioned, expansion of the coal mine into currently unleased areas would only occur if the BLM were to issue a new lease. Any lease issued would include conservation measures (e.g., net conservation gain, lek buffers, disturbance cap, and restrictions for noise, tall structures, and season of use). These measures, which are based on the best available scientific information, should provide adequate protection for GRSG using the Alton area and allow for continued survival; however, impacts are difficult to predict, especially given the small size of the population and susceptibility of GRSG to a multiplicity of threats including stochastic events.

Underground Mining

Impacts from underground mining would be nearly identical to those described under Alternative B and similar to those described under Alternative D, except any new permanent surface facilities that are located in PHMA would be subject the conservation measures which would further limit adverse impacts on GRSG. Appurtenant surface facilities would not be allowed in PHMA unless there are no feasible alternatives. If construction of new facilities is required, they would be collocated with facilities in existing disturbed areas. If collocation is not possible, new facilities would be located in an area determined to be the least harmful to GRSG. Any new surface disturbances in PHMA would be subject to disturbance threshold (3 percent) and density stipulations (1 energy or mining disturbance per 640 acres), which would reduce the amount of direct habitat loss and fragmentation and ensure areas with contiguous habitat remain intact.

In GHMA, new coal leases would be allowed if conservation measures (e.g., net conservation gain, lek buffers, and RDFs) and are implemented. This includes application of compensatory mitigation that would result in a net conservation gain of GRSG habitat. Mitigation for actions in GHMA could occur off-site in PHMA; the location of mitigation would be determined through coordination between the BLM or Forest Service and the State of Utah. Allowing off-site mitigation would provide opportunities to offset impacts occurring in GHMA by improving habitat in PHMA. Off-site mitigation could provide a net benefit to GRSG in the planning area, but result in unmitigated impacts on some small populations.

Coal exploration activities would be required to comply with the 3 percent disturbance cap in PHMA (5 percent on National Forest System lands in the Wyoming portions of the planning area). Exploration activities typically disturb minimal acreage and are completed in a short time

period. Under the Proposed Plans, these activities would be conducted outside of sensitive time periods; any facilities associated with exploration activities would be removed before the next season of use; and disturbances would be reclaimed. This would eliminate noise and visual impacts. There are minimal anticipated impacts on populations from exploration activities.

Locatables

SFA would be recommended for withdrawal from locatable mineral entry. The impacts on GRSG from withdrawing lands identified as SFA from the Mining Law of 1872, as amended, would be the same as those described under Alternatives B and C.

In the remainder of PHMA, impacts on GRSG would be similar as those described under Alternative D, except the BLM and Forest Service-Utah would attempt to limit surface disturbance to 3 percent rather than 5 percent (National Forest System lands in the Wyoming portions of the planning area would still be subject to the 5 percent disturbance cap as under Alternative D). In PHMA, the BLM and Forest Service would also work with claimants to include other GRSG conservation measures (e.g., RDFs and restrictions on noise, tall structures, and season of use). These measures would be applied to the maximum extent allowable by law.

In GHMA, impacts on GRSG are expected to be the same as those described under Alternative D, except the BLM would work with claimants and where possible apply lek buffers. Where applied, lek buffers would minimize some impacts of disturbance on lekking, nesting, and brooding habitat.

Mineral Materials

For lands managed according to the BLM and the Forest Service-Utah Proposed Plans, PHMA would be closed to mineral materials sales, but would remain open for free use permits. In addition, operators of existing mines would be allowed to expand existing pits. Development of new free use sites and the expansion of pits would only be allowed if GRSG conservation measures are implemented. PHMA is not closed to mineral material disposal on National Forest System lands in the Wyoming portion of the planning area.

Under the Proposed Plans, the impacts from mineral materials development on GRSG in PHMA are expected to be similar to but less than those analyzed under Alternative D because of the conservation measures, which include lek buffers (unless justifiable departures are present); seasonal, noise, and tall structure restrictions; limitations on the amount (3 percent for the BLM and Forest Service-Utah Proposed Plans and 5 percent for the Forest Service-Wyoming Proposed Plan) and density (one mineral disturbance per 640 acres) of disturbance; and compensatory mitigation resulting in a net conservation gain. Applying these stipulations to any new authorizations would reduce habitat fragmentation and prevent GRSG disruption.

As discussed under the nonenergy leasable and coal sections, any new surface disturbance in GRSG habitat could still result in localized fragmentation and direct loss of some occupied GRSG seasonal habitats, which could result in displacement of GRSG from current use areas. The general effects of fragmentation and habitat loss are discussed in **Section 4.3.2**.

Fluid Minerals (Including Geothermal)

For lands managed according to the BLM and the Forest Service-Utah Proposed Plans, leasing of fluid minerals would be allowed in PHMA, subject to NSO stipulations. In SFA, which cover portions of the Box Elder and Rich Population Areas, there would be no exceptions, waivers, or modifications allowed. In PHMA outside of SFA, no waivers or modifications would be allowed; however, exceptions could be considered on a very limited basis, and only in circumstances where granting an exception would have either have no impacts or would reduce impacts on GRSG. Given strict conditions under which an exception can be granted, it is not expected that the subtle difference between management in SFA and PHMA would have any noticeable impacts on GRSG.

In general, NSO stipulations on new leases would protect PHMA from surface-disturbing activities, ensure that connectivity between leks would be preserved, and not contribute to fragmentation. GRSG would not be exposed to disruption that is often associated with the noise and human activity that accompanies construction, development, or production activities.

In some instances, NSO restrictions placed on federal mineral estate in PHMA could cause operators to develop private, tribal, and State lands in PHMA more heavily. Development on nonfederal lands could potentially occur in important seasonal habitats and disproportionately impact brooding habitat because private lands often have more water and riparian resources than more arid public lands. Closing public lands to fluid mineral leasing, as considered under Alternatives B and C, would offer slightly greater protection to GRSG than the Proposed Plans because it is more likely to deter leasing of State and private lands in PHMA, particularly in areas where there is predominately federal land ownership. In other circumstances, designating federal lands as NSO has been sufficient to discourage development of other lands; thereby providing secondary protection for habitat found on nonfederal lands.

When compared with allocations for PHMA under the other alternatives, the Proposed Plans are slightly less restrictive than Alternatives B or C, but more restrictive than Alternatives A or E. Impacts would be similar to those described under Alternative B because no surface disturbance would be allowed in PHMA.

Under the Proposed Plans, impacts from development of existing leases in PHMA would be very similar to those described under Alternative B. Where possible, development would be located outside of PHMA. If locations outside of PHMA are not possible, to the extent it is consistent with existing lease rights, the BLM and Forest Service would require operators to comply with the suite of GRSG conservation measures included (e.g., application of lek buffers, restrictions on the amount and density of disturbance, seasonal, noise, and tall structure restrictions, and compensatory mitigation resulting in a net conservation gain). These measures vary slightly from those included under Alternative B, but would afford GRSG similar levels of protection.

In GHMA, new leases would continue to be subject to stipulations found in current LUPs. Development of existing leases would be subject to the stipulations that are attached to those leases. As discussed under Alternative A, existing stipulations provide inconsistent levels of protection that in many cases have been found to be inadequate to protect GRSG from significant threats identified in the USFWS listing determination. The impacts of continuing to manage GRSG habitat under the current management is discussed in detail under Alternative A.

During implementation-level planning, in GHMA, conservation measures outlined in MA-GRSG-5 would be applied as COAs to APDs. These measures include placement of lek buffers on energy development, requiring compensatory mitigation that results in a net conservation gain, and consideration of RDFs. With the addition of these requirements, the Proposed Plans would provide more assurance that habitat requirements would be met compared with Alternatives B or D.

Development of fluid mineral resources in GHMA would still result in the localized direct loss and fragmentation of seasonal habitats and displacement of GRSG from current use areas outside of the applicable lek buffers. The general effects of fragmentation, habitat loss, and displacement are discussed in **Section 4.3.2**. Application of lek buffers as required conservation measures or COAs would be sufficient to protect lekking, most nesting, and some brooding and winter habitat; however, nesting, brooding, and winter habitat located outside of the buffer would be afforded no specific protections.

Impacts of development outside the buffer area could be offset by mitigation because operators would be required to mitigate impacts until there is a net conservation gain. However, mitigation may be conducted off-site if it would provide greater benefit to GRSG as a whole in the planning area, thus potentially resulting in unmitigated impacts on local populations in GHMA.

Impacts from the development of new and existing oil and gas leases on GRSG in GHMA are likely to be greatest in the West Tavaputs and Anthro Mountain areas. The PHMA boundaries for these areas include all mapped occupied habitat within 3.1 miles of existing leks. Much of the Anthro Mountain population that was PHMA in Alternative D falls within the 3.1-mile lek buffer. In the small areas that fall outside of PHMA boundary there may be slightly more impacts on GRSG than under Alternative D. The remainder of the GRSG habitat in these areas is GHMA. Given that all of the GHMA falls outside of the 3.1 mile lek buffers, winter habitat that has high development potential on the West Tavaputs Plateau and on Anthro Mountain would only be afforded protection via 1) existing lease stipulations or stipulations included in the existing LUP; 2) COAs identified in previously completed oil and gas development EISs; and 3) potentially, on- or near-location mitigation that may be completed in the area. In West Tavaputs, in particular, there would be more impacts in wintering habitat than under Alternatives D because under Alternative D these areas would be protected to some degree by the 5 percent disturbance cap and NSO restrictions on new leasing. Development density could occur consistent with an existing EIS, which allows one well per 160 acres in most GRSG habitat. As a result, GRSG may avoid using the wintering habitats (Naugle et al. 2011).

Impacts from fluid minerals development would also be expected in GHMA in the Uintah Population Area, and in particular, in GRSG habitat found in the Halfway Hollow, Deadman's Bench and East Bench/Book Cliffs areas. Impacts in these areas would be same as in the West Tavaputs and Anthro Mountain areas; however, habitat loss and displacement in these areas would impact small portions of populations or smaller GRSG populations as these areas are already impacted by various energy-related disturbances and/or have leks that are declining at rates not observed in less-impacted surrounding leks. For South Slope Uintah, due to the lack of

regulatory discretion that the BLM or Forest Service have on resources in this area because of tribal and private lands, impacts on GRSG from oil and gas development are difficult to analyze.

The RFD scenario for the Proposed Plans is nearly identical to Alternative D. The majority of reasonably foreseeable development would occur in the above-mentioned GHMA areas. While the Proposed Plans include additional protection measures for GRSG, the most prominent measure, application of lek buffers, would not substantially alter the expected amount of development because of the limited number of leks in areas that are both GHMA and have high oil and gas potential.

Infrastructure

As discussed under other alternatives, new infrastructure development can occur in conjunction with many different BLM and Forest Service programs including lands and realty, minerals, grazing, travel and transportation management, and recreation. Impacts from minerals, grazing, travel and transportation management, and recreation are discussed in other sections. Therefore, this analysis is primarily focused on the impacts from lands and realty decisions.

Under the Proposed Plans, PHMA would be managed as an avoidance area for ROWs, permits, and leases. In general, this is less restrictive than what was considered under Alternatives B and C because under those alternatives PHMA is designated as an exclusion area.

The effects of the Proposed Plans are similar to Alternative E in that, under that alternative, all SGMAs would be avoidance areas. However, the avoidance criteria included in the Proposed Plans is more specific and restrictive than under Alternative E. Therefore, the impacts would be less than those described under that alternative.

Impacts from infrastructure development under the Proposed Plans would be most similar Alternative D, although there are a number of notable distinctions. In some cases, Alternative D, which excludes portions of PHMA from certain types of infrastructure development, is slightly more restrictive than the Proposed Plans. In other cases, the Proposed Plans are more restrictive because it includes more stringent conservation measures, such as limiting surface disturbance to 3 percent, rather than 5 percent in most areas.

Under the Proposed Plans, new infrastructure development would be subject to the GRSG conservation measures. These conservation measures, which apply to all discretionary actions in PHMA, require a net conservation gain of GRSG habitat; include lek buffers; include seasonal, noise, and tall structure restrictions; limit the amount of disturbance to 3 percent; and minimize opportunities for predation.

In general, these conservation measures, which are based on the best available science, provide various levels of protection in lekking, nesting, early brooding habitat, and wintering habitat within 3.1 miles of leks; minimize and apply compensatory mitigation measures to mitigate the loss and fragmentation of other seasonal habitat; and aim to minimize the effects of disruptions and displacement to GRSG.

Because the Proposed Plans give the BLM and Forest Service the discretion to authorize some lands and realty actions in PHMA when avoidance is not possible, there is potential for localized

impacts on GRSG. In general, those impacts would be the same as those discussed in the Minerals section and include direct loss and fragmentation of seasonal habitats, and displacement of GRSG from current use areas, especially outside of the applicable lek buffers. A more detailed discussion on the effects of specific lands and realty decisions is included below.

Above-Ground Linear and Site Type ROWs

Under the Proposed Plans, tall structures would be avoided in PHMA. Where avoidance is not possible, placement of tall structures would only be allowed under the conditions outlined in the Proposed Plans. As described in the Proposed Plans and in **Appendix F**, tall structures would not be allowed within 2 miles of occupied leks in PHMA. This 2-mile buffer would apply to most site type ROWs, such as communications sites, as well as aboveground transmission lines. Regarding transmission lines, the 2-mile buffer being considered under the Proposed Plans is less restrictive than the 4-mile exclusion buffer considered under Alternative D. However, the 2-mile buffer is more restrictive than the 1-mile buffer considered under Alternative D for site-type ROWs such as communication sites.

Under the Proposed Plans, additional restrictions would be placed on the development of high voltage transmission lines (100 kV or greater). If avoidance of a high voltage line in PHMA is not possible, the line would have to be located in a designated corridor. If location in a designated corridor is not possible, the line would have to be collocated with an existing line, and constructed as close as technically feasible to the existing line to minimize habitat fragmentation. This decision would likely prevent the construction of new cross-county high voltage transmission lines through unfragmented GRSG habitat. Under adaptive management, if a hard trigger is tripped in PHMA outside of corridors, high voltage transmission lines (100 kV or greater) would be excluded; within existing corridors the size of new lines would be limited to the same as existing structures, or not larger than 138 kV. This adaptive management response would help conserve existing sagebrush habitat by limiting fragmentation, which would benefit GRSG and its habitat within the affected PHMA.

Under Alternative A, an existing designated utility corridor was aligned to intersect two major leks in the Panguitch area but currently does not have any power lines in a portion of it. Therefore, to minimize further habitat fragmentation, under the Proposed Plans, the vacant portion of the corridor is being realigned closer to Highway where there are existing power lines. Because of this realignment, if a new transmission line (100 kV or greater) cannot avoid PHMA, which is the principle management approach, the next option would be to locate it in a designated corridor. By placing a potential new line next to an existing power line, there would be less new disturbance and impacts would be concentrated where there is already some disturbance. Where large pipelines could be located in GRSG habitat, application of other conservation measures would minimize the impacts on GRSG and ensure net conservation gain. Under the Proposed Plans, no new ROW corridors would be designated. However, with requirements mentioned above and in MA-GRSG-3, impacts would not be noticeably different from under Alternative D where ROW corridors would be designated.

The general impacts of transmission lines were discussed in detail in **Section 4.3.2**. When placed in landscapes that have limited natural perching opportunities, power lines may provide predator perching/nesting opportunities giving a strategic advantage for avian predators of

GRSG (Steenhof et al. 1993, Atamian et al. 2007). GRSG may be displaced by the introduction of tall structures, especially in areas where GRSG populations have evolved without tall structures as part of their landscape (e.g., trees or rugged terrain) (LeBeau 2012). In addition, GRSG collisions with distribution lines have been document (Beck et al. 2006). The Falcon-Gondor 345 kV line research project initially concluded that nest locations were not affected by the installation of the line but once the study took habitat quality into consideration, nest location and female survival showed the line had a substantial effect (Gibson et al. 2014). Repeated, experimental data is generally lacking to evaluate power lines and transmission lines (Messmer et al. 2013). In lieu of extensive research on the impacts of power lines on GRSG, there are primarily anecdotal reports and observations to rely on. Based on these reports and observations, only neutral to negative effects have been observed (Ellis 1985; Beck et al. 2006; Walker 2007a; LeBeau 2012).

The Proposed Plans would limit but not eliminate tall structures (predator perching/nesting opportunities) from GRSG breeding and nesting habitat. However, power lines placed in PHMA would be subject to tall structure restrictions as described in MA-GRSG-3 as determined on a case-by-case basis.

In GHMA, the BLM and Forest Service would continue to manage lands in accordance with current LUPs. Lands that are open to new ROW placement would remain open. The impacts of continuing to manage GRSG habitat under the current management is discussed in detail under Alternative A.

During implementation level planning, required conservation measures (i.e., net conservation gain, lek buffers, and RDFs) would be added to new ROW authorizations in GHMA. These measures include placement of the above-mentioned 2-mile lek buffer on tall structures, compensatory mitigation that results in a net conservation gain, and consideration of RDFs. With the addition of these requirements, the Proposed Plans would be more restrictive that Alternative D, which considers a 1-mile avoidance buffer and no unmitigated loss of GRSG habitat.

Locating new ROW facilities in GHMA would result in some direct loss and fragmentation of seasonal habitats. Placement of tall structures could displace GRSG from current use areas, especially outside of the applicable lek buffer (2 miles).

Impacts of development outside the 2-mile buffer area could be offset by near-location mitigation because companies would be required to mitigate impacts until there is a net conservation gain. However, mitigation may be conducted off-site if is determined that it would provide greater benefit to GRSG as a whole in the planning area, thus potentially resulting in unmitigated impacts on local populations in GHMA.

Roads and Pipelines

Under the Proposed Plans, PHMA would be an avoidance area for all ROWs, including ROWs for new roads and pipelines. Where avoidance is not possible, roads and pipelines should be aligned in existing ROWs or as near as possible to existing ROWs. Where this is not possible, new roads and pipelines would only be allowed with GRSG conservation measures. Under adaptive management, if a hard trigger is tripped in PHMA outside of designated corridors,

major pipelines (greater than or equal to 24 inch) would be excluded. This response would help conserve existing sagebrush habitat by limiting fragmentation and benefit GRSG and its habitat within the affected PHMA.

As discussed in **Appendix F**, roads (linear features) and pipelines (infrastructure related to energy development) are limited by lek buffers (3.1 mile lek buffer in PHMA for lands managed according to the BLM and the Forest Service-Utah Proposed Plans and 0.6 miles in PHMA and 0.25 miles in GHMA on National Forest System lands in the Wyoming portion of the planning area). When compared to the Alternative D, the Proposed Plans are more restrictive, thus reducing potential impacts on GRSG more than Alternative D. Under Alternative D, PHMA would be designated as ROW avoidance area; however, there would be no lek buffers that provide direct protection for nesting and breeding habitat. In addition, under Alternative D, a greater amount of surface disturbance (5 percent) would be allowed in PHMA in most areas.

Because the Proposed Plans give the BLM and Forest Service the discretion to authorize new road and pipeline ROWs in PHMA in some circumstances (when avoidance is not possible), there is potential for impacts on GRSG. In general, the impacts, which are tied to surface disturbance, are the same as those discussed in the Minerals section, and include direct loss and fragmentation of seasonal habitats, and displacement of GRSG from current use areas, especially outside of the applicable lek buffers. Abiding by timing restrictions would prevent disruption of GRSG during seasons of use. However, authorization of both pipelines and roads could result in localized loss of sagebrush cover, increase opportunities for predation, and increase opportunities for spread of invasive species.

Any impacts caused by placement of new roads or pipelines in PHMA would have to be mitigated. The amount of mitigation would be determined on a case-by-case basis, but must be sufficient to result in a net conservation gain. Application of compensatory mitigation resulting in a net conservation gain should provide for continued persistence of GRSG in PHMA.

As mentioned under other sections, in GHMA, the BLM and Forest Service would continue to manage lands in accordance with current LUPs. Lands that are open to new ROW placement would remain open. During implementation level planning conservation measures would be added to new ROW authorizations in GHMA. These measures include application of lek buffers, RDFs, and requiring mitigation that results in a net conservation gain. With the addition of these requirements, the Proposed Plans would provide more assurance than Alternative D that GRSG habitat needs would be met.

Locating new pipelines and roads in GHMA outside of the lek buffer area would result in some direct loss and fragmentation of seasonal habitats. The long-term disturbance associated with roads would result in the permanent habitat loss, increase opportunities for predation, and increase the number of GRSG and vehicle collisions. Such impacts could be offset by mitigation because ROW holders would be required to mitigate impacts until there is a net conservation gain. However, mitigation may be conducted off-site if it provides greater benefit to GRSG as a whole in the planning area, thus potentially resulting in unmitigated impacts on local populations in GHMA.

Land Tenure Adjustments
Impacts from land tenure adjustments are the same as those described under Alternative D.

Renewable Energy
All PHMA would be designated as exclusion areas for wind energy development on lands managed according to the BLM and the Forest Service-Utah Proposed Plans and avoidance areas on National Forest System lands in the Wyoming portion of the planning area. Within the exclusion areas, this would eliminate direct impacts from potential wind development on GRSG in PHMA. In addition, no wind development would be allowed in GRSG opportunity areas within 5 miles of occupied leks that are within PHMA. Excluding wind development from all areas within 5 miles of occupied leks, regardless of whether the area includes GRSG habitat, would ensure that wind developments outside of PHMA would have no indirect impact on GRSG located in PHMA. The Proposed Plans would offer more protection from wind energy development than under Alternatives B and D because more area would be excluded from wind energy development, extending beyond PHMA.

In Utah, there is a limited amount of GRSG habitat with high wind potential. All of the areas that have high wind potential would be managed as PHMA, therefore it is not anticipated that there will be any wind energy developments in PHMA. In the event that there is proposed wind energy development in GHMA, wind development would be allowed so long as the area is open to renewable energy development in an existing LUP. During the implementation-level planning process, compensatory mitigation measures would be applied. This includes the application of lek buffers (infrastructure related to energy development) and mitigating impacts so that there is a net conservation gain. These measures are more protective then the measures considered in either Alternative B or D.

Fire
Fire management decisions considered under the Proposed Plans are similar to those included under Alternative D; as such, impacts would the same as discussed in **Section 4.3.5**, Alternative D, with the exception of items discussed below.

Table 4.10 shows the modeled habitat trends, including the changes in the percent of the modeled sagebrush in the mid- to late-seral stage. Under the Proposed Plans, modeling indicates that the decadal average for acres of proposed treatment are sufficient to improve or maintain GRSG habitat conditions to meet desired habitat conditions for each population area. Further, the VDDT modeling effort shows the Proposed Plans can maintain trends for sagebrush in the mid- to late-seral class stages better than those described for Alternative A. This is due to including specific vegetation treatment objectives for areas within PHMA, as well as treating adjacent opportunity areas, which would result in increases in available habitat and improved habitat condition, similar to Alternative E1. Additionally, providing an emphasis on fire prevention and preparation of proactive fires lines would result in a smaller loss of habitat.

As discussed in **Section 4.3.1**, information derived from the VDDT model provides valuable information on estimated trends; however, the model also has a number of limitations. It is also important to note that for some areas, the current level of vegetation meeting the 10-30 percent sagebrush cover may be above the long-term dynamic average. For example, if an area

Table 4.10
Sagebrush Condition and Trend Analysis: Comparing Alternatives by Percent of Sagebrush in Mid- or Late-Seral Classes for Population Areas at 10 Years and 50 Years – Alternatives A and the Proposed Plans

Population Area[2]	Percent of Sagebrush in Mid- and Late-Seral Class[1]				
	Current Conditions[3]	10 Years		50 Years	
		Alternative A[3]	Proposed Plans[3]	Alternative A[3]	Proposed Plans[3]
Uintah	84%	77%	80%	67%	73%
Carbon	71%	68%	72%	67%	74%
Emery	54%	51%	55%	62%	70%
Parker Mountain	71%	66%	71%	71%	78%
Panguitch	54%	51%	55%	62%	70%
Bald Hills	54%	51%	55%	62%	70%
Hamlin Valley	77%	72%	74%	55%	71%
Ibapah	77%	72%	74%	55%	71%
Sheeprocks	63%	62%	66%	61%	71%
Box Elder	73%	70%	72%	62%	70%
Rich	84%	77%	80%	67%	73%
Strawberry	71%	68%	72%	67%	74%
Lucerne	84%	77%	80%	67%	73%
Wyoming -Uinta	84%	77%	80%	67%	73%
Wyoming - Blacks Fork	84%	77%	80%	67%	73%

[1]The percentages in this table are not directly comparable to those presented under the other alternatives. For the other alternatives, the BLM and Forest Service VDDT vegetation modeling used a combination of reGAP and LANDFIRE sagebrush inputs and limited the model to occupied GRSG habitat. The Proposed Plans were modeled using LANDFIRE sagebrush inputs, as well as other LANDFIRE vegetation classes that have sagebrush sub-components. Modeling the Proposed Plans also included the entire population areas to capture those areas adjacent to PHMA/GHMA that could ecologically support sagebrush. This included areas that are not currently GRSG habitat, but that, through treatment could meet the vegetation objective of 70 percent of lands capable of supporting sagebrush doing so with 10-30 percent canopy cover. The Proposed Plans were modeled differently to be consistent with modeling efforts being conducted for other GRSG planning efforts in the west. Alternative A was re-modeled similarly to the Proposed Plans to allow comparison and determine change from the effects of existing management.
[2] Trends reflect the combined treatment acres in both BLM and Forest Service Proposed Plans.
[3] Habitat condition percentages are the amount of the modeled area that meets the 10-30 percent sagebrush cover.

has experienced less than its long-term average wildfire rates in recent years, it may have more than its normal amount of mid and late seral sage. A return to normal wildfire burn rates associated with the treatment rates in the Proposed Plans may reduce the percentage of mid and late seral sage, and the percentage in mid to late seral stage will go down. However, the VDDT sagebrush condition and trend analysis indicate that vegetation management in the Proposed Plans will maintain the levels of sagebrush on the landscape needed to provide for GRSG habitats.

In contrast, the VDDT sagebrush condition and trend analysis conducted for Alternatives A through D in the Draft EIS indicated that, despite changes in wildfire management and increases

in the amount of vegetation treatment, at 50 years the percent of sagebrush in the mid- or late-seral class would likely decrease in many population areas.

Given concern over the potential decrease in sagebrush in the mid- or late-seral class, in developing the Proposed Plans, the BLM and Forest Service used VDDT to determine the approximate number of acres that would have to be treated to meet the 70 percent objective in all population areas at 50 years. According to the model, the number of acres of conifer and annual grasses that would have to be treated is the same as what is included in the Proposed Plans. In other words, treating the number of acres included identified in the Proposed Plans should be sufficient to meet the identified GRSG sagebrush habitat objectives. Research indicates that when 50-70 percent of the landscape includes sagebrush, the likelihood of GRSG persistence increases (Aldridge et al. 2008; Wisdom et al. 2011).

Using VDDT the BLM and Forest Service also predicted the percent change in acres of juniper and grasses burned for Alternative B through E. Fire prevention actions considered under Alternative D, which as previously mentioned, are nearly identical to those included in the Proposed Plans, would result in a reduction in the average annual acres of GRSG habitat burned. The average percent change in average annual acres burned predicted under Alternative D is included in **Table 4.8**. Though not specifically modeled, the percent change in acres burned annually under the Proposed Plans would likely be greater (in other words, fewer acres would be burned) than under Alternative D because increasing the amount of conifer and annual grasses treatments would decrease the number of acres burned on an average annual basis.

The Proposed Plans include a 3 percent disturbance cap (5 percent on National Forest System lands in Wyoming) and other measures that would reduce the amount of human activity in PHMA. Decreases in the amount of human activity could reduce the number of human-caused fire starts. Fuels management treatments and post-fire rehabilitation projects in PHMA would focus on maximizing benefits on GRSG habitat using the resistance and resilience concepts in Chambers et al. (2014) coupled with the FIAT assessments. These concepts would reduce impacts from invasive annual grasses and altered fire regimes on the sagebrush ecosystem as well as reduce the rate of conifer encroachment in order to reduce GRSG habitat fragmentation and maintain or re-establish habitat connectivity over the long term and at a landscape scale. Fuelbreaks would also be implemented to better contain wildfires, and during firefighting operations, sagebrush habitat would be protected to the extent possible, as a valuable resource. Under adaptive management, if a hard trigger is tripped in PHMA, fuels management treatments would become top priority in the affected population area.

The Proposed Plans include an adaptive management strategy based on population and habitat triggers for each conservation area. Adaptive management would expand more restrictive management based on specific and measurable triggers relating to habitat and population metrics, for example, grazing may be restricted in areas adjacent to burns in order to restore habitat capable of supporting GRSG. Enhanced monitoring would be conducted in restoration areas under the Proposed Plans. These policies are designed to limit the prevalence of wildfire in sagebrush areas and would reduce damage to GRSG habitat more than current management.

In total, management actions considered under the Proposed Plans would reduce the size and frequency of fires more than any other alternative. Nonetheless, as discussed under Alternative

A, fire is the primary threat to GRSG in the Great Basin region and would likely continue to impact GRSG habitat, especially in arid low elevation areas where there is a cheatgrass-fire cycle. BLM and Forest Service planning decision may not be able to prevent loss or degradation of habitat in these areas or alter existing trends.

Invasive Plant Species

Weeds

Impacts from implementing the 3 percent disturbance cap would be the same as those described under Alternative B on lands managed according to the BLM and the Forest Service-Utah Proposed Plans. On National Forest System lands in the Wyoming portions of the planning area, implementing the 5 percent disturbance cap would produce impacts similar to Alternatives E1 and E2.

Under the Proposed Plans, the BLM and Forest Service would treat the amount of annual grasses identified in the Proposed Plans. Treatment of annual grasses, following RDFs, and aggressive treatment and rehabilitation of areas with weeds would reduce the extent of invasive species in PHMA.

The Proposed Plans include management actions aimed at preventing the establishment and spread of invasive species; however, given the prevalence of certain invasive species, such as cheatgrass, invasive species would continue present a threat to GRSG habitat, especially in the population areas located in the Great Basin, and at lower elevations where there are already cheatgrass dominated landscapes that are prone to wildfire.

Conifer Encroachment

Under the Proposed Plans, impacts would be similar to those described in Alternative D, except the Proposed Plans identify a systematic method to delineate treatment priorities and determine treatment objectives.

Objectives for acres of conifer treatments are identified in the Proposed Plans. Conifer treatment priorities are based on the potential to improve or restore GRSG habitats (e.g., phase 1 or 2 states of encroachment), with specific emphasis on areas near leks, nesting habitats, and brood-rearing habitats. For example, under the Proposed Plans, an emphasis would be placed on reducing conifer within 0.6 miles of a lek to less than 5 percent canopy cover. Reducing the percent of conifer within 0.6 miles of leks could increase lek attendance because studies have shown that GRSG lek attendance is impacted at very low levels of conifer encroachment (Baruch-Mordo et al. 2013).

Based on the vegetation objective for the Proposed Plans, which are based on results of VDDT modeling, the rate of conifer reduction should be equal to or greater than the rate of encroachment. Conifer treatments, in combination with treatment of annual grasses and wildfire prevention and suppression, would give the BLM and Forest Service the ability to maintain a minimum of 70 percent of land capable of producing sagebrush with 10 to 30 percent sagebrush canopy cover. Research indicates that when 50-70 percent of the landscape includes sagebrush, there is a higher likelihood of GRSG persistence (Aldridge et al. 2008; Wisdom et al. 2011). The

Proposed Plan is the only alternative that includes specific quantifiable treatment objectives that are directly linked to the aforementioned 70 percent sagebrush cover objective.

Grazing (Including Wild Horses and Burros)

Impacts from Domestic Livestock Forage Use (Herbivory)
Under the Proposed Plans, PHMA and GHMA would still be available for livestock grazing. Active AUMs for livestock grazing would be the same as under Alternative A.

Generally, impacts from domestic livestock grazing would be similar to those described under Alternative D. Grazing systems in PHMA would be designed to meet BLM Utah Standards for Rangeland Health and achieve GRSG habitat objectives. The Proposed Plans include more specific vegetation objectives than what was included under Alternative D. These objectives are based on the ecology of GRSG population areas within the planning area. In developing these objectives, the BLM and Forest Service started with guidelines included in Connelly et al. 2000 and made adjustments based on local nesting and brood-rearing data that has been collected in conjunction with research projects conducted in Utah. Requiring livestock grazing to meet both land health standards and the GRSG vegetation objectives would reduce the impact of livestock grazing on GRSG habitat.

Under the Proposed Plans, permits/leases in SFA would be prioritized for processing, followed by permits/leases in PHMA outside of SFA. In PHMA, priority would be given to permits/leases for allotments that are not meeting rangeland health standards where livestock grazing is identified as a causal factor, with a focus on those containing riparian resources. Under adaptive management, allotments within PHMA where a soft trigger is tripped would become top priority. Prioritization would help the BLM and Forest Service identify issues that may be associated with improper grazing and implement corrective actions in the areas that have the greatest habitat value.

In addition to the more specific objectives included in the Proposed Plans, when conducting implementation-level NEPA analysis for renewals and modifications of livestock grazing permits/leases, the BLM and Forest Service would be required to identify specific management thresholds based on GRSG habitat objectives and identify responses that would allow the BLM and Forest Service to make adjustments to livestock grazing practices without conducting additional NEPA. This would allow for impacts to be identified and changes in management to be implemented more quickly than under current BLM practices whereby management changes are typically implemented during permit renewal or based on land health determinations. Permits are available for renewal every 10 years. Land health determinations are also generally made on a consistent evaluation cycle, usually every 10 years. Development of implementation-level management thresholds and appropriate responses would give the BLM and Forest Service the ability to expeditiously implement actions needed to reverse negative trends observed during monitoring.

The inclusion of more specific planning-level objectives in the Proposed Plans creates additional parameters that could increase the amount of certainty and improve the level of consistency when considering on the ground actions, such as term permit renewals. Following these more specific planning-level objectives could prevent improper grazing practices. Having more specific

vegetation objectives may, in some cases, improve the quality of habitat and, potentially, decrease opportunities for predation, which in turn should increase nest success and chick survival.

On National Forest System lands in nesting habitat, livestock grazing would be managed to maintain residual grass height by limiting forage use to 7 inches of perennial grass height during the nesting season. In wet meadows and riparian areas, livestock grazing would be managed to retain a 4-inch stubble height in brood rearing and summer habitat. This management direction would benefit GRSG more than Alternative A by increasing hiding cover during nesting and early brood-rearing seasons. Increased hiding cover would likely increase nest success and brood survival.

Monitoring of vegetation objectives would be conducted as discussed in the Greater Sage-Grouse Monitoring Framework (**Appendix C**). As part of the monitoring plan, the BLM and Forest Service would evaluate the effectiveness of vegetation management objectives every 5 years. Monitoring of sagebrush, grasses, and forbs in different seasonal habitats could occur in conjunction with rangeland health evaluations, but may also in conjunction with other monitoring activities.

Impacts on wetlands and riparian areas are similar to those described under Alternative B. The Proposed Plans require the development of specific objectives to conserve, enhance, or restore GRSG habitat based on ESDs and assessments within wetlands and riparian areas. If an effective grazing system that meets GRSG habitat requirements is not already in place, under the Proposed Plans, the BLM and Forest Service would design a grazing program to ensure wetlands and riparian areas are meeting proper functioning condition. To ensure recovery or maintenance of appropriate vegetation and water quality is achieved, where livestock grazing can be shown as the causal factor, similar to Alternative D, the Proposed Plans identify grazing management practices such as fences, herding techniques, or changes in seasonal use or livestock distribution of which mitigate impacts on wetland/riparian vegetation.

Impacts from Wild Horse Forage Use (Herbivory)

Most impacts from wild horse herbivory would be the same as that described under Alternative D. Under the adaptive management strategy, if a hard trigger is tripped in PHMA, an emergency gather could be initiated to reduce wild horse populations. If the population is within AML and the area does not meet GRSG habitat objectives, AML would be reduced up to 25 percent. This response could help facilitate meeting GRSG habitat objectives for the HMA within the affected PHMA.

Impacts from Wild Ungulate Forage Use (Herbivory)

The impacts from wild ungulates would be the same as under Alternative A.

Impacts from Livestock Grazing Program Actions

Impacts from the livestock grazing program actions would be similar to those described under Alternatives B and D. New structural range improvements would only be allowed if they have a neutral effect or conserve, enhance, or restore GRSG habitat.

On lands managed according to the BLM and the Forest Service-Utah Proposed Plans, the BLM and Forest Service would apply a 1.2-mile lek buffer to low structures, which include fences and facilities such as ponds. This is more restrictive that what was considered under Alternatives B or D. Low structures, including range improvements, would not be allowed within 1.2 miles of a lek unless a justifiable departure exists. Variations to the lek buffer distance would require appropriate environmental analysis.

The application of a 1.2-mile lek buffer would avoid adding perching opportunities for potential predators of GRSG and would avoid the addition of the potential for fence collisions. As discussed under Alternative A, research conducted during the GRSG breeding season in Idaho documented that terrain ruggedness and distance from the leks were the primary factors associated with the high fence collision risk (Stevens et al. 2013). In the Rich Population Area, 36 GRSG carcasses were found along a 2-mile stretch of fence within 3 months of the fence being constructed (Call and Maser 1985).

On National Forest System lands in the Wyoming portion of the planning area, a buffer of 0.6 miles in PHMA and 0.25 miles in GHMA would be applied near occupied leks.

Under the Proposed Plans, the BLM and Forest Service would also mark fences in high-risk areas, including new (those allowed because of justifiable departures) and existing fences that are located within 1.2 mile of a lek. In Wyoming, Christiansen (2009) placed fence markers on a portion of fence after 143 GRSG collisions were documented within a two-year timeframe and found that the markers decreased collisions by 70 percent over unmarked fences. More recently, Stevens (2011) conducted research in Idaho GRSG breeding habitat to specifically test the efficacy of fence markers by identifying numerous high fence collision areas and marking them. Results were similar to Christiansen, marking of high-risk fences decreased collision rates, but by 83 percent (Stevens et al. 2012).

Based on the abovementioned information, limiting the number of new fences, removing fences that are no longer necessary, and marking any existing or new fences should limit impacts on GRSG under the Proposed Plans compared with Alternatives B and D.

Impacts from Wild Horse Program Actions

Impacts from wild horse program actions would be the same as that described under Alternative B.

Recreation

Impacts from OHV area designations would be similar to those described under Alternative D. Except, under the Proposed Plan the BLM would continue to manage two small OHV open areas within PHMA (525 total acres) as open to cross-country motorized vehicle travel. Given the size, and location of the OHV open areas and the type of cross-country OHV use occurring, habitat needs for GRSG would still be met; there would be no noticeable impact on GRSG populations.

Under the Proposed Plan implementation-level travel and transportation planning would be completed after completion of this LUPA in accordance with National BLM Travel Management guidance. Route designations would be made specific to travel management needs and seasonal

habitat needs of GRSG. Routes considered unnecessary would be closed while other routes could be designated as limited with seasonal or daily access restrictions. Travel systems would be managed with an emphasis on improving the sustainability of the travel network in a comprehensive manner to minimize impacts on GRSG and maintain motorist safety. Under adaptive management, if a hard trigger is tripped in PHMA, travel management planning would become top priority or designated routes would be re-evaluated and revised if determined to be causing population level impacts. This response could reduce direct and indirect impacts and benefit GRSG within the affected PHMA.

On lands managed according to the BLM and the Forest Service-Utah Proposed Plans, impacts from issuing SRPs and SUAs would be similar to those described under Alternative D with one exception. The BLM and Forest Service would not allow disruptive activities, such as motorized recreation events, within 0.25 miles of occupied leks. On National Forest System lands in the Wyoming portions of the planning area, disruptive activities would not be allowed in all PHMA and within two miles of occupied leks in GHMA. Application of the lek-buffer would provide some protection for GRSG from noise related disruptions.

Habitat Conversion for Agriculture and Urbanization

Under the Proposed Plans, management would be similar to Alternative B, except that slightly more acres of GRSG habitat would be designated as PHMA, and potential land tenure adjustments would emphasize that it must be a net conservation gain for GRSG. Retaining PHMA in federal ownership unless disposal would result in an overall net conservation gain for GRSG would limit conversion of habitat currently in federal ownership for agriculture and urbanization.

ACEC Designations

No special management areas would be designated to provide protection for GRSG under the Proposed Plans. Any incidental protections provided to GRSG by current ACEC management would continue to occur as described under Alternative A.

4.4 AIR QUALITY

4.4.1 Methods and Assumptions

Air quality has been identified as a resource that would primarily have indirect, beneficial impacts from the implementation of most GRSG conservation measures. As such, this section focuses mainly on describing the nature and type of beneficial impacts that would result from implementing each of the alternatives being considered. In some cases, GRSG conservation measures may have an indirect, adverse impact on air quality; these impacts are also discussed.

Implementing management for the protection of GRSG generally involves reducing or otherwise restricting land uses and activities that generate air pollutants. Actions that emit air pollutants can result in negative effects on air resources, including increased concentrations of air pollutants, decreased visibility, increased atmospheric nitrogen and sulfur deposition on soils and vegetation, and acidification of sensitive water bodies.

Livestock grazing, travel, mineral extraction, wildland fires, and construction activities within ROW grants have all been identified as actions that generate pollutants that affect air quality.

Protecting areas from these activities for the purpose of protecting GRSG would also protect air quality from an increase in particulates, decreased visibility, and increased deposition. Whether these activities are allowed and the degree to which these activities would occur constitute the indicators used in this analysis. These indicators are listed below.

Indicators

Indicators of impacts on air quality are as follows:

- Increase or decrease in livestock grazing AUMs and associated support activities such as trucking, trailering, and construction of new or maintenance of range improvements
- Acres closed to fluid mineral leasing
- Acres found unsuitable for surface coal mining
- A substantial change in the likelihood or severity of wildland fire (based on level of restrictions on uses that may introduce sources of ignition)
- Acres managed as ROW exclusion areas

Assumptions

In addition to the assumptions in **Section 4.2.1**, this analysis includes the following assumptions:

- Air resource impacts can be localized or regional.
- Weather-related events and wildfires may cause or contribute to local or regional air resource impacts.

4.4.2 Alternatives Analysis

All of the action alternatives and the Proposed Plans would result in restrictions on activities that emit air pollutants as compared with the continuation of existing management under Alternative A. These restrictions include such measures as reductions in acres available for livestock grazing, closure of areas to solid and fluid mineral leasing and development, and management of ROW exclusion areas. Alternative C places the greatest level of restrictions on actions that would emit air pollutants compared with the other alternatives, and consequently could be expected to have the smallest impact on air quality. Alternative C identifies all mapped occupied habitat as PHMA and limits many uses in that area. Under Alternative C, no air pollutant-emitting actions associated with fluid mineral development, solid mineral development (i.e., coal, nonenergy leasables, and mineral materials disposal), utility corridor development, or other ROW development would occur. The same would be true under Alternative C1 for livestock grazing, as livestock grazing would be prohibited in all mapped occupied habitat. In addition, under Alternative C, a portion of mapped occupied habitat on BLM-administered lands would be closed to OHV travel, reducing the presence of fugitive dust and exhaust emissions in those areas. Alternative B also greatly restricts air pollution-generating actions, but not to the same degree as Alternative C. Alternative E would have the fewest restrictions of the action alternatives. The Proposed Plans would have similar restrictions to those under Alternative D, particularly in PHMA. Generally, there would be fewer restrictions in GHMA under the Proposed Plans than under Alternative D. The Proposed Plans would have greater restrictions

than under Alternative E, and fewer restrictions than under Alternatives B and C. Indirect impacts on air quality under the Proposed Plans would consequently be greater than those under Alternative C and B but less than under Alternative E. Differences across alternatives in the number of AUMs, the number of acres closed to fluid mineral leasing, the number of acres closed to road construction, the number of acres identified as unsuitable for coal mining, and the number of acres in ROW exclusion areas are displayed in **Table 2.3**, and provide a quantitative basis for an analysis of how impacts on air quality may vary across alternatives.

While many GRSG conservation measures would have an indirect, beneficial impact on air quality as described above, some measures would have indirect, adverse effects. Under Alternatives B, C, and D, and the Proposed Plans, the BLM would increase ROW exclusion and avoidance areas compared with Alternative A, including the removal of some existing ROWs and the prohibition of new ROWs in some areas. Within oil and gas development areas such as the Uinta Basin, limiting ROWs would limit the development of power lines needed to run production equipment. Absent a source of electricity, new and existing well equipment would continue to be powered by natural gas- and diesel-fired compressors and generators. Under Alternative A, operators have been encouraged to develop ROWs for power lines in order to reduce the number of natural gas- and diesel-fired compressors and generators that operate in the Uinta Basin in order to improve air quality. Alternatives B, C, and D, and the Proposed Plans would limit the ability to achieve these improvements compared with Alternative A.

Restrictions on mineral material development under Alternatives B, C, and D, and the Proposed Plans would also have indirect adverse effects on air quality to the extent that construction materials such as sand and gravel could not be sourced close to a construction site, resulting in increased fugitive dust and exhaust-related emissions from longer haul distances.

4.5 CLIMATE CHANGE

4.5.1 Methods and Assumptions

Indicators

The indicator of impacts on climate change is changes in GHG emissions.

The indicator of impacts on GRSG from climate change is changes in climate trends and changes in ecological conditions due to changes in climate.

Assumptions

In addition to the assumptions in **Section 4.2.1**, this analysis includes the assumption that there is a correlation between global concentrations of GHGs and climate change.

4.5.2 Alternatives Analysis

Effects of Greater Sage-Grouse Management Decisions on Climate Change

All of the action alternatives would result in greater restrictions on activities that emit GHGs as compared with the continuation of existing management under Alternative A, including such measures as reductions in acres available for livestock grazing (Alternative C), management of ROW exclusion and avoidance areas, and closure or restrictions on mineral leasing and

development. Alternative B and Alternative C tend to place greater restrictions on actions that would generate GHGs than the other alternatives, and consequently could be expected to have the smallest impact on climate change. The Proposed Plans also greatly restricts GHG generating actions, but to a slightly lesser extent than Alternatives B or Alternative C. Differences across alternatives in the number of acres closed to fluid mineral leasing, the number of acres closed to OHV travel, the number of acres identified as unsuitable for coal mining, and the number of acres in ROW exclusion areas are displayed in **Table 2.3** and provide a quantitative basis for an analysis of how impacts on climate change may vary across alternatives. In addition to limiting activities that would reduce GHG emissions, each alternative would seek to limit the encroachment of pinyon-juniper into mapped GRSG habitat. Woodlands tend to store more carbon due to greater aboveground biomass and greater total root biomass (Pinno and Wilson 2011). Due to this, a conversion of habitat type from woodland to shrubland could result in a decrease in carbon-storage capacity. The Proposed Plans would have the greatest potential to effect this change, as this alternative would emphasize removal of encroaching pinyon-juniper to a greater extent than the other alternatives that seek to limit encroachment. Alternative E also focuses on removal of encroaching pinyon-juniper to a greater extent but with slightly less acres treated. Alternative C would have the least potential to effect climate change because an emphasis would be placed on passive restoration rather than active restoration.

Effects of Climate Change on Greater Sage-Grouse

Sagebrush remains one of the vegetation communities most vulnerable to climate change. In habitat areas that are expected to be most impacted by climate change, an estimated 12 percent of the current distribution of sagebrush would be lost with each 1°C increase in temperature (Bryce et al. 2012). Climate change models predict that semi-arid regions will experience more severe weather events, higher temperatures, drier summer soils conditions, and wetter winters in the future. These shifts in precipitation, soil conditions, and temperature may impact sagebrush communities and affect when and where sagebrush is able to thrive (Connelly et al. 2004).

Climate change also increases the likelihood of erosion, wildfire, and the encroachment of invasive plants, all of which would negatively impact sagebrush habitat. Soil erosion in particular is a concern, as it is considered the greatest threat to shrubland sustainability (Society for Range Management 1995). Additionally, habitat encroachment will be a concern as vegetation communities shift upwards in elevation in response to the warmer climate. This can cause habitat fragmentation, which would have detrimental effects on GRSG populations. It is anticipated that climate change may interact with other change agents in the future to degrade and reduce GRSG habitat (Bryce et al. 2012).

The long-term potential for climate change to affect GRSG in the Colorado Plateau Ecoregion was mapped in the Central Basin and Range Rapid Ecoregional Assessment (BLM 2012a). The population areas in the Colorado Plateau ecoregion with the greatest potential to be impacted by climate change are the Uintah, Strawberry, and Carbon Population Areas. The potential impact would primarily be an increase in pinyon-juniper invasion of existing sagebrush communities. This would result in the degradation of existing habitat. Potential acres in each alternative that could be affected are shown in **Table 4.11**. Potential impact is expected to be mitigated to some extent by GRSG habitat restoration treatments, such as those that conducted

Table 4.11
Potential for Future Climate Change in the Colorado Plateau Ecoregion (Long-Term) and Habitat Alignment by Alternative

Population Area	Climate Change Class	Alternative A	Alternative B		Alternative C	Alternative D		Alternative E		Proposed Plans	
		Acres in Mapped Occupied Habitat	Acres in PHMA	Acres in GHMA	Acres in PHMA *(all mapped occupied habitat)*	Acres in PHMA	Acres in GHMA	Acres in GRSG Habitat in SGMAs/ Core Areas	Acres in GRSG Habitat outside of SGMAs/ Noncore Areas	Acres in PHMA	Acres in GHMA
Carbon	Very High	28,333	27,864	468	28,333	28,309	24	22,789	5,544	27,965	651
	Moderately High	0	0	0	0	0	0	0	0	0	0
	Moderate	182,501	164,606	17,896	182,501	167,366	15,136	56,658	125,843	108,975	75,716
	Moderately Low	77,042	35,759	41,282	77,042	46,858	30,184	36,987	40,055	39,514	37,808
	Very Low	0	0	0	0	0	0	0	0	0	0
Emery	Very High	15,273	14,302	972	15,273	14,302	972	14,302	972	14,812	971
	Moderately High	598	598		598	598	0	598	598	0	597
	Moderate	36,768	34,930	1,838	36,768	34,930	1,838	34,930	2,084	34,869	2,077
	Moderately Low	40,380	34,351	6,029	40,380	34,351	6,029	34,351	6,029	34,364	6,024
	Very Low		0	0	0	0	0	0	0	0	0
Panguitch	Very High	2,431	2,431	0	2,431	0	2,431	0	0	2,430	0
	Moderately High	3,635	3,635	0	3,635	0	3,635	3,635	0	3,634	0
	Moderate	24,046	24,046	0	24,046	0	24,046	24,046	0	24,050	0
	Moderately Low	5	5	0	5	0	5	5	0	5	0
	Very Low	0	0	0	0	0	0	0	0	0	0

Table 4.11
Potential for Future Climate Change in the Colorado Plateau Ecoregion (Long-Term) and Habitat Alignment by Alternative

Population Area	Climate Change Class	Alternative A	Alternative B		Alternative C	Alternative D		Alternative E		Proposed Plans	
		Acres in Mapped Occupied Habitat	Acres in PHMA	Acres in GHMA	Acres in PHMA *(all mapped occupied habitat)*	Acres in PHMA	Acres in GHMA	Acres in GRSG Habitat in SGMAs/ Core Areas	Acres in GRSG Habitat outside of SGMAs/ Noncore Areas	Acres in PHMA	Acres in GHMA
Parker	Very High	15,746	15,746	0	15,746	15,746	0	15,746	0	15,736	0
	Moderately High	5,391	5,391	0	5,391	5,391	0	5,391	0	5,387	0
	Moderate	135,402	135,402	0	135,402	135,402	0	134,167	0	134,082	0
	Moderately Low	5,043	5,043	0	5,043	5,043	0	5,043	0	5,040	0
	Very Low	0	0	0	0	0	0	0	0	0	0
Strawberry	Very High	53	0	53	53	0	53		53	0	53
	Moderately High	0	0	0	0	0	0	0	0	0	0
	Moderate	24,216	24,216	0	24,216	24,216	0	24,214	2	24,197	0
	Moderately Low	16,419	15,998	422	16,419	15,998	422	15,996	423	16,708	421
	Very Low	0	0	0	0	0	0	0	0	0	0
Uintah	Very High	74,616	64,708	9,907	74,616	64,708	9,907	64,701	9,915	64,721	9,903
	Moderately High	0	0	0	0	0	0	0	0	0	0
	Moderate	93,367	9,732	83,635	93,367	9,732	83,635	9,732	83,635	9,727	83,595
	Moderately Low	509,806	240,526	269,280	509,806	240,526	269,280	230,492	279,314	231,401	279,159
	Very Low	64,112	60,870	3,242	64,112	60,870	3,242	60,865	3,247	60,955	3,241

Source: BLM 2012a

by the Utah Watershed Restoration Initiative. In the Proposed Plans, Vegetation Objective VEG-1, the desired condition is to maintain a minimum of 70 percent of lands capable of producing sagebrush with 10 to 30 percent sagebrush canopy cover in all SFA and PHMA. While all alternatives allow for restoration of GRSG habitat, the Proposed Plans and Alternative E place the most emphasis on restoration. Both alternatives include mapped opportunity areas and quantitative objectives for the number of acres treated annually; however, the Proposed Plans conduct slightly more vegetation treatments resulting in greater opportunity to reach objective. On the other hand, Alternative C places greater emphasis on passive restoration, which would be less effective at mitigating juniper encroachment. All alternatives consider similar management actions regarding fire and fuels management and invasive plant species. Implementation of management actions would not necessarily result in notable changes in on the ground conditions because protection of sagebrush habitats and weed treatments are already a BLM and Forest Service priority.

Impacts of vegetation (including invasive species) and fire management on GRSG are discussed in **Section 4.3**.

The changes in climate in the Central Basin and Range ecoregion are projected to have the greatest potential impact on GRSG habitat in the northwest and southwest areas of Utah and cause a contraction of GRSG habitat throughout much of that portion of the Central Basin and Range ecoregion, as shown in **Map 3.5-1.** The impacts would occur primarily from fire and invasive species, predominately cheatgrass, in conjunction with climate change. This would occur because of the larger and more frequent occurrence of wildfires that have very high potential to reduce habitat quality and quantity of sagebrush communities. GRSG habitat in entire population areas could be lost, at least temporarily in a single event because of the vulnerability of sagebrush communities to wildfire and invasive species. It is difficult to quantify the impacts because of the uncertainty of site-specific fire occurrence and the influence of climate conditions. Impacts could be partially mitigated by management actions such restoration treatments and creation of fuelbreaks. Mapped GRSG habitat for each alternative that could be affected is shown in **Table 4.12**. The other potential impact associated with climate change in the Central Basin and Range and Northern Great Basin ecoregions would be an increase in pinyon-juniper invasion of existing sagebrush communities in the northwest and southwest areas of Utah, which, as in the Colorado Plateau ecoregion area, would result in the degradation of existing occupied habitat. However, the potential impact would be mitigated by GRSG habitat restoration treatments as priority treatment areas for the Utah Watershed Restoration Initiative, which is being done very proactively in the Central Basin and Range and Northern Great Basin ecoregions.

The compilation of climate change information from all sources for the Utah Sub-region planning area, primarily from the Colorado Plateau and Central Basin and Range Ecoregional Assessments, indicate a moderate to moderately low potential impact on GRSG habitat, with the exception of the Bald Hills and Sheeprocks Population Areas where 70 percent or more of the areas are predicted to be impacted by climate change (see **Table 4.11** and **Table 4.12**). Existing rapid ecoregional assessment data indicate that the Rich and Parker Mountain Population Areas could also impacted by climate change; however, existing data do not provide

Table 4.12
GRSG Occupied and Climate Space Trends (Long-Term) in the Central Great Basin Ecoregion by Habitat Alignments

Population Area	Climate Change Class	Alternative A	Alternative B		Alternative C	Alternative D		Alternative E		Proposed Plans	
		Acres in Decision Area	Acres in PHMA	Acres in GHMA	Acres in PHMA *(all occupied habitat)*	Acres in PHMA	Acres in GHMA	Acres in GRSG Habitat in SGMAs/ Core Areas	Acres in GRSG Habitat outside of SGMAs/ Noncore Areas	Acres in PHMA	Acres in GHMA
Bald Hills	0.0-0.3	106,286	100,575	5,711	102	100,575	5,711	133,562	2,771	103,474	3,773
	0.31-0.6	65,200	61,110	4,090	53	61,110	4,090	80,947	1,470	62,031	4,090
	0.61-1.0	102,568	100,139	2,430	92	100,139	2,430	128,307	244	99,344	1,659
Box Elder	0.0-0.3	131,714	119,236	12,476	227	126,581	5,131	290,040	3,679	145,620	0
	0.31-0.6	145,390	124,801	20,585	266	137,877	7,511	334,774	1,896	157,444	0
	0.61-1.0	160,755	130,592	30,062	253	158,197	2,457	332,142	5,024	166,806	0
Carbon	0.0-0.3	19	0	19	1	0	19	0	150	0	19
	0.31-0.6	4	0	4	1	0	4	0	4	0	4
	0.61-1.0	210	0	210	1	0	210	0	1,522	0	209
Hamlin Valley	0.0-0.3	34,389	34,389	0	44	34,389	0	50,061	2	38,313	0
	0.31-0.6	26,431	26,431	0	31	26,431	0	31,625	0	22,590	0
	0.61-1.0	46,652	46,652	0	56	46,652	0	61,426	1	47,117	0
Ibapah	0.0-0.3	12,263	10,553	1,711	12	10,553	1,711	16,300	1,717	11,347	1,712
	0.31-0.6	17,280	14,843	2,437	19	14,843	2,437	17,397	3,123	14,855	2,439
	0.61-1.0	28,145	22,242	5,904	18	22,242	5,904	32,851	5,955	22,578	5,909
Panguitch	0.0-0.3	11,410	11,410	0	15	11,410	0	13,083	0	13,009	0
	0.31-0.6	14,841	14,841	0	15	14,841	0	18,174	0	13,623	0
	0.61-1.0	15,655	15,366	0	36	15,366	0	19,434	0	11,993	0
Parker	0.0-0.3	1,808	1,673	135	12	0	135	992	2,734	364	135
	0.31-0.6	3,478	140	3,338	12	0	3,338	1,072	5,061	117	2,416
	0.61-1.0	1,286	1,024	263	8	0	263	147	8,292	1,023	263
Rich	0.0-0.3	14,254	13,824	430	65	13,824	430	32,347	13,098	24,145	1,418
	0.31-0.6	6,537	5,950	587	33	5,950	587	11,385	5,859	10,979	772
	0.61-1.0	6,175	4,624	1,551	27	4,624	1,551	6,225	21,271	6,214	3,834
Sheeprocks	0.0-0.3	183,222	165,332	17,890	251	141,450	41,773	177,206	97,238	155,703	41,784
	0.31-0.6	117,875	102,976	14,837	180	82,892	34,921	110,861	81,104	80,028	34,510
	0.61-1.0	255,319	221,154	34,143	357	203,449	51,848	247,382	119,815	201,789	51,670

Source: BLM 2012b

enough coverage of these areas to draw any analysis conclusions. Impacts could range from total loss of suitable habitat to reduced population size and resiliency due to changes in habitat conditions unless mitigation is applied.

Given the uncertainties associated with the impact of climate change on sagebrush habitats, as well as potential threats for fire, invasive species, and development activities in or near sagebrush ecosystems, management actions that increase and enhance the number, quality, and connectivity of sagebrush habitats, while limiting fragmentation from anthropogenic sources, will be particularly important for maintaining viable GRSG populations. The uncertainty of climate projections result from the imperfect knowledge of initial conditions such as sea surface temperatures that are difficult to measure; the levels of future anthropogenic emissions, which are unknowable since they are dependent on current and future political decisions and social choices and not on physical laws of nature; and general system behavior (such as clouds and ice sheet melt) that continues to be the subject of basic climate research and that constitutes the "known unknowns" of the climate system (Bryce et al. 2012). However, even with the uncertainty associated with the climate models and projections, the climate change assessment does provide valuable information to assess climate trends and potential effects that will assist identifying areas and possible mitigation actions for further management consideration.

The resiliency of vegetative communities and their ecological condition and associated habitat quality as discussed in **Chapter 3** as intactness has the potential to be affected by both climate change and anthropogenic disturbances. Intactness classes for each population area and habitat management areas by alternatives are shown in **Table 4.13** for the Colorado Plateau Ecoregion and **Table 4.14** for the Central Basin and Range Ecoregion. Data from the two ecoregional assessments indicate very little change in intactness in the Central Basin and Range Ecoregion and a slight downward trend in intactness in the Colorado Plateau Ecoregion in population areas from climate change and anthropogenic disturbances such as oil and gas development, road construction, transmission lines and livestock grazing (see **Figure 4.1**). However, the potential impacts would be mostly mitigated by the use of identified RDFs, stipulations, and the management prescriptions identified in each alternative, except for the impacts from climate change, which will only be partially mitigated because of the nature of climate change and its uncertainty.

The intactness information by alternatives as displayed in **Table 4.13** and **Table 4.14** indicate very little difference in the amount of intact GRSG habitat and potential gain or loss of habitat, especially mapped GRSG habitat in SGMAs/core areas, except for Alternatives C and E and the Proposed Plans. Alternative C would provide the greatest amount of intact PHMA because of the very restrictive prescriptions for use and development and the amount of acres closed to development and use. However, the greatest potential for expansion of intact habitat would be under Alternative E and the Proposed Plan due to the emphasis placed on improving or expanding GRSG habitat. This is most apparent in the Central Basin and Range as shown in **Table 4.14**. The greater number of intact acres of mapped GRSG habitat is a result of the broad boundaries of the SGMAs and the inclusion of unoccupied habitat, but more importantly the inclusion of opportunity areas, which would expand GRSG habitat through implementation of restoration treatments identified in the alternative. The threat of fire has the greatest

Table 4.13
GRSG Occupied Habitat and Ecological Integrity in the Colorado Plateau Ecoregion by Habitat Alignments

Population Area	Ecological Intactness Class	Alternative A	Alternative B		Alternative C	Alternative D		Alternative E		Proposed Plans	
		Acres in Decision Area	Acres in PHMA	Acres in GHMA	Acres in PHMA *(all occupied habitat)*	Acres in PHMA	Acres in GHMA	Acres in GRSG Habitat in SGMAs/ Core Areas	Acres in GRSG Habitat outside of SGMAs/ Noncore Areas	Acres in PHMA	Acres in GHMA
Carbon	Very High	3,280	0	3,272	3,272	0	3,280	0	3,272	0	3,270
	High	84,980	33,354	18,013	51,367	70,028	14,952	37,263	14,104	37,235	14,093
	Mod High	127,221	76,900	15,403	92,303	113,931	13,290	54,694	37,610	60,820	32,174
	Mod Low	135,266	85,481	17,424	102,906	117,050	18,216	23,988	78,918	58,817	45,802
	Low	43,233	29,533	5,534	35,067	37,109	6,125	491	34,576	18,147	17,316
	Very Low	3,111	2,961	0	2,961	3,111	0	0	2,961	1,447	1,519
Panguitch	Very High	6,786	5,564	0	5,564	0	6,786	5,564	0	5,563	0
	High	9,889	6,950	0	6,950	0	9,889	6,950	0	6,957	0
	Mod High	21,238	15,515	0	15,515	0	21,238	15,515	0	15,512	0
	Mod Low	2,797	2,021	0	2,021	0	2,797	2,021	0	2,020	0
	Low	81	64	0	64	0	81	64	0	64	0
	Very Low	0	0	0	0	0	0	0	0	05	0
Emery	Very High	0	0	0	0	0	0	0	0	0	0
	High	10,328	8,680	1,644	10,325	8,680	6,164	8,443	1,882	8,436	1,880
	Mod High	22,016	17,028	4,063	21,091	17,028	4,063	17,028	4,063	17,014	4,060
	Mod Low	59,736	54,685	2,836	57,521	54,685	2,836	54,079	3,442	54,809	3,433
	Low	4,117	3,787	296	4,083	3,787	296	3,787	296	3,784	295
	Very Low	0	0	0	0	0	0	0	0	0	0
Uintah	Very High	254,038	14,537	95,001	109,538	14,537	95,001	14,148	95,390	14,146	95,363
	High	229,099	61,578	70,588	132,166	61,578	70,588	56,946	75,220	57,021	75,195
	Mod High	420,427	142,417	83,022	225,439	142,417	83,022	139,249	86,189	140,228	86,099
	Mod Low	471,802	118,553	99,358	217,911	118,553	99,358	116,704	101,208	116,669	101,156
	Low	119,538	37,174	15,279	52,453	37,174	15,279	37,166	15,287	37,165	15,271
	Very Low	17,391	1,575	2,817	4,391	1,575	2,817	1,574	2,817	1,575	2,815
Strawberry	Very High	4,694	0	0	0	0	0	0	0	0	0
	High	52,034	0	3,358	3,358	0	3,358	3,358	0	3,356	0
	Mod High	63,306	307	21,467	21,774	307	21,467	21,467	307	21,995	307
	Mod Low	61,449	168	15,389	15,557	168	15,389	15,385	172	15,555	168
	Low	2	0	0	0	0	0	0	0	0	0
	Very Low	0	0	0	0	0	0	0	0	0	0

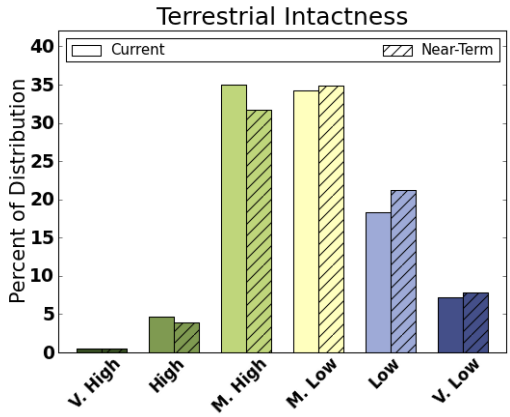
Table 4.13
GRSG Occupied Habitat and Ecological Integrity in the Colorado Plateau Ecoregion by Habitat Alignments

Population Area	Ecological Intactness Class	Alternative A	Alternative B		Alternative C	Alternative D		Alternative E		Proposed Plans	
		Acres in Decision Area	Acres in PHMA	Acres in GHMA	Acres in PHMA *(all occupied habitat)*	Acres in PHMA	Acres in GHMA	Acres in GRSG Habitat in SGMAs/ Core Areas	Acres in GRSG Habitat outside of SGMAs/ Noncore Areas	Acres in PHMA	Acres in GHMA
Parker	Very High	24,872	20,301	0	20,301	20,301	0	19,589	0	19,572	0
	High	76,058	62,310	0	62,310	62,310	0	62,223	0	62,185	0
	Mod High	44,658	38,589	0	38,589	38,589	0	38,152	0	38,124	0
	Mod Low	58,083	39,566	0	39,566	39,566	0	39,566	0	39,540	0
	Low	784	784	0	784	784	0	784	0	784	0
	Very Low	31	31	0	31	31	0	31	0	31	0

Table 4.14
GRSG Occupied Habitat and Landscape Condition Class in the Central Great Basin Ecoregion by Habitat Alignments

Population Area	Landscape Condition Class	Alternative A	Alternative B		Alternative C	Alternative D		Alternative E		Proposed Plans	
		Acres in Decision Area	Acres in PHMA	Acres in GHMA	Acres in PHMA *(all occupied habitat)*	Acres in PHMA	Acres in GHMA	Acres in GRSG Habitat in SGMAs/ Core Areas	Acres in GRSG Habitat outside of SGMAs/ Noncore Areas	Acres in PHMA	Acres in GHMA
Bald Hills	0.0 - 0.3	106,286	100,575	5,711	106,286	100,575	5,711	133,562	2,771	103,474	3,773
	0.31 - 0.6	65,200	61,110	4,090	65,200	61,110	4,090	80,947	1,470	62,031	4,090
	0.61 - 1.0	102,568	100,139	2,430	102,568	100,139	2,430	128,307	244	99,344	1,659
Box Elder	0.0 - 0.3	131,714	119,236	12,476	131,714	126,581	5,131	290,040	3,679	147,092	0
	0.31 - 0.6	145,390	124,801	20,585	145,390	137,877	7,511	334,774	1,896	159,450	0
	0.61 - 1.0	160,755	130,592	30,062	160,755	158,197	2,457	332,142	5,024	167,918	0
Carbon	0.0 - 0.3	19	0	19	19	0	19	0	150	0	19
	0.31 - 0.6	4	0	4	4	0	4	0	4	0	4
	0.61 - 1.0	210	0	210	210	0	210	0	1,522	0	209
Hamlin Valley	0.0 - 0.3	34,389	34,389	0	34,389	34,389	0	50,061	2	38,313	0
	0.31 - 0.6	26,431	26,431	0	26,431	26,431	0	31,625	0	22,590	0
	0.61 - 1.0	46,652	46,652	0	46,652	46,652	0	61,426	1	47,117	0
Ibapah	0.0 - 0.3	12,263	10,553	1,711	12,263	10,553	1,711	16,300	1,717	11,347	1,712
	0.31 - 0.6	17,280	14,843	2,437	17,280	14,843	2,437	17,397	3,123	14,855	2,439
	0.61 - 1.0	28,145	22,242	5,904	28,145	22,242	5,904	32,851	5,955	22,578	5,909
Panguitch	0.0 - 0.3	11,410	11,410	0	11,410	11,410	0	13,083	0	13,755	0
	0.31 - 0.6	14,841	14,841	0	14,841	14,841	0	18,174	0	14,292	0
	0.61 - 1.0	15,655	15,366	0	15,655	15,366	0	19,434	0	14,077	0
Parker	0.0 - 0.3	1,808	1,673	135	1,808	0	135	992	2,734	1,631	135
	0.31 - 0.6	3,478	140	3,338	3,478	0	3,338	1,072	5,061	117	3,335
	0.61 - 1.0	1,286	1,024	263	1,286	0	263	147	8,292	1,023	263
Rich	0.0 - 0.3	14,254	13,824	430	14,254	13,824	430	32,347	13,098	25,412	1,423
	0.31 - 0.6	6,537	5,950	587	6,537	5,950	587	11,385	5,859	11,706	772
	0.61 - 1.0	6,175	4,624	1,551	6,175	4,624	1,551	6,225	21,271	6,637	3,835
Sheeprocks	0.0 - 0.3	183,222	165,332	17,890	183,222	141,450	41,773	177,206	97,238	155,703	42,576
	0.31 - 0.6	117,875	102,976	14,837	117,875	82,892	34,921	110,861	81,104	80,028	34,510
	0.61 - 1.0	255,319	221,154	34,143	255,319	203,449	51,848	247,382	119,815	201,789	52,823

Figure 4.1
Colorado Plateau Ecoregion



potential to reduce the number of intact GRSG habitat because of the unpredictable and uncontrollable nature of wildland fire. However, the conservation measures identified in the alternatives would minimize the potential loss of intact habitat and, under Alternative E, would increase the acres of intact habitat if the prescribed conservation measures and mitigation are implemented.

4.6 SOIL RESOURCES

4.6.1 Methods and Assumptions

Soils have been identified as a resource that would have only beneficial impacts from the implementation of GRSG conservation measures. As such, this section focuses on qualitatively describing the nature and type of beneficial impacts that would result from implementing the action alternatives, Alternatives B through E, and the Proposed Plans. The analysis is focused on the effects of the action alternatives on sensitive soils within the population areas, the acreages of which are provided in the Soil Resources section of **Chapter 3**.

Indicators

Indicators of impacts on soil resources are as follows:

- Acres of land added to or removed from specific grazing practices
- Acres of land protected from or open to surface-disturbing activities
- Increases or decreases in vegetation treatments, prescribed burns, and potential for wildfire, which can decrease infiltration and increase erosion

Assumptions

This analysis is based on the assumptions in **Section 4.2.1**.

4.6.2 Alternatives Analysis

Activities that disturb, compact, contaminate, or remove vegetation from soils are generally considered to negatively affect soil health. In some cases, soil compaction aids in plant

establishment and growth. However, too much compaction decreases water infiltration rates and gas exchange rates. Decreased gas exchange rates can cause aeration problems, induce nitrogen and potassium deficiency, and negatively impact root development, which is a key component of soil stabilization. As soil compaction increases, the soil's ability to support vegetation diminishes because the resulting increase in soil strength and change in soil structure (loss of porosity) inhibit root system growth and reduce water infiltration. As vegetative cover, water infiltration, and soil stabilizing crusts are diminished or disrupted, the surface water runoff rates increase, further accelerating rates of soil erosion.

Impacts on soil resources can result from a number of causes, including improper livestock grazing practices, recreation, mineral resource activities, renewable energy development, and road construction. The intensity and extent of impacts on soil resources are determined in part by the type and location of the surface-disturbing activities and surface occupancy. Impacts on soil resources can also be affected by any applicable stipulations and plans of operations that address site-specific environmental concerns and require mitigation to stabilize soil, to prevent unnecessary erosion, and to revegetate disturbed surfaces. Impacts on soil resources can be mitigated by avoiding or minimizing the impact. This can be done by managing certain lands as closed or unavailable for surface-disturbing activities, or by restricting the activity by managing certain lands as ROW avoidance areas or attaching such stipulations as NSO or CSU to fluid minerals leases. Impacts that cannot be avoided can be minimized through project design and the application of COAs and BMPs. In addition, to protect GRSG, disturbance cap requirements and the application of lek buffers can locally eliminate impacts from disturbance. However, there could be impacts elsewhere if the disturbance is pushed to another location to minimize impacts on GRSG.

Grazing activities alter vegetative and biological soil crust communities. Livestock grazing can cause adverse impacts on soils, particularly during high-intensity low-duration grazing systems in small pastures. Impacts from clearing vegetation and increasing rates of wind erosion and water erosion during storm events may be more sever on sensitive soils (identified in the Soil Resources section of **Chapter 3**). Livestock grazing may also decrease the depth to hardpan or bedrock by increasing soil compaction, particularly during spring months or when soils are wet. Modified grazing management practices can be necessary to maintain soil health where soils are found to be sensitive to livestock disturbances (for example, soil on steep slopes). Properly managed grazing can protect soils and help provide healthy plant communities. Currently livestock grazing impacts on soil resources are measured according to the Utah BLM Public Land Health Standards.

The use of the landscape by wild horses can have a similar impact on soils as described for livestock grazing. Adjustments in AMLs can be necessary to maintain a thriving natural ecological balance and multiple-use relationships for the area.

The designation of utility corridors would encourage the disturbance of soils within those corridors and would be protective of soils outside of the corridors. Utility lines would be encouraged to be parallel to one another, resulting in more intense disturbance within the corridors than in other areas.

Vegetation treatments, which include herbicide application, targeted grazing, tillage, and prescribed fire, can have both beneficial and adverse effects on soils. Their effects vary by application and situation.

Travel in the planning area could adversely impact soils through compaction, vegetation removal, and erosion, particularly in areas of fragile soils (e.g., steep slopes), saline and selenium soils, within riparian areas, and along stream banks.

Implementing GRSG conservation measures generally involves reducing or otherwise restricting land uses and activities that remove vegetation and that compact and erode the soil. Conservation measures include implementing RDFs and BMPs when authorizing or permitting site-specific activities and projects for wildland fire management actions, travel and transportation management, lands and realty, and energy and mineral development.

All of the action alternatives and the Proposed Plans would result in greater restrictions on compaction and erosion activities as compared with continuation of existing management under Alternative A, including such measures as reductions in acres available for livestock grazing, management of ROW exclusion areas, and closure to mineral leasing and development. **Table 2.3** provides a quantitative overview of how management actions would vary across alternatives. As such, all of the action alternatives are likely to be more protective of soils within the decision area through reducing compaction and erosion, particularly on areas with sensitive soils. Differences across alternatives in the number of AUMs, AMLs for wild horses, and the number of acres closed to fluid mineral leasing, closed to road construction, identified as unsuitable for coal mining, and in ROW exclusion areas displayed in **Table 2.3** provide a quantitative basis for an analysis of how impacts on soils may vary across alternatives.

Alternative C would have the greatest restrictions on new ROWs, fluid mineral leasing, and coal surface mining and thus on development in these areas that would otherwise have the potential to impact soils. However, Alternative C would emphasize passive restoration, which may cause some resource damage that leads to soil instability or erosion. Alternative B would also greatly limit soil-disturbing activities, but not to the same degree as Alternative C. Alternative E would have the fewest restrictions of the action alternatives.

Alternative C would also close a portion of mapped occupied habitat to OHV travel, something not considered under the other alternatives, reducing the threat of erodibility and compaction from this type of use. Impacts would be limited to the closure areas, which are spread throughout the decision area.

Differences across alternatives in the acres designated as utility corridors are unlikely to result in differences in the amounts of disturbed soils because utility lines can still be constructed outside of the corridors on a case-by-case basis.

Differences across alternatives with respect to vegetation treatments can have varied effects on soils, although no clear relationship is identified to distinguish the effects of one alternative versus another.

Implementing a disturbance cap under all of the action alternatives would reduce impacts on soils, particularly sensitive soils, compared with Alternative A by limiting the amount of disturbance in a population area. Impacts would be reduced the most under Alternative C where a 3 percent disturbance cap would apply to all mapped occupied habitat and would include fire, heavily grazed areas, and vegetation treatments. The calculated disturbance would include all lands, regardless of ownership. Impacts would be reduced the least under Alternative E where a 5 percent disturbance cap would apply and would exclude fire. The disturbance cap would also not be calculated on all lands, regardless of ownership, but rather only federal and state lands. By calculating the disturbance cap across such a large area, locally significant impacts could still occur even if the disturbance cap is not reached. Under the Proposed Plans, a 3 percent disturbance cap would be calculated at the BSU and at a project level. This would reduce the likelihood of locally significant impacts because no further anthropogenic disturbance would be permitted in the proposed project analysis area until disturbance in the area is reduced to below the cap. Anthropogenic disturbances in PHMA and GHMA would be also mitigated to ensure a net conservation gain to GRSG, thereby preserving the potential for these areas to provide GRSG habitat.

In addition to the disturbance cap, under the Proposed Plans a limit would be placed on the density of energy and mining facilities which would reduce impacts caused by such disturbances as described above. In addition, numerous conservation measures would be implemented in PHMA and GHMA such as RDFs and lek buffers (**Appendix F**) to reduce impacts from human activities in PHMA and GHMA.

The Proposed Plans would retain existing AUMs and would continue to manage livestock to meet the Standards and Guidelines for Rangeland Health, site descriptions, science-based GRSG habitat objectives, or Forest Service equivalent standards. HMAs in GRSG habitat would be managed at the AML ranges to achieve and maintain GRSG habitat objectives as outlined in **Appendix V**, Great Basin Vegetation Modeling using Vegetation Dynamics Development Tool, and rangeland health assessments containing GRSG habitat objectives would be completed for the HMAs. Establishing and maintaining healthy vegetation cover would help protect soil stability and overall health across the landscape, especially in GRSG habitat.

The Proposed Plans would reduce potential impacts on PHMA and GHMA over current management by managing additional acres as ROW avoidance and exclusion**.** This would concentrate impacts on soil resources from ROW permitting and construction to limited areas compared current management, where impacts could be distributed throughout the decision area. The application of additional RDFs to meet GRSG objectives would reduce the impact of the ROWs that are permitted in these areas, over current management. The Proposed Plans would also have greater restrictions on mineral development by closing areas of PHMA and GHMA to fluid mineral leasing, nonenergy development, coal leasing, salable, and locatable mineral, and managing some open areas with NSO and CSU restrictions, which would prevent impacts on soils resources from these uses. Finally, the Proposed Plans would manage more areas as limited or closed to travel and transportation over current management, which would reduce the threat of erosion or compaction of soil resources from this use. The protection of soils resources from travel restrictions would be limited to areas that are closed or restricted to designated routes, which are spread throughout the decision area.

Vegetation management under the Proposed Plans would aim to maintain a minimum of 70 percent of lands capable of producing sagebrush with a 10 to 30 percent canopy cover. Treatment of vegetation to enhance vegetation communities would inadvertently enhance soils resources, prevent excessive erosion, and protect sensitive soils by providing adequate stability and cover.

4.7 WATER RESOURCES

4.7.1 Methods and Assumptions

Water has been identified as a resource that would have only beneficial impacts from the implementation of GRSG conservation measures. As such, this section focuses on qualitatively describing the nature and type of beneficial impacts that would result from implementing the action alternatives, Alternatives B through E and the Proposed Plans.

Indicators

Indicators of impacts on water resources are as follows:

- Stream miles that meet state and federal water quality standards and designated beneficial uses
- Acres of lakes and reservoirs that fully support beneficial uses
- Acres of land open or closed to surface-disturbing activities
- Volume of water stored in the landscape as surface water and groundwater
- Changes to water sources for GRSG to a point at which water availability is affected
- Restoration of water sources for GRSG
- Changes to water features that may change their ability to serve as mosquito-breeding habitat

Assumptions

This analysis is based on the assumptions in **Section 4.2.1**.

4.7.2 Alternatives Analysis

Management actions could change the quality and accessibility of water features that serve as GRSG drinking sources. Drinking water accessibility and quality in turn affect the health and survival of the GRSG. Actions could also increase or decrease the ability of water sources to serve as mosquito breeding habitat, which could in turn increase or decrease, respectively, the risk of West Nile virus transmission to GRSG.

Surface water quality is influenced by both natural and human factors. Aside from the natural factors of weather-related erosion of soils into waterways, surface water quality can be affected by the transport of eroded soils and contaminants into streams due to surface-disturbing activities such as ROWs, energy, or mineral development, improperly managed livestock grazing or recreation, wild horse and burro use of the landscape above AMLs, introduction of waste matter into streams from domestic livestock, and "low-water" crossing points of roads, routes, and ways used by motorized vehicles. ROW, fluid mineral, locatable and salable mineral, and

energy development can impact waterways by disturbing land surface, clearing vegetation, increasing rates of erosion and sedimentation into waterways, compacting soils and increasing rates of run off, and increasing water consumption for some operation activities (BLM 2014). Manure from horses and livestock can locally impact water resources by introducing pathogens and excessive nutrients such as phosphorus and nitrogen. Excessive nutrients can spark growth within water resources which results in depleted oxygen levels, and sometimes anoxic environments that result in mass fish kills (Commonwealth of Massachusetts 2014). Activities that introduce chemicals into the natural environment also have the potential to degrade surface and water quality through leaks, accidents, and broken well casings. Energy and mineral development can impact water resources by increasing areas of cleared and compacted ground.

The quantity of water stored in the landscape either as surface water or groundwater varies over time dependent upon precipitation and human extractions of that water. Management measures that restrict water-consuming uses, such as mineral development and livestock grazing, pinyon-juniper removal and vegetation management would have a net benefit on the quantities of water stored in the landscape.

All of the action alternatives would result in greater restrictions on resource uses compared with continuation of existing management under Alternative A, including such measures as reductions in acres available for livestock grazing, management of ROW exclusion areas, and closure to mineral leasing and development. All of the action alternatives would thereby potentially result in overall improvements in water quality across the decision area. Under Alternative C, AMLs for wild horses would be reduced by 25 percent, which would also reduce the demand on water resources from wild horses. Alternative C would also close certain areas to OHV travel, which, if done in areas where such use is contributing to water quality issues, would curtail the impacts. While the effects could be spread beyond the closure areas to the watershed, this magnitude of the effects is unlikely given the size and dispersed nature of the closures throughout the decision area.

Because water-consuming activities would be restricted, the action alternatives are all also likely to result in increased storage of water in the landscape. Restrictions from the action alternatives would improve the likelihood of more waters meeting fully supporting beneficial uses and increase or maintain the level of stream miles meeting state and federal water quality standards and designated beneficial uses. The action alternatives are likely to protect, if not improve and restore, water sources for GRSG, and are also likely to decrease the presence of mosquito breeding habitat.

The Proposed Plans would reduce potential impacts on PHMA and GHMA over current management by implementing additional acres as ROW avoidance and exclusion (see **Table 2.3**). This would concentrate impacts on water resources from ROW permitting and construction to limited areas in comparison to current management The application of additional RDFs for GRSG objectives would reduce the impact of the ROWs that are permitted in these areas, over current management, The Proposed Plans would also have greater restrictions on mineral development by closing areas of PHMA and GHMA to fluid mineral leasing, nonenergy development, coal leasing, salable, and locatable mineral, and managing some open areas with NSO and CSU restrictions (**Table 2.3**), which would prevent impacts on water

resources from these uses. Finally, the Proposed Plans would manage areas as limited or closed to travel and transportation over current management which would reduce the threat of erosion or runoff into water resources from this use.

Vegetation treatments and prescribed burns can reduce vegetation cover in the short term, which typically increases overland flow and sediment loading of waterways. Watershed health would be affected by reducing water infiltration rates, increase overland flow and sediment loading, which could affect turbidity, temperature, and nutrient loading in water systems. Vegetation management under the Proposed Plans would aim to maintain a minimum of 70 percent of lands capable of producing sagebrush with a 10 top 30 percent canopy cover. Treatment of vegetation to enhance vegetation communities would inadvertently enhance and maintain water resources, by reducing runoff and preventing prevent excessive erosion by stabilizing soils.

The Proposed Plans would apply a 3 percent disturbance cap (5 percent on National Forest System lands in Wyoming) to all anthropogenic disturbances PHMA at both the BSU and project levels, and a limit would be placed on the density of energy and mining facilities, which would reduce impacts caused by such disturbances as described above. Anthropogenic disturbances in PHMA and GHMA would be also mitigated to ensure a net conservation gain to GRSG, thereby preserving the potential for these areas to provide GRSG habitat. In addition, numerous conservation measures would be implemented in PHMA and GHMA such as RDFs and lek buffers (**Appendix F**) to reduce impacts from human activities in PHMA and GHMA.

4.8 VEGETATION (INCLUDING NOXIOUS WEEDS, RIPARIAN AREAS, AND WETLANDS)

GRSG rely on sagebrush ecosystems for all aspects of their life cycle. Typically, a range of sagebrush community composition within the landscape (including variations in sub-species composition, co-dominant vegetation, shrub cover, herbaceous cover, and stand age), along with the use of riparian and wet meadow areas, is needed to meet seasonal requirements for food, cover, nesting, and wintering habitats. The landscape required for GRSG may be up to 40 square miles (Connelly et al. 2004). Thus, the ecology, management, and conservation of large, intact sagebrush ecosystems goes hand-in-hand with managing for the dynamics and behaviors of the populations themselves (Connelly et al. 2004; Crawford et al. 2004). Intact sagebrush does not imply uniform coverage of sagebrush across the ecosystem, but a mosaic of shrub, grassland, and riparian cover across the landscape that allows for migration of GRSG between seasonal habitats (Connelly et al. 2011).

Historically, sagebrush-dominated vegetation was one of the most widespread habitat types in the US, but its expanse has been fragmented, lost, or altered by invasive plant species and anthropogenic disturbance (NTT 2011, p. 4). Protection of GRSG habitat would involve restrictions and limitations on activities that contribute to the spread of invasive plant species, fire, and other surface disturbance, and management of vegetation to promote healthy sagebrush and understory vegetation to support GRSG.

Riparian and wetland areas provide important seasonal habitat, water, and forage for GRSG; these areas are discussed in this section under the topics of livestock grazing and vegetation management. Noxious weeds are discussed under GRSG management, vegetation management, and fire.

4.8.1 Methods and Assumptions

Indicators

Indicators of impacts on vegetation are as follows:

Upland Vegetation

- Acres and condition of vegetation communities
- Effects of fragmentation

Riparian and Wetland

- Acres and condition of riparian and wetland vegetation

Noxious Weeds and Invasive Species

- Likelihood for noxious weed or invasive species introduction or spread
- Likelihood for conifer encroachment

Assumptions

In addition to the assumptions in **Section 4.2.1**, this analysis includes the following assumptions:

- All plant communities would be managed toward achieving a diverse species composition, cover, and age classes across the landscape, except in localized situations where plantings are used for stabilization after wildfire to reduce annual grass invasion, or from past rangeland-improvement practices.
- The degree of impact attributed to any one disturbance or series of disturbances would be influenced by several factors, including location in the watershed; the type, time, and degree of disturbance; existing vegetation; precipitation; and mitigating actions applied to the disturbance.
- Noxious and invasive weeds would continue to be introduced and spread because of ongoing vehicle traffic in and out of the planning area, recreational activities, wildland fire, wildlife and livestock grazing and movements, and surface-disturbing activities.
- Activities that would disturb soils could cause erosion, loss of topsoil, and soil compaction, which could affect the ability of vegetation to regenerate. Further, surface-disturbing activities could increase dust, which could cover existing vegetation and impair plant photosynthesis and respiration. Resulting impacts could include lowered plant vigor and growth rate, altered or disrupted pollination, and increased susceptibility to disease.
- Ecological health and ecosystem functioning depend on a number of factors, including vegetative cover, species diversity, nutrient cycling and availability, water infiltration and availability, and percent cover of weeds.
- Climatic fluctuation would continue to influence the health and productivity of plant communities on an annual basis.

4.8.2 Alternative A

In general, Alternative A relies on management guidance that does not reflect the most up-to-date science regarding GRSG, as well as older LUPs that often lack a landscape-level approach to land planning.

Greater Sage-Grouse Management

There is no consistently applied GRSG management across all LUPs, though many incorporate objectives for maintaining, improving, or restoring vegetation communities, particularly sagebrush and riparian and wetland habitats. As a result, there is general direction to preserve and improve vegetation communities; however, discrete anthropogenic disturbances, such as road construction, mineral development, and ROW development, would continue. This could result in a number of impacts on vegetation, including vegetation removal, fragmentation of vegetation communities, loss of habitat for pollinators, and conversion of areas to an earlier seral stage, which could change vegetation community succession and reduce the extent of native plant communities. The remaining vegetation could have reduced vigor or productivity due to mechanical damage, soil compaction, and dust. Soil compaction would inhibit natural revegetation in areas without active reclamation efforts and would reduce plant vigor, making plants more susceptible to disease, drought, or insect attack.

Vegetation Management and Fire (including invasive plants and juniper encroachment)

In addition to landscapes with large, intact patches of sagebrush, GRSG require high-quality habitat conditions including a diversity of herbaceous species, vegetative and reproductive health of native grasses, and an abundance of sagebrush, making management for high condition in seasonally important habitats important (Manier et al. 2013, p. 181-182). Given the limited distribution of suitable sagebrush habitats and the cost of habitat restoration, management plans that protect intact sagebrush and restore impacted areas strategically to enhance existing habitats (for example, connectivity of intact sagebrush) have the best chance of increasing the amount and quality of sagebrush cover (Manier et al. 2013, p. 183). Sagebrush-promoting vegetation treatments would enhance native vegetation and overall ecosystem productivity, while reducing the distribution of invasive species and some woody species.

Invasive plants can alter plant community structure and composition, productivity, nutrient cycling, and hydrology, and may competitively exclude native plant populations. In particular, invasive plants can reduce and eliminate vegetation that GRSG use for food and cover, resulting in habitat loss and fragmentation, and may increase the risk of wildfire. The spread of invasive plants such as cheatgrass (*Bromus tectorum*) has increased the frequency and intensity of fires (Balch et al. 2012). An assortment of nonnative annuals and perennials and native conifers are currently invading sagebrush ecosystems.

Expansion of conifer woodlands, especially juniper (*Juniperus* spp.) present a threat to GRSG because they do not provide suitable habitat, and mature trees displace shrubs, grasses, and forbs through direct competition for resources; juniper expansion is also associated with increased bare ground and increased erosion potential (Manier et al. 2013, pp. 152-154).

Current treatments and active vegetation management typically focus on vegetation composition and structure for fuels management, habitat management, and/or productivity manipulation for improving the habitat and forage conditions for ungulates and other grazers, using surface soil

stabilization to increase productivity, or by removing invasive plants. Locally and regionally, the distribution of these treatments can affect the distribution of sagebrush habitats (Manier et al. 2013, pp. 179-185). Vegetation treatments would have short-term effects on vegetation from vegetation removal and disturbance, but would result in long-term improvements in vegetation condition.

While wildfires likely played an important role historically in creating a mosaic of herbaceous-dominated areas (recently disturbed) and mature sagebrush (less-frequently disturbed), current land-use patterns have restricted the system's ability to support natural wildfire regimes. Slow rates of regrowth and vegetation recovery after disturbances (driven by low water availability and other constraints), coupled with high rates of disturbance and conversion to introduced plant cover, are largely responsible for the accumulating displacement and degradation of the sagebrush ecosystem (Manier et al. 2013, pp. 133-144). Thus, preservation of sagebrush against wildfire and limiting use of prescribed burning is important to preserving GRSG habitat.

Fire is particularly damaging to sagebrush ecosystems. Big sagebrush does not re-sprout after a fire, but is replenished by wind-dispersed seed from adjacent unburned stands or seeds in the soil. Depending on the species and the size of a burn, sagebrush can reestablish within 5 years of a burn, but a return to a full pre-burn community cover can take 15 to 30 years (Manier et al. 2013, pp. 133-134). Fire suppression may be used to maintain habitat for GRSG (NTT 2011, pp. 25-26). When management decreases fire size by controlling natural ignitions, the indirect impact is that vegetation ages across the landscape, and early successional vegetation communities, are diminished. Fire suppression may preserve the condition of some vegetation communities, as well as habitat connectivity. This is particularly important in areas where fire frequency has increased because of weed invasion, or where landscapes are highly fragmented. Fire suppression can also lead to increased fuel loads, which can lead to more damaging or larger-scale fires in the long term. Fire also increases opportunities for invasive species, such as cheatgrass, to expand (Brooks et al. 2004), so fire suppression can indirectly limit this expansion.

Controlled burning may be prescribed to treat fuel buildup and can assist in the recovery of sagebrush habitat in some vegetation types. Emergency Stabilization and Rehabilitation (for BLM-administered lands) and Burned Area Emergency Rehabilitation (for National Forest System lands) would reduce the potential effects of invasive species by providing the best opportunities for vegetation to reestablish following wildland fires and compete with the natural strengths invasive species have compared to native species. Re-seeding with native plants and long-term monitoring to ensure the production of GRSG cover and forage plants assists with vegetation recovery (NTT 2011, pp. 25-26). Under Alternative A, projects would be designed to minimize the size of wildfire and prevent the further loss of sagebrush. However, past restoration and rehabilitation efforts have not specifically targeted GRSG habitat objectives. A recent study suggests that past restoration and rehabilitation efforts did not increase the probability of burned areas meeting most GRSG habitat objectives (Arkle et al. 2014).

Livestock Grazing and Wild Horses and Burros

Livestock grazing is the most widespread land use across the sagebrush biome (Connelly et al. 2004, p. 7-29). Livestock grazing can affect soils, vegetation health, species composition, water, and nutrient availability by consuming vegetation, redistributing nutrients and seeds, trampling

soils and vegetation, and disrupting microbial systems (Connelly et al. 2004 Ch. 7; NTT 2011, p. 14; Jones 2000, p. 159). Livestock grazing has been described as a "diffuse" form of biotic disturbance that exerts repeated pressure over many years on a system; unlike point sources of disturbance (e.g., fires), livestock grazing exerts repeated pressure across the landscape. Thus, effects of grazing are not likely to be detected as disruptions, but as differences in the processes and functioning of the sagebrush, riparian and wetland systems. Grazing effects are not distributed evenly because historic practices, management plans and agreements, and animal behavior all lead to differential use of the range (Manier et al. 2013, pp. 157-168). In addition, some grass species that evolved with grazing pressure from large herbivorous mammals may be less affected by livestock grazing compared to species without herbivore-adapted traits (Mack and Thompson 1982, p. 768). Livestock often use riparian and wetland areas for water and shade, which could reduce riparian community condition and hydrologic functionality. Properly managed grazing could also reduce litter and fine fuel loading, which could reduce fire size and severity. Wild horse and burro impacts are similar to those from livestock grazing, as wild horses and burros also forage on and trample vegetation. However, wild horse and burro use is not a permitted use and is thus not managed in the same way as livestock grazing.

Water developments, roads, and structural range improvements associated with livestock grazing would remove vegetation over the long term and could be a source of weed introduction to rangelands. Livestock may congregate around water developments, causing soil compaction and trampling nearby vegetation, including shoreline and riparian areas, making reestablishment of native vegetation difficult in the area surrounding water developments. Water developments may also cause dewatering of riparian areas, leading to generally degraded conditions or loss of riparian habitats.

At unsustainable levels, grazing can lead to loss of vegetative cover, reduced water infiltration rates, decreased plant litter, increased bare ground, reduced nutrient cycling, decreased water quality, and increased soil erosion (Manier et al. 2013, pp. 157-159; Jones 2000, p. 159). Grazing may also confer competitive advantage on junipers through the removal of native grasses and forbs, facilitation of tree regeneration by increased shrub cover, and enhanced seed dispersal (Baker 2011, p. 200). Land health evaluations are used to assess rangeland condition and help to identify where changing in grazing management would be beneficial.

Livestock grazing would continue to occur under Alternative A, with 329,521 AUMs permitted on BLM-administered lands and 265,373 AUMs permitted on National Forest System lands. Rangelands would continue to be managed to conform to the BLM Utah Public Land Health Standards or similar guidelines, so that vegetation communities would continue to be maintained and improved to some extent across the decision area. Changes and adjustments would be considered on a case-by-case basis and would incorporate grazing standards and guides to evaluate the ability to meet desired conditions. Riparian and wetland areas would be managed to maintain or attain proper functioning condition or Forest Plan standards and guidelines.

Travel and Transportation

Road construction divides and fragments vegetation and causes erosion and nutrient leaching. OHV travel compacts soils and allows the spread of human disturbance, including wildfire and invasive plant species (USFWS 2010, pp. 13929-13931; Manier et al. 2013, pp. 71-90). Invasive

plant species can out-compete sagebrush and other vegetation essential for GRSG survival. Invasive plant species also increase wildfire frequencies, further contributing to habitat loss (Balch et al. 2012).

The more areas that are seasonally or permanently closed to OHV travel, the fewer impacts on vegetation from surface disturbance, such as vehicle and human trampling of vegetation, soil compaction, and spread of dust and weeds, would be expected.

Impacts from OHV use would continue under Alternative A on 797,000 acres that would be open to cross-country use. Route and trail modifications would be considered on a case-by-case basis.

Infrastructure Development (including all ROWs and utility corridors)

Permitted activities, such as construction of utility ROWs, involve vegetation removal, which reduces the condition of native vegetation communities and individual native plant species, alters age class distribution, reduces connectivity, and encourages the spread of invasive species. Construction activities could compact soils, which would inhibit natural revegetation in areas without active reclamation efforts and would reduce plant vigor, which would make plants more susceptible to disease, drought, or insect attack. In most cases, reclaimed areas would be ripped and seeded during interim or final reclamation (NTT 2011, pp. 12-13).

The impacts from different types of ROWs would impact vegetation in different ways. Aboveground linear and underground ROWs, such as transmission lines or pipelines, would temporarily remove vegetation during construction, but areas would be reclaimed or restored after construction. Vegetation would be permanently removed for construction of surface linear ROWs, such as roads. Furthermore, because aboveground and surface linear ROWs may extend for many miles, vegetation communities could be fragmented and the potential for weeds to be introduced or to spread may increase. Aboveground site-type ROWs and wind energy projects would remove vegetation during the life of the project, often lasting several decades, but areas would be restored after the ROW is decommissioned. ROW corridors on 177,700 acres would concentrate disturbances in one area, which would cause greater impacts in this one area but would reduce the likelihood for disturbance in other areas.

ROW exclusion areas would prohibit all development of ROWs in those areas, which would directly protect vegetation from disturbance and removal. In ROW avoidance areas, the permits would be considered on a case-by-case basis. This flexibility may be advantageous where federal and private land ownership is mixed, and exclusion areas may result in more widespread development on private lands. Under Alternative A, 102,500 acres would be managed as ROW exclusion areas, including for wind energy development.

Land exchanges or acquisitions to reduce the fragmentation of GRSG habitat could improve the BLM and Forest Service's ability to implement management actions that would result in increased vegetation diversity, ecological health, and attainment of BLM Utah Public Land Health Standards. In addition, retention of federal lands would prevent sagebrush removal associated with land conversion to agricultural or urban uses. Under Alternative A, 24,400 acres of land would be available for disposal and would be required to meet certain disposal criteria.

Mineral Development (including geothermal)

Energy development requires construction of roads, well pads, wells, and other infrastructure, and associated noise, traffic, and lights that alter, degrade, and/or entirely displace native ecosystems (Manier et al. 2013, pp. 90-104). Surface disturbance associated with mineral development often removes vegetation, reduces the condition of native vegetation communities and the connectivity of habitat, and encourages the spread of invasive species (NTT 2011, pp. 19-20). Vegetation removal results in conversion of areas to an earlier seral stage, which could change vegetation community succession and reduce desired plant communities. The remaining vegetation could have reduced vigor or productivity due to mechanical damage, soil compaction, and dust. Impacts would not occur in areas closed to mineral leasing or development.

Under Alternative A, 138,500 acres would be closed to nonenergy mineral leasing, 73,500 acres closed to mineral material development, and 335,300 acres closed to fluid mineral leasing. In addition, 22,900 acres would be found unsuitable for surface mining of coal, and 498,100 acres would be recommended for withdrawal from locatable mineral entry. Stipulations may be applied in certain areas to reduce impacts from mineral leasing or development, but these stipulations are not applied consistently across the planning area. As a result, impacts from mineral development on vegetation as described above would continue to occur in areas open to leasing and development.

Other Actions

Recreational use of GRSG habitat can be benign, but casual use at excessive levels may cause degradation of sagebrush vegetation from activities such as camping, bicycling, OHV use, and hunting. Potential impacts from casual recreation use include trampling, soil compaction, erosion, invasive plants spread, and fugitive dust generation (Knick et al. 2011). Recreational use can also increase the potential for wildfire caused by invasive plant spread or human error (Knick et al. 2011). Most impacts occur in easily accessible areas and in areas open to cross-country travel, particularly motorized use. Restrictions on recreational use of GRSG habitat would limit damage to the vegetation communities that comprise this habitat, by directly reducing disturbance to vegetation from trampling, motorized vehicles, dust, and spread of invasive species. Such restrictions could involve seasonal area closures or limitations on the number of users or types of uses permitted, particularly OHV use (NTT 2011, p. 12). In general, impacts from recreation would be similar among all alternatives, as dispersed casual recreation would continue throughout the planning area.

No existing BLM ACECs or Forest Service Zoological Areas include GRSG habitat as a relevant and important value, and no additional ACECs or Zoological Areas would be designated under Alternative A. Existing ACECs could protect vegetation through use restrictions, and these impacts are analyzed under each existing LUPs within the planning area. As a result, there would be no additional effects from ACEC or Zoological Area management on vegetation under this alternative.

4.8.3 Alternative B

Under Alternative B, lands in the decision area would be managed to conserve, enhance, and restore sagebrush ecosystems. Direct protection of sagebrush habitat to support GRSG would limit or modify uses in this habitat type, improving the acreage and condition of desired

vegetation communities. Use restrictions would reduce damage to native vegetation communities and individual native plant species in areas that are important for regional vegetation diversity and quality. Likewise, use restrictions would minimize loss of connectivity and would be more likely to retain existing age class distribution within these specific areas. Use restrictions could also minimize the spread of invasive species by limiting human activities that cause soil disturbance or seed introductions.

Greater Sage-Grouse Management

Under Alternative B, identified PHMA and GHMA would encompass 2,781,700 acres and 532,100 acres of vegetation, respectively. A 3 percent anthropogenic disturbance cap would be applied to activities in PHMA and would implement numerous conservation measures to reduce impacts from human activities in PHMA, which would reduce the likelihood for sagebrush vegetation removal, degradation, or fragmentation, and improve the acreage and condition of sagebrush vegetation.

Vegetation Management and Fire (including invasive plants and juniper encroachment)

Under Alternative B, management actions for habitat restoration and rehabilitation post-fire would aim to improve GRSG habitat and prioritize restoration efforts to benefit GRSG habitats. The use of native seeds would be required, with some exceptions, as a component and would design post- rehabilitation efforts to ensure the long-term persistence of the restoration efforts. In addition, climate changes would be considered when determining restoration species. Together, these management actions would alter vegetative communities by promoting increases in sagebrush height and herbaceous cover and vegetation productivity. Treatments designed to prevent encroachment of trees and nonnative species would alter the condition of native vegetation communities by changing the density, composition, and frequency of species within plant communities. Habitat connectivity for GRSG could increase through vegetation manipulation designed to restore vegetation, particularly sagebrush overstory cover.

Vegetation manipulations in riparian areas, such as weed treatments, native plantings, and erosion control in the channel, would improve the acreage and condition of the riparian vegetation community, individual riparian species, and hydrologic functionality to attain proper functioning condition or Forest Plan standards and guidelines.

Fuels treatments under Alternative B would be designed to protect sagebrush ecosystems by maintaining sagebrush cover, applying seasonal restrictions and protections for winter range, and requiring use of native seeds as a component of restoration. Post-fuels treatments, Emergency Stabilization and Rehabilitation, and Burned Area Emergency Response management would be designed to ensure long-term persistence of seeded areas and native plant restoration areas. These management actions would help to retain the extent of sagebrush vegetation and prevent degradation or destruction of sagebrush caused by wildland fires. Suppression in PHMA would be prioritized, which would retain the existing conditions and trends of vegetation in these areas. Nature and type of impacts from fuels treatments, Emergency Stabilization and Rehabilitation/Burned Area Emergency Response, and suppression would be similar to those described under Alternative A. However, treatments targeting GRSG habitat objectives would increase the likelihood that restoration and rehabilitation efforts would result in improved diversity of sagebrush and native vegetation.

Livestock Grazing and Wild Horses and Burros

Under Alternative B, permitted AUMs would not change from Alternative A. However, a number of management actions would be implemented in PHMA to incorporate GRSG habitat objectives and management considerations into livestock grazing management. These include, but are not limited to, completion of land health assessments or similar grazing evaluations, consideration of grazing methods and systems to reduce impacts on GRSG habitat, improved management of riparian areas and wet meadows, and evaluation of existing introduced perennial grass seedings, water developments, and structural range improvements. Such measures would help maintain or improve acreage and vegetation condition of rangeland and riparian and wetland areas, and could reduce the likelihood of nonnative invasive species introduction or spread. Together, these efforts would reduce, but would not eliminate, impacts from grazing on vegetation.

Impacts from wild horse and burro management would be similar to those described for Alternative A but would incorporate GRSG habitat objectives and considerations into wild horse and burro management. Such considerations could reduce grazing impacts and improve condition of vegetation described under Alternative A in these areas.

Travel and Transportation

Impacts from OHV use closures would be the same as those described under Alternative A. However, under Alternative B, 95 percent fewer acres would be open to cross-country use, and additional management actions would be implemented to reduce new route construction and restore roads, primitive roads, and trails not designated in travel management plans. These actions would reduce the likelihood of impacts caused by roads as described under Alternative A and would increase the acreage and connectivity of sagebrush vegetation.

Infrastructure Development (including all ROWs and utility corridors)

Identifying 2,784,200 acres (over 25 times more acres than under Alternative A) of ROW exclusion areas (including 2,781,700 acres of wind ROW exclusion) and undesignating 47,500 acres of ROW corridors would reduce impacts on vegetation as described under Alternative A. In addition, ROWs that are no longer in use would be restored, which would increase the extent and connectivity of sagebrush habitats, and reduce the spread of weeds to these areas, over the long term. Lands would be retained in federal ownership, with limited exceptions, which would reduce fragmentation as described under Alternative A.

Mineral Development (including geothermal)

Under Alternative B, 3,341,300 acres would be closed to nonenergy mineral leasing (nearly 25 times more than under Alternative A) and fluid mineral leasing (nearly 10 times more than under Alternative A), and BMPs would be required on existing leases. In addition, PHMA would be found unsuitable for surface coal mining and would be recommended for withdrawal from locatable mineral entry. In addition, all PHMA would be found unsuitable for surface coal mining and 3,650,900 acres (7 times more than Alternative A) would be recommended for withdrawal from locatable mineral entry. In PHMA, applicable BMPs would be mandatory as COAs. In addition, 3,340,000 acres would be closed to mineral material development (45 times more than under Alternative A). Furthermore, mineral material pits no longer in use would be restored and fluid mineral development in PHMA would require numerous conservation measures.

Over the long term, closures and NSO stipulations would protect existing vegetation from removal, degradation, fragmentation, and nonnative invasive species introduction or spread in unleased areas. Conservation measures would help to reduce such impacts in leased areas, and restoration activities would improve the condition and increase the extent of vegetation, and depending on the location, could remove nonnative invasive species and reduce fragmentation. Exploration activities could disturb vegetation or spread weeds, but would be unlikely to remove substantial amounts of vegetation.

Other Actions

In general, impacts from recreation would be similar among all alternatives, as dispersed casual recreation would continue throughout the planning area. Impacts from ACEC and Zoological Area management under Alternative B would be the same as those described for Alternative A.

4.8.4 Alternative C

Under Alternative C, lands would be managed to conserve, enhance, and restore sagebrush ecosystems. Management and associated impacts would be largely similar to those described for Alternative B, though with more-stringent guidance and restrictive management.

Greater Sage-Grouse Management

Under Alternative C, management actions would be applied to all mapped occupied GRSG habitats, encompassing 3,313,800 acres of vegetation. Unique to Alternative C, an area would be considered successfully restored only if GRSG used the area. Impacts from implementing the 3 percent disturbance cap would be similar to those described for Alternative B, but all surface disturbances (including anthropogenic disturbance and burned areas) would count towards the disturbance cap under Alternative C. This would further reduce the acreage of vegetation that would be removed or fragmented within all occupied habitat over the long term.

Vegetation Management and Fire (including invasive plants and juniper encroachment)

Management under Alternative C would be similar to that described under Alternative B, but with an increased focus on restoration of areas with invasive species and crested wheatgrass seedings. In addition, management would apply to a larger area than Alternative B, all mapped occupied habitat. As a result, there would be greater improvements to vegetation condition and an increase in sagebrush acreage under Alternative C.

Impacts from wildland fire management under Alternative C would be similar to those described for Alternative B. Alternative C would require exclusions of grazing after a fire has occurred until woody and herbaceous plants achieve GRSG habitat objectives. This could lead to grazing exclusions for a decade or longer depending on site and vegetation conditions, compared to a standard of 2 years under Alternative A. This would reduce grazing pressure on and trampling of Emergency Stabilization and Rehabilitation seedings in the first several years post-fire thus improving the likelihood of native vegetation restoration.

Livestock Grazing and Wild Horses and Burros

Alternative C1

Under Alternative C1, all mapped occupied habitat would be made unavailable for livestock grazing, resulting in a reduction of up to 329,521 permitted AUMs on BLM-administered lands

and 265,373 AUMs on National Forest System lands. Removal of livestock grazing would assure that effects on vegetation from improper grazing use levels, as described under Alternative A, no longer occurred within mapped occupied GRSG habitats. As a result, Alternative C1 would reduce impacts on vegetation from improper livestock grazing, including disturbance or trampling of nesting birds (Rasmussen and Griner 1938), competition for resources, and spread of weeds, as well as increased soil compaction, erosion, and decreased water quality (Reisner et al. 2013; Braun 1998) more than Alternative A, and would allow for native understory perennial recovery and would increase herbaceous vegetation cover (Strand and Launchbaugh 2013). Because livestock grazing would not be allowed in mapped occupied GRSG habitat, there could be a buildup of fine fuel or an increase in noxious weed growth in sagebrush vegetation communities. This could increase the risk of destructive wildfires that would destroy and fragment sagebrush vegetation. Livestock would not be a tool available for implementing fuels management treatments or invasive species control in sagebrush habitat areas. A reduction in available tools decreases the potential for successful implementation of treatments used to protect or restore sagebrush habitats. Impacts from wild horse and burro management would be the same as those described for Alternative B.

Alternative C2

Under Alternative C2, permitted AUMs would be reduced, resulting in 197,713 AUMs available for permitting on BLM-administered lands and 159,224 AUMs on National Forest System lands. By reducing AUMs, land managers would reduce the likelihood for the grazing-related impacts described under Alternative A, including trampling and removal of vegetation in mapped occupied habitat. Other management actions would be similar to those described for Alternative B, though Alternative C2 includes additional restrictions on grazing, such as not allowing grazing during the growing season, authorizing no new water developments for diversion from springs or seeps, and avoiding all new structural range developments and location of supplements in occupied habitat. These management actions would preserve and restore rangeland and riparian acreage more than the other alternatives.

Impacts from wild horse and burro management would be similar to those described for Alternative B; however, wild horse AMLs would be reduced by 25 percent, thereby reducing the likelihood for impacts from wild horses by reducing grazing pressure more than Alternative B.

Travel and Transportation

Impacts from travel and transportation management under Alternative C would be similar to those described for Alternative B, though there would be fewer impacts on vegetation under Alternative C because no acres would be open to cross-country use, new road construction would be prohibited within 4 miles of occupied leks, and mitigation of impacts from route construction would be required. In addition, approximately 555,700 acres of mapped occupied habitat would be closed to OHV travel. This includes 32,200 acres that are currently closed as well as 523,500 acres of new closed areas. Closed areas, shown on **Map 2.56**, would reduce the risk of trampling or removal of vegetation, although the majority of the closed areas are absent mapped routes.

Infrastructure Development (including all ROWs and utility corridors)

Management for infrastructure development under Alternative C would be similar to that described for Alternative B. However, ROW exclusion areas, including for wind energy development, would be designated in all mapped occupied habitats, covering 3,313,800 acres (over 30 times more than under Alternative A). In addition, all designated ROW corridors would be undesignated, and mapped occupied habitat would not be available for land tenure adjustments. Impacts from land tenure decisions would be similar to those described under Alternative B, although Alternative C would not allow for exceptions to disposal criteria, which would reduce management flexibility and could reduce vegetation connectivity by pushing projects outside of all mapped occupied habitat on federal lands. Impacts from ROW exclusion areas and retention of federal lands would be as described under Alternative A.

Mineral Development (including geothermal)

Under Alternative C, 4,008,580 acres would be closed to nonenergy mineral leasing (nearly 30 times more than under Alternative A), and 3,821,580 acres would be closed to fluid mineral leasing (11 times more than under Alternative A) and 4,008,580 acres to mineral material and locatable mineral development (7 times more than Alternative A). In addition, 4,008,580 acres would be closed to mineral material development (50 times more than under Alternative A). Other management actions would be similar to those described for Alternative B, but because they would apply to a larger area, all mapped occupied habitat, impacts would be largely reduced, thereby preserving more vegetation acreage.

Other Actions

In general, impacts from recreation would be similar among all alternatives because dispersed casual recreation would continue throughout the planning area. Under Alternative C, the BLM would designate 13 ACECs covering 1,834,200 acres, and the Forest Service would establish 399,600 acres of new Zoological Areas. Within these areas, the BLM and Forest Service would aim to reduce anthropogenic disturbances, retain intact sagebrush vegetation, and remove existing infrastructure. As a result, the extent and condition of vegetation in these areas would be maintained, and the likelihood for the spread of invasive plant species caused by surface-disturbing activities would be reduced. The likelihood for other impacts caused by surface-disturbing activities, such as removal of or damage to vegetation, soil compaction, and soil erosion, would be similarly reduced.

4.8.5 Alternative D

Under Alternative D, lands would be managed to conserve, enhance, and restore sagebrush ecosystems, and management would be applied within identified PHMA and GHMA. Management and impacts would be similar to Alternative B, though Alternative D would provide the BLM and Forest Service with the ability to make adjustments to sagebrush habitat objectives in the sub-regional when there is local scientific literature that supports variation. In general, Alternative D would provide more guidance and criteria for how to implement the management actions.

Greater Sage-Grouse Management

Under Alternative D, 2,760,300 acres would be identified as PHMA and 553,500 acres would be identified as GHMA, slightly modified from the PHMA and GHMA boundaries under Alternative

B. A 5 percent disturbance cap on discrete anthropogenic disturbances would be applied in PHMA, which would reduce impacts caused by such disturbances as described under Alternative A. In addition, Alternative D provides criteria for determining when an area has been restored or reclaimed, thereby providing a set standard to which managers would be able to compare the existing conditions. These metrics may improve the likelihood for restoration or reclamation success and increase the extent, connectivity, and condition of vegetation communities in PHMA.

Management under Alternative D would recognize that there are areas within the mapped occupied habitat that lack the principle habitat components necessary for GRSG. Under certain conditions, actions may be allowed in mapped occupied habitat areas that are not ecologically capable for supporting GRSG. Development within nonhabitat areas could result in removal and damage to vegetation. However, impacts would not be on sagebrush or vegetation that supports GRSG.

Vegetation Management and Fire (including invasive plants and juniper encroachment)

Management under Alternative D would be similar to that described for Alternative B, though with additional measures to prioritize vegetation rehabilitation, incorporate design features that would improve the success of rehabilitation projects, and allow for commercial seed or plant collection. Alternative D would also consider use of post-fire grazing exclusion areas in PHMA; however, it would not require GRSG use of habitat for an area to be considered "rehabilitated" and for grazing to resume. Together, these management actions would improve the likelihood for sagebrush rehabilitation and sustainable use of native plant products, while maintaining vegetation condition over the long term.

Wildland fire management under Alternative D would be similar to that described for Alternative B, though management would not only aim to protect, but also to maintain and expand, sagebrush ecosystems. In addition, the BLM and Forest Service would prioritize wildfire suppression pre-planning. Together, these actions would help to retain and increase sagebrush community and improve condition. Furthermore, the likelihood of catastrophic wildfire and subsequent impacts on vegetation from wildland fire described under Alternative A would also be reduced.

Livestock Grazing and Wild Horses and Burros

Under Alternative D, the BLM and Forest Service would maintain the same number of AUMs as under Alternative A, though the number of AUMs on a permit may be adjusted during site-specific evaluations. On BLM-administered lands, if acres are not meeting BLM Utah Public Land Health Standards, livestock grazing systems would be adjusted to ensure progress is made towards meeting the standards. Many of the management actions would be similar to those described under Alternative B, although Alternative D would include refinements to improve management flexibility and implementation. These actions would help to maintain or restore sagebrush habitat and riparian and wetland vegetation in certain areas and to reduce the impacts from livestock grazing on vegetation as described under Alternative A. Impacts from wild horse and burro management would be similar to those described under Alternative B.

Travel and Transportation

Under Alternative D, the BLM and Forest Service would reduce the acreage open to cross-country use by 90 percent compared with Alternative A. Other impacts from travel and transportation management under Alternative D would be similar to those described under Alternative B, though with increased flexibility incorporated to provide for high-quality and sustainable travel routes and administrative access. As such, there may be increased impacts on acreage of vegetation in areas where new routes are created. Impacts in these areas would be as described under Alternative A.

Infrastructure Development (including all ROWs and utility corridors)

Under Alternative D, ROW avoidance and exclusion areas would differ between the types of ROW development. The greatest restrictions would be applied to aboveground linear ROWs, as 1,504,000 acres of mapped GRSG habitat and population areas would be managed as ROW exclusion. Slightly fewer restrictions would be applied for aboveground site-type ROWs, for which there would be 301,200 acres of mapped GRSG habitat and population areas managed as ROW exclusion. The fewest restrictions would be applied to underground and surface linear ROWs, where ROW exclusion areas would cover 102,500 acres of mapped GRSG habitat and population areas. Approximately 2,864,300 acres of mapped GRSG habitat and population areas would be managed as ROW exclusion for wind energy development. Together, these management actions would reduce the impacts on vegetation, as described under Alternative A, from each type of ROW development.

The BLM would undesignate 39,700 acres of existing ROW corridors and designate an additional 31,700 acres of new ROW corridors, making the acreage impact from ROW corridors similar to, but slightly less than, Alternative A. Impacts would occur in different areas, however, and the emphasis on avoiding GRSG habitat would increase the likelihood that sagebrush vegetation would also be avoided.

Impacts from land tenure management would be similar to those described under Alternative B, although impacts could occur on 5,540 acres of vegetation that would be available for disposal. Impacts from disposal would be as described under Alternative A.

Mineral Development (including geothermal)

Impacts under Alternative D would be similar to Alternative B, but restrictions would focus on surface mining, with fewer restrictions on underground mining. This would reduce the acreage of surface disturbance, which would reduce the amount of vegetation removed and would reduce the likelihood for invasive species introduction or spread. Restrictions include closure to nonenergy mineral leasing with development by surface mining, closure to all leasing on 3,302,900 acres (nearly 24 times more than under Alternative A) and closure to mineral materials development on 352,800 acres (nearly 5 times more than under Alternative A). Acres recommended for withdrawal from locatable mineral entry would be the same as Alternative A (498,700 acres). The same acreage of GRSG habitat and population areas would be closed to fluid mineral leasing as under Alternative A, but 2,451,900 acres would have an NSO stipulation applied (over 2 times more than under Alternative A), thereby reducing acreage of surface-disturbing impacts from fluid mineral development in these areas.

Other Actions

In general, impacts from recreation would be similar among all alternatives, as dispersed casual recreation would continue throughout the planning area. Under Alternative D, the BLM and Forest Service would not designate any additional ACECs or Zoological Areas, respectively, and thus no additional impacts on vegetation from ACEC management would occur.

4.8.6 Alternative E

Under Alternative E, lands would be managed to protect, maintain, improve, and enhance sagebrush ecosystems and would identify mapped GRSG habitat in SGMAs/core areas within which management would be applied. Management and impacts would be similar to Alternative D, though Alternative E would apply less-stringent use restrictions and would manage the least amount of mapped GRSG habitat in SGMAs/core areas when compared to the other alternatives.

Greater Sage-Grouse Management

GRSG management under Alternative E would be similar to that described for Alternative D, but would provide less protection to vegetation by designating fewer acres as GRSG habitat in SGMAs/core areas (2,711,200 acres), and the BLM and Forest Service would not manage for habitat outside GRSG habitat in SGMAs/core areas. In addition, under Alternative E, the 5 percent disturbance cap on surface disturbance would not include existing disturbances, only new disturbances, which could result in significantly higher acreage of disturbed areas in GRSG habitat in SGMAs/core areas. As a result, protective measures and restrictions on uses and surface-disturbing activities would be applied to a smaller acreage, and thus there could be greater impacts on vegetation acreage and condition from such uses, as described under Alternative A.

Vegetation Management and Fire (including invasive plants and juniper encroachment)

Vegetation and fire management under Alternative E would emphasize removal of encroaching conifers, cheatgrass, and other invasive species, active restoration and reclamation, improved fire response, and limitations on sagebrush treatment projects, thereby maintaining and expanding sagebrush vegetation as compared to Alternative A.

Fire suppression would be prioritized in mapped GRSG habitat in SGMAs/core areas only. Under Alternative E, the 5 percent disturbance cap would apply only to new disturbances, not existing disturbances. Under Alternative E2, vegetation treatments in GRSG habitat would be evaluated and may or may not count in the 5 percent disturbance cap. Due to the increased allowance for disturbance under Alternative E, there is the potential for greater impacts on vegetation acreage or less-successful vegetation protection or vegetation condition enhancement. However, burned areas would be counted in the 5 percent disturbance cap calculation for Alternative E, therefore in areas with fire there is decreased potential for disturbance.

Livestock Grazing and Wild Horses and Burros

Under Alternative E, the same number of AUMs would be maintained as under Alternative A. However, Alternative E incorporates consideration of GRSG needs and management for seasonal habitats, which would reduce the likelihood for impacts on associated vegetation, including riparian vegetation, from livestock. Water developments would be allowed, and

impacts on vegetation could occur as described under Alternative A. Impacts from wild horse and burro management would be the same as described under Alternative A.

Travel and Transportation

Under Alternative E, fewer acres would be open to cross-country travel, 351,700 acres (over 50 percent fewer acres than Alternative A). This would reduce vegetation impacts caused by OHV use as described under Alternative A. Few additional management measures are presented under Alternative E for travel and transportation management; thus, additional impacts cannot be inferred.

Infrastructure Development (including all ROWs and utility corridors)

Under Alternative E, agencies would manage the same acreage as ROW exclusion as Alternative A, but would focus on managing areas as ROW avoidance with stipulations to reduce impacts from ROW development. Under Alternative E, 2,757,200 acres would be managed as ROW avoidance, including for wind energy development (over 23 times more acres than under Alternative A). Alternative E does not provide guidance for managing ROW corridors or land tenure decisions; thus, impacts cannot be inferred.

Mineral Development (including geothermal)

Under Alternative E, the same acreage of nonenergy leasable minerals and mineral materials would be open as under Alternative A. In addition, the same amount of acres would be recommended for withdrawal from locatable mineral entry. Additional stipulations would be implemented that would reduce impacts on vegetation in GRSG habitat in SGMAs/core areas by reducing surface-disturbing activities.

Impacts from coal leasing and locatable minerals management would be similar to those described for Alternative D, though additional stipulations to reduce the extent of surface-disturbing activities would be applied. As a result, this would reduce the impacts on vegetation acreage and condition from mineral development described under Alternative A.

CSU stipulations would be applied to fluid mineral leases on 2,642,700 acres (2 times as many acres as under Alternative A) to reduce impacts in sensitive areas. The same number of acres would be closed to leasing as under Alternative A. However, under Alternative E, additional conservation measures would not be applied to leased federal fluid mineral estate. This could cause impacts where existing conservation measures are not as stringent as the most up-to-date GRSG guidance.

Other Actions

In general, impacts from recreation would be similar among all alternatives, as dispersed casual recreation would continue throughout the planning area. Under Alternative E, the BLM and Forest Service would not designate any additional ACECs or Zoological Areas, respectively, and thus no additional impacts on vegetation from ACEC management would occur.

4.8.7 Proposed Plans

Under the Proposed Plans, lands would be managed to conserve, enhance, and restore sagebrush ecosystems, and management would be applied within identified SFA, PHMA, and GHMA, as well as in certain areas outside of PHMA and GHMA. Management and impacts

would be similar to Alternative D, though Alternative D would provide additional protections to vegetation and the Proposed Plans do not have a lek-centered approach for lands and realty or minerals management.

Greater Sage-Grouse Management

Under the Proposed Plans, mapped GRSG habitat would be identified as SFA, PHMA, and GHMA. Management of SFA would provide additional protections from locatable minerals activities, fluid minerals development, and livestock grazing compared to PHMA. This area constitutes approximately five percent of total mapped occupied habitat. In PHMA, management actions would aim to achieve certain vegetation objectives to improve GRSG habitat. A 3 percent disturbance cap (5 percent on National Forest System lands in Wyoming) on discrete anthropogenic disturbances would be applied in PHMA at both the BSU and project levels, and a limit would be placed on the density of energy and mining facilities which would reduce impacts caused by such disturbances as described under Alternative A.

Anthropogenic disturbances in PHMA and GHMA would be also mitigated to ensure a net conservation gain to GRSG, thereby preserving the potential for these areas to provide GRSG habitat. In addition, numerous conservation measures would be implemented in PHMA and GHMA such as RDFs and lek buffers (**Appendix F**) to reduce impacts from human activities in PHMA and GHMA. This would reduce the likelihood for vegetation removal, degradation, or fragmentation and reduce the likelihood for weed introduction or spread.

Over a 10-year period, conifer treatments designed to increase the amount and functionality of seasonal habitats within PHMA would alter the condition of native vegetation communities by changing the density, composition, and frequency of species within plant communities. Habitat connectivity for GRSG could be increased over the planning timeframe through vegetation manipulation designed to restore vegetation, particularly sagebrush overstory cover.

Vegetation Management and Fire (including invasive plants and juniper encroachment)

Impacts from vegetation management under the Proposed Plans would be similar to those described for Alternative D. The Proposed Plans would further reduce impacts on sagebrush and riparian/wetland habitats by including additional measures for conifer removal, including acres to be removed, improved management of wet meadows, and implementation of RDFs.

Impacts from wildland fire management would also be similar to those described for Alternative D. The Proposed Plans would further reduce impacts on vegetation by including additional fuels management actions, such as removing encroaching conifer stands, prioritizing the use of native seeds, and avoiding sagebrush reduction treatments in certain areas. Together, these actions would help to retain and increase sagebrush community vegetation extent and improve condition. Furthermore, the likelihood of catastrophic wildfire and subsequent impacts on vegetation from wildland fire described under Alternative A would also be reduced.

Livestock Grazing and Wild Horses and Burros

Impacts from livestock grazing management under the Proposed Plans would be similar to those described for Alternative D. The Proposed Plans would further reduce impacts on riparian and wet meadow vegetation by prioritizing the review of grazing permits/leases in SFA and PHMA in areas not meeting Land Health Standards, with focus on those containing riparian and wet

meadow vegetation. This action would expedite improvements to riparian and wetland condition in areas most important to GRSG. Impacts from wild horse and burro management would be similar to those described under Alternative B. The Forest Service will incorporate grazing guidelines (outlined in **Sections 2.6.3** and **2.6.4**) into term grazing permits that will likely improve vegetation structure in GRSG seasonal habitat on grazing allotments.

Travel and Transportation

Impacts from travel and transportation management under the Proposed Plans would be similar to those described for Alternative D. The Proposed Plans would have greater potential to increase the extent of sagebrush vegetation by considering the use of transplanted sagebrush when reseeding roads, primitive roads, and trails.

Infrastructure Development (including all ROWs and utility corridors)

Identifying PHMA as exclusion for wind energy development on lands managed according to the BLM and Forest Service-Utah Proposed Plans and avoidance on National Forest System lands in the Wyoming portion of the planning area and avoidance for other types of ROWs and undesignating ROW corridors would reduce impacts on vegetation as described under Alternative A. All GRSG habitat would be retained in federal ownership, with limited exceptions, which would reduce fragmentation as described under Alternative A.

Mineral Development (including geothermal)

Impacts under the Proposed Plans would be similar to Alternative B, but expansion of existing operations for nonenergy leasable and salable minerals could be considered in certain instances, causing impacts on vegetation as described for Alternative A. Restrictions under the Proposed Plans include closure of all PHMA to nonenergy mineral leasing and to mineral materials development on lands managed according to the BLM and Forest Service-Utah Proposed Plans and avoidance on National Forest System lands in the Wyoming portion of the planning area. SFA would be recommended for withdrawal from the Mining Law of 1872, as amended. Further, coal management would emphasize underground mining, which would reduce impacts on vegetation. The same acreage of GRSG habitat and population areas would be closed to fluid mineral leasing as under Alternative A, but protections for vegetation would be increased in SFA, which would be subject to an NSO stipulation without waivers, exceptions or modifications. Vegetation would also be highly protected in PHMA; in total, an NSO stipulation would be applied on 3,258,300 acres (7 times more than under Alternative A), thereby reducing acreage of surface-disturbing impacts from fluid mineral development in these areas. These measures, combined with the RDFs, buffers, and mitigation, would help to reduce impacts on vegetation from mineral development compared to Alternative A.

Other Actions

In general, impacts from recreation would be similar among all alternatives, as dispersed casual recreation would continue throughout the planning area. Under the Proposed Plans, no additional ACECs or Zoological Areas would be designated, and thus no additional impacts on vegetation from ACEC management would occur.

4.9 OTHER SPECIAL STATUS SPECIES

4.9.1 Methods and Assumptions

Although data on known locations and habitats within the planning area are available, the data are not complete or comprehensive concerning all special status species known to occur or potential habitat that might exist. Known and potential special status species and habitat locations were considered in the analysis; however, the potential for species to occur outside of these areas was also considered, and, as a result, some impacts are discussed in more general terms.

Impacts on special status species would primarily result from unmitigated surface disturbance such as wildfires, wildfire-suppression activities, erosion, and trampling. Direct and indirect impacts on special status species result from any surface-disturbing activity or alteration to occupied habitats. All federal actions would comply with ESA consultation requirements, and all implementation actions would be subject to further special status species review before site-specific projects are authorized or implemented. Federal regulations and BLM and Forest Service policy protecting threatened, endangered, and sensitive species were considered methods for reducing the potential impacts from permitted activities. If adverse impacts are identified, compensatory mitigation measures, including avoidance, would be implemented to minimize or eliminate the impacts.

Indicators

Indicators of impacts on other special status species are as follows:

- Amount and condition of available habitat
- Likelihood of mortality, injury, or direct disturbance
- Likelihood of habitat disturbance

Assumptions

In addition to the assumptions in **Section 4.2.1**, this analysis includes the following assumptions:

- The analysis presented is largely qualitative due to the lack of data or uncertainty in existing data on certain special status species' occurrences, such as many of the BLM sensitive plant species. Furthermore, because many special status species may potentially use habitats that are currently unoccupied and populations fluctuate, any quantitative analysis of occupied habitat would change over time as knowledge of species locations increases. Where appropriate, acreages from **Table 2.3** are included to show a comparison between alternatives.
- Impacts on special status species would be more significant than impacts on common species because population viability may be already uncertain for special status species, and certain species, such as special status plants, tend to be poor competitors.
- Short-term effects are defined as those that would occur over a timeframe of 5 years or less, and long-term effects would occur over longer than 5 years.

- USFWS would be consulted on any action that could potentially affect any listed plant or animal species or their habitat.

Implementing the management actions for GRSG would have mostly negligible or beneficial impacts on other special status species and, therefore, impacts from each alternative are not discussed separately in detail. The key impacts from resource uses, as well as management actions for GRSG, on other special status species are described below.

4.9.2 Alternatives Analysis

Special status fish, wildlife, and plant species are likely to inhabit the population areas within the decision area, as described in **Table 3.33** and **Table 3.34**. Special status fish and wildlife habitats on BLM-administered and National Forest System lands within the decision area would be affected under all alternatives, and the condition of habitats is directly linked to vegetation conditions, water quality and quantity, and progression towards land health standards (**Section 4.8**, Vegetation (Including Noxious Weeds, Riparian Areas, and Wetlands) and **Section 4.7**, Water Resources, respectively). Habitat loss or modification due to human activity is a threat to ecosystems and has effects on species adapted to specific ecological niches. The BLM and Forest Service land management practices are intended to sustain and promote species that are legally protected and to prevent plant and animal species that are not yet legally protected from needing such protection (see the Other Special Status Species section of **Chapter 3** for agency management guidance).

General Management Decisions

Management actions for GRSG are based on minimizing disturbance to limit impacts on GRSG habitat to improve GRSG population growth. Disturbance thresholds would apply under the action alternatives throughout population areas so the potential for impacts would be present for all special status species identified in **Chapter 3** (Other Special Status Species). Impacts from disturbance on special status plant species habitat could result in loss of vigor or reduced reproductive success, changes in habitat structure, competition, loss of pollinators or pollinator habitat, soil compaction, erosion or sedimentation, alteration of hydrologic conditions, and changes in fire regime. Special status animal species could be impacted from increased habitat loss and degradation. Reducing disturbance to protect GRSG would also reduce the impacts from disturbance on special status plants and wildlife.

Under Alternative A, no specific allocations to protect GRSG is applied in mapped occupied habitat and surface-disturbing activities would continue within GRSG occupied habitat in accordance with allocations prescribed in existing LUPs. Alternative A provides the least amount of protection to GRSG habitat. Protections for GRSG under Alternative A are inconsistently applied across the decision area and overall would provide the least amount of protection for other special status species that occupy GRSG habitat (see the Other Special Status Species section of **Chapter 3**). Because there is no consistent management for GRSG across the decision area, there are no consistent direct impacts from implementing management for GRSG under Alternative A. Protection for special status plants and wildlife would continue to be managed according to the BLM and Forest Service policies and management in existing LUPs, where applicable.

Imposing disturbance caps, applying fluid mineral lease restrictions, identifying PHMA and GHMA, and changing livestock grazing practices could result in habitat protection for certain special status species that occur within GRSG habitat. Alternatives B and C and the Proposed Plans would provide the greatest quantity of habitat protection from human disturbance activities by imposing a 3 percent disturbance cap, compared to the 5 percent disturbance limit proposed under Alternatives D and E. The disturbance caps would generally protect special status species habitat by minimizing the amount of disturbance in special status species habitat that overlaps mapped occupied GRSG habitat. In addition, under Alternative C treatments that remove sagebrush would be limited by the disturbance cap. Because Utah prairie dog and black-footed ferret would benefit from sagebrush removal, limiting such treatments under Alternative C could impact Utah prairie dog and black-footed ferret (see additional discussion below). Limiting disturbance in GRSG habitat could also push disturbance to outside of mapped occupied GRSG habitat on federal lands.

The Proposed Plans also include more restrictive management in SFA as well as lek buffers and requirements for mitigation of anthropogenic disturbances; together these actions would further protect habitats. Compared to all of the other alternatives, actions proposed under Alternative C would provide the greatest quantity of protected PHMA because all mapped occupied habitat would be identified as PHMA under Alternative C. Therefore, Alternative C would provide for the most restrictions on development in PHMA and the greatest level of protection from development. In addition, under Alternative C, disturbance would be collocated where possible; concentrating smaller areas of impacts into larger, less-diffuse clusters would increase the quality of protected habitat by reducing the potential for habitat fragmentation.

Utah prairie dog complex data (**Table 4.15**) indicate that Alternative C would provide the most habitat protection for the prairie dog within occupied habitat because Alternative C would manage the most acres as PHMA and would have the highest level of restrictions on surface-disturbing activities. The 3 percent disturbance cap proposed under Alternative C would reduce impacts from surface disturbance; however, it would also limit vegetation treatments that could improve Utah prairie dog and black-footed ferret habitat as well as the habitat of other special status species that rely on areas with less sagebrush listed in the Other Special Status Species section of **Chapter 3**. The 5 percent disturbance cap proposed under Alternatives D and E would allow for more surface disturbance but it would also allow more habitat treatments (where appropriate) that could increase the quality for those species that need less of a canopy cover or less shrubs (like Utah prairie dog and black footed-ferret) while also improving GRSG habitat. Impacts from GRSG management under Alternative E would be similar to those described under Alternative D. However, Alternative E would provide fewer acres of protection to occupied GRSG habitat and the 5 percent disturbance cap would only apply to new disturbances. Because of these two differences, there is the potential for more impacts on other sensitive species both that use GRSG habitat and those that are only within the population areas if Alternative E is chosen. The Proposed Plans would not include habitat treatments as disturbances under the 3 percent disturbance cap (5 percent on National Forest System lands in Wyoming), thereby providing flexibility to improve Utah prairie dog and black-footed ferret habitat by allowing sagebrush treatments when necessary.

Table 4.15
Acres of Utah Prairie Dog Habitat in GRSG Occupied Habitat by Alternative

Category	Alternative A	Alternative B		Alternative C	Alternative D		Alternative E		Proposed Plans	
Prairie Dog Habitat	**Mapped Occupied Habitat**	**PHMA**	**GHMA**	**PHMA** *(all mapped occupied habitat)*	**PHMA**	**GHMA**	**GRSG Habitat in SGMAs/ Core Areas**	**GRSG Habitat outside SGMAs/ Noncore Areas**	**PHMA**	**GHMA**
Bald Hills	77,100	75,000	2,100	77,100	75,000	2,100	77,100	0	77,600	0
Hamlin Valley	11,500	11,500	0	11,500	11,500	0	11,500	0	11,500	0
Panguitch	105,800	105,800	0	105,800	94,700	11,200	105,400	0	105,100	0
Parker Mountain	356,100	356,100	0	356,100	356,100	0	352,500	0	336,300	0
Total	*550,500*	*548,400*	*2,100*	*550,500*	*537,300*	*13,300*	*546,500*	*0*	*530,500*	*0*

Source: BLM 2012d, 2015

Infrastructure Development (including all ROWs and utility corridors)

The development of infrastructure includes a range of permitted activities such as utility ROWs, roads, and pipelines. Surface disturbing activities associated with the construction and maintenance of ROWs can result in impacts on all special status species described in the Other Special Status Species section of **Chapter 3** through mortality, injury, displacement, and noise or human disturbance caused by increased vehicle traffic and use of heavy machinery during construction. Mortality and injury to special status bird species could occur from collision or electrocution with transmission lines and other ROW structures (EPG 2011). Indirect impacts may include introduction of invasive vegetation that results in alteration of fire return intervals; increase in predators or predation pressure; decreased survival or reproduction of the species; and decreased habitat available for special status species. Invasive species could also outcompete some of the native special status plant species. Additional impacts on habitat could include loss of vegetation and native plant communities as described in **Section 4.8.2**, Alternative A. These activities would remove or fragment habitats due to road construction and use within ROWs, which could also affect all special status species identified in the Other Special Status Species section of **Chapter 3**. Special status wildlife could avoid developed areas over the long term, or may adapt and recolonize sites after construction.

Under Alternative A, 3,219,000 acres would continue to be open to ROW development resulting in the greatest amount of BLM-administered and National Forest System lands in occupied habitat available for infrastructure development. The potential for impacts (like those listed above) from ROW and infrastructure development would continue for all special status species listed in the Other Special Status Species section of **Chapter 3**.

Management actions that restrict surface-disturbing activities from infrastructure development would reduce impacts described above such as habitat degradation or loss, fragmentation, and human disturbance. The magnitude of these impacts on special status species would depend on the location and nature of the restrictions, as well as the acres covered by the restrictions. ROW avoidance and exclusion areas that could reduce or avoid habitat impacts and would

reduce the total acreage of habitat disturbance and fragmentation. ROW development in areas where there are existing ROWs could also reduce impacts, as resident special status wildlife may have adapted to the existing ROWs (Avian Power Line Interaction Committee 2005). In addition, in areas of occupied GRSG habitat with mixed ownerships, land exchanges or acquisitions would provide more contiguous federal management of GRSG habitat and could increase the continuity of habitat for sagebrush obligate special status species. This could improve the ability of the agencies to implement management actions that would result in improved habitats, undisturbed special status fish and wildlife populations, and attainment of BLM Utah Public Land Health Standards. However, lands identified for disposal could cause fragmentation and habitat loss if the disposed land is converted to other uses, such as agriculture, residential, or industrial development.

Management under Alternative B would limit the development of infrastructure by excluding new ROWs in PHMA (2,784,200 acres) and avoiding new ROWs in GHMA (529,600 acres). See **Section 4.3.3**, Alternative B, for additional habitat protections provided under Alternative B. The exclusion of PHMA under Alternative B would substantially reduce potential impacts from surface-disturbing activities on those special status species that are within the decision area where there is PHMA whether they use sagebrush habitat or not (see the Other Special Status Species section of **Chapter 3**), compared with Alternative A. ROWs no longer in use would be restored to natural habitat and could improve habitat connectivity for special status species that occur in those areas. Land acquisitions to gain or improve GRSG habitat under Alternative B could reduce habitat fragmentation and improve habitat connectivity for all special status species in PHMA. However, the management actions proposed under Alternative B could push infrastructure development outside of PHMA.

Under Alternative C, all mapped occupied habitat would be PHMA and would be ROW exclusion areas (3,313,800 acres). Alternative C would provide the greatest amount of habitat protection for special status species within PHMA from ROW development. No land tenure adjustments would be available, preventing the BLM and Forest Service from acquiring blocks of land in an attempt to concentrate GRSG habitat and, in turn, most likely benefitting other special status species, especially those that occupy or rely on sagebrush. This could result in an increase in habitat fragmentation by creating islands of occupied habitat with a mosaic of ownerships with multiple land uses, which would impact special status species such as the Utah prairie dog and black-footed ferret, which benefit from open and contiguous habitat. Additionally, the complete closure of new ROWs in all GRSG habitat could push additional infrastructure development outside of PHMA.

Alternative D would provide management flexibility in developing infrastructure within GRSG habitat and provide more protection of habitat near leks compared to the action alternatives. Under Alternative D, 522,600 acres of PHMA would be open to new aboveground linear ROWs. A 4-mile exclusion buffer from occupied leks for aboveground linear ROWs in PHMA and a 1-mile avoidance buffer from occupied leks in GHMA would provide additional protection from infrastructure development and operations for all special status species that are in the population areas and within the exclusion areas but outside of the occupied habitat. Land tenure adjustments proposed under Alternative D would be the same as Alternative B, which would aim to reduce GRSG habitat fragmentation in PHMA. This would indirectly benefit species that

overlap GRSG habitat and could push impacts outside of PHMA. See **Section 4.3.5**, Alternative D, for more information regarding proposed management actions that would protect GRSG habitat.

Under Alternative E1, management for new infrastructure would allow for 632,200 acres open in GRSG habitat for new ROWs and would be the least restrictive action alternative. Proposed stipulations under Alternative E1 would restrict infrastructure development within occupied leks, provide a 1-mile disturbance buffer from occupied leks, establish noise thresholds during the breeding season, and implement time of day as well as seasonal stipulations when leks are active. Despite these stipulations, infrastructure development within mapped GRSG habitat in SGMAs would be permitted if project proponents demonstrate that avoidance of impacts in GRSG habitat in SGMAs is not possible. This could result in additional loss of GRSG habitat in SGMAs particularly in areas with high mineral potential such as the Uintah Population Area. Special status species that inhabit GRSG habitat in SGMAs would likely encounter a decrease habitat quantity and quality under Alternative E1. This alternative would provide the flexibility for allowing infrastructure development within GRSG habitat in SGMAs.

The Proposed Plans would provide management flexibility in developing infrastructure similar to Alternative D, but would focus on GRSG habitats. Under the Proposed Plans, over 2.7 million acres of PHMA would be ROW avoidance for new linear and site type ROWs, permits, and leases; high voltage transmission lines ROWs (100 kV or greater); major pipelines; and communication sites. Additional protection would be provided by managing PHMA and GHMA as ROW exclusions areas for solar energy development and PHMA as ROW exclusion areas for wind energy development. Under the Proposed Plans, PHMA and GHMA would be identified for retention with some exceptions for situations that would not result in impacts on GRSG or would have a net conservation gain. Impacts would be similar to the other action alternatives. Such management would protect special status species that overlap GRSG habitat, but could push impacts outside of GRSG habitat.

Under the Proposed Plans, a portion of a designated utility corridor is being realigned to avoid impacts to two primary leks in PHMA in the Panguitch Population Area. The existing designated utility corridor, under Alternative A, is aligned to intersect two primary leks but this portion of the corridor does not have any power lines in it. Under the Proposed Plans, the vacant portion of corridor is being realigned to where there currently are existing power lines and closer to Highway 89. Because of this realignment, if a new transmission line (100 kV or greater) cannot avoid PHMA, which is the principle management approach, the next option would be to locate it in a designated corridor. By placing a potential new line next to an existing power line, there would be less new disturbance and impacts would be concentrated where there is already some disturbance. The location of the existing power lines goes over some existing Utah prairie dog colonies. However, management decisions in the existing Kanab RMP that pertain to Utah prairie dogs (and are not being amended in this process) state that no surface disturbance or surface occupancy can occur within 0.5 miles of active Utah prairie dog habitats, and that renewed or amended ROWs on public lands that have the potential to disturb active and inactive Utah prairie dog colonies should be rerouted. Though a designated utility corridor does not guarantee a power line will be built in the area, it increases the likelihood, relative to other areas outside the designated corridor. In addition to complying with the GRSG lands actions

directing avoidance of this area, any potential power line would have to also comply with the Utah prairie dog management actions in the Kanab RMP, including in the realigned corridor. Further, the Kanab RMP does not restrict power lines to designated corridors; neither do the Proposed Plans. As such, any new potential power lines, while more likely to be located within the realigned corridor, would still need to comply with other GRSG and Utah prairie dog management actions.

Mineral Development (including geothermal)

Permitted surface-disturbing activities because of mineral exploration and development could result in impacts on any special status species identified in the Other Special Status Species section of **Chapter 3**. During mineral development, increased human disturbance activities could result in temporary habitat avoidance or direct impacts on special status species causing mortality or injury. Other direct impacts include the removal or degradation of habitat vegetation and the spread of noxious weeds. Continuous operations associated with oil and gas development or mining can result in long-term impacts on special status species and their habitat. Displacement of species could increase competition for resources in adjacent habitats. Over the long term, these activities could remove and fragment habitats due to road development and use, facility construction and placement, creation of well pads and pipelines, and construction. Special status species may avoid developed areas over the long term, or may adapt and recolonize sites after construction and reclamation.

Both short term, loud noise (such as from vehicles or construction) and long-term, low-level noise (such as from industrial activities such as oil and gas development) have been documented to cause physiological effects on multiple special status wildlife species. These effects include increased heart rate, altered metabolism, and changes in hormones, foraging, anti-predator behavior, reduced reproductive success, density, and community structure (Radle 2007; Barber et al. 2009a). In addition, noise can impact special status wildlife species through the disruption of communication and environmental cues (US Department of Transportation, Federal Highway Administration 2011). Determining the effect of noise is complicated because different species and individuals have varying responses, and certain species rely more heavily on acoustical cues than others (Radle 2007; Barber et al. 2009b). Impacts would be both short- and long-term, depending on the type and source of noise, and the depending on the species.

Restricting surface-disturbing activities through management actions would reduce impacts on special status species plants and animals and their habitat. Such management actions include stipulations to protect GRSG habitat, closure of areas to mineral leasing and development, areas recommended for withdrawal from mineral entry, restrictions within ACECs, and route closure or restrictions. For example, impacts on special status species within GRSG habitat would be reduced if lands are withdrawn from mineral entry, by reducing the total acreage of potential habitat disturbance and fragmentation from that activity. Areas closed to mineral leasing and development or managed under NSO stipulations would reduce surface disturbance and associated impacts from mineral development in certain areas.

Management proposed under Alternative A would continue to have 22,900 acres unsuitable for coal surface mining in occupied GRSG habitat; 138,500 acres would be closed to fluid mineral leasing and nonenergy mineral leasing. Although leasing stipulations would apply to areas open

to mineral leasing, management actions under Alternative A would provide the most acres of GRSG habitat available for mineral leasing and provide the least amount of habitat protection for all special status species. Alternatives B and C would close 3,341,300 acres and 3,821,580 acres respectively of fluid mineral leasing and could push development outside of the closed areas, impacting other lands. The remaining isolated areas outside of GRSG habitat may be the only pieces of land open to fluid mineral leasing that could be developed to a high degree. The NSO stipulations within Alternatives D and E and the Proposed Plans could also push development onto lands adjacent to the areas managed with NSO stipulations (see **Table 2.3** for a comparison of the number of acres open to leasing and subject to NSO stipulations for each fluid mineral alternative). Subsequently, these management actions could increase fluid mineral development on non-BLM administered or non-National Forest System lands. Management under Alternative E would provide the most fluid mineral leasing acreage with CSU and TL stipulations. However, Alternative E would allow the most fluid mineral leasing acres to be open (with stipulations) of all the action alternatives and would likely result in the greatest number of impacts on special status species in mapped occupied GRSG habitat in SGMAs/core areas.

Livestock Grazing and Wild Horses and Burros

Other special status species identified in the Other Special Status Species section of **Chapter 3** that use rangelands can benefit from the proper management of livestock. These benefits include providing sustainable, diverse, and vigorous mixtures of native vegetation for forage and habitat. In addition, proper management of grazing livestock can control noxious weeds and reduce fuel accumulations, protect intact sagebrush habitat, and increase habitat extent and continuity (NRCS 2011). Elmore and Messmer (2006) proposed that proper livestock grazing management can be applied to improve Utah prairie dog habitat in the long term by reducing canopy cover and increasing grass and forb composition. If managed improperly, overuse of forage by livestock could occur, leading to increased competition with wildlife for forage, and potentially reduced cover and nesting habitat for other species. Livestock could also spread weeds, which would degrade habitats. Special status wildlife could be displaced from their habitats, which could increase competition for resources in adjacent habitats. Impacts would vary depending on the extent of removal, type of vegetation impacted, and length of the grazing period. In general, the more acres that are available for livestock grazing under a given alternative, the greater the risk for impacts. Livestock may degrade riparian areas, which could impact riparian-dependent aquatic and fish species identified in the Other Special Status Species section of **Chapter 3**.

Wild horse and burro impacts are similar to those from livestock grazing, as wild horses and burros forage on and trample vegetation used by special status species. However, wild horse and burro use is not a permitted use, and is thus not managed in the same way as livestock grazing.

Under Alternative A, 329,521 AUMs of BLM-administered lands and 265,373 AUMs of National Forest System lands in GRSG habitat would continue to be available for livestock grazing. The BLM Utah's Standards for Rangeland Health would continue to provide management direction for rangelands. In addition, special status species under Alternative A would continue to be managed to conform to Standard 3 of the Rangeland Health Standards. Changes in livestock grazing practices to protect GRSG habitat would increase the availability of forage and habitat

for special status wildlife that rely on those resources as described in the Other Special Status Species section of **Chapter 3**.

Management proposed under Alternative B would permit the same number of AUMs as those under Alternative A; however, Alternative B would include GRSG habitat objectives within PHMA in BLM and Forest Service grazing allotments and management actions. Compared with Alternative A, other special status species habitat within PHMA under Alternative B would likely increase in quality from the proposed range improvements aimed at reducing impacts on GRSG habitat.

Under Alternative C1, the potential indirect benefits to some special status species from proper rangeland management, water treatments, and improvements to riparian and wetland habitats as described above would be reduced under Alternative C1. Utah prairie dog and black-footed ferret would also be impacted by the loss of the beneficial hoof action on their habitat.

Livestock grazing management actions proposed under Alternative C2 would reduce available AUMs to 197,713 on BLM-administered lands and 159,224 on National Forest System lands compared with Alternative A. In addition, AMLs for wild horses would be reduced by 25 percent, which would reduce the competition for forage between wild horses and special status species. Many of the remaining management actions proposed under Alternative C2 would be similar to those described under Alternative B with a few exceptions. Under Alternative C2, no grazing would be allowed during the growing season within GRSG habitat and other seasonal grazing restrictions would be implemented to meet GRSG habitat requirements. Additionally, the availability of AUMs under Alternative C2 could provide beneficial impacts on other special status species from proper livestock grazing practices.

Impacts from the proposed management under Alternatives D and E and the Proposed Plans would be similar to those described under Alternative B with a few exceptions. The Proposed Plans would also prioritize PHMA for review of livestock grazing permits/leases, which could expedite habitat improvements and/or rehabilitation in these areas.

Vegetation Management and Fire (including invasive plants and juniper encroachment)

A diversity of special status species use a wide variety of habitats throughout Utah. Many factors threaten the viability of special status species habitat as described in the Other Special Status Species section of **Chapter 3**. Current vegetation management is directed at fire and fuels management, habitat management, and habitat treatment to improve the quality of resources for special status wildlife and livestock, see **Section 4.8** for more details regarding vegetation management. Some existing LUPs prioritize vegetation management and habitat restoration efforts towards benefiting multiple resources, which include special status species. In addition, existing LUPs generally allow for prescribed fire and non-fire fuels treatments but they do not include specific fire management decisions aimed specifically at sagebrush habitat. However, under Alternative A, project designs would have to consider measures to reduce wildfire size and prevent the loss of sagebrush.

Vegetation management proposed under Alternatives B and C would prioritize restoration and treatment efforts to maintain, protect, and/or expand GRSG habitat. Additionally, fire management under Alternatives B and C would implement fuels treatments with an emphasis on

protecting sagebrush ecosystems. Management under Alternative C would emphasize restoring habitat affected by invasive weeds to recover and expand occupied sagebrush habitat. In addition, under Alternative C, areas affected by fire would be excluded from grazing to allow vegetation treatments to improve sagebrush ecosystems. Vegetation and fire management proposed under Alternatives B and C would strive to increase the quantity and quality of habitat of GRSG habitat, which would benefit most special status species that overlap GSRG habitat. Actions taken in these alternatives could reduce the habitat quality and directly cause injury or mortality to the special status species that do not rely on GRSG habitat as actions are taken to reduce fuels or increase sagebrush landscapes. Alternative C would eliminate habitat treatments that are critical to the improvement of habitat for other special status species that depend on portions of sagebrush that are different than the needs of GRSG including understory plant composition or removal.

Management under Alternative D and the Proposed Plans would be similar to that described for Alternative B but would include a comprehensive strategy for wildland fire management, including the FIAT. Further, Alternative D and the Proposed Plans would take into consideration the habitat requirements of other special status species, such as the Utah prairie dog or black-footed ferret, that in some cases have needs that might conflict with GRSG during certain life stages. Where the management of GRSG habitat conflicts with federally listed species habitat, under Alternative D and the Proposed Plans the federal agencies would need to develop vegetation treatments that could improve the habitat for GRSG and other threatened or endangered species at the same time or at least not to the detriment to the overall habitat or population of the other one. As such, Alternative D and the Proposed Plans would provide the most comprehensive habitat wildland fire, restoration and vegetation management of all the proposed actions for increasing special status species habitat and GRSG habitat. Vegetation treatments under Alternative D and the Proposed Plans would aim to achieve certain vegetation objectives, and include the removal of pinyon-juniper habitat and other plant species that have encroached on suitable sagebrush habitat. In addition, increased emphasis on vegetation treatments (e.g., conifer removal) and fire suppression in GRSG could result in direct and indirect impacts to Utah prairie dogs where they overlap with PHMA areas. Though measures would be taken to avoid and minimize impacts to Utah prairie dogs, the implementation of these actions could increase human presence through or near existing colonies that could change prairie dog behavior. In the short term, vegetation treatment and vegetation removal near riparian areas within GRSG habitat could result in increased sediment, however this is anticipated to be negligible because the riparian stipulations would remain the same and protect special status fish species. The BLM Utah Riparian Policy requires a 100-meter buffer for surface-disturbing activities, which is the smallest protective buffer around riparian areas in the current RMPs. If there was the need for any potential vegetation treatments within or adjacent to riparian areas for riparian health or a fuels treatment, additional site-specific evaluations to consider impacts on special status species would be required at that time. None of those actions is being proposed as part of this action.

Although efforts to increase the quality of habitat for those special status species that use GRSG habitat, those plant and animal species identified in the Other Special Status Species section of **Chapter 3** that occur in pinyon-juniper habitat would have reduced available habitat over the long term as encroaching conifers would be treated to encourage sagebrush growth. Under

Alternative E, vegetation treatments would focus on the removal of invasive plant species and encroaching pinyon-junipers to expand and improve sagebrush habitat. Additionally, management under Alternative E would recommend that within mapped GRSG habitat in SGMAs/core areas, GRSG stipulations would take precedence over stipulations to protect other species if allowable by law. Therefore, management actions proposed under Alternative E would favor special status species that rely on GRSG habitat over other such species as the experimental black-footed ferret population described in the Other Special Status Species section of **Chapter 3**.

Travel and Transportation

Habitat loss and fragmentation from the development and use of roadways as well as direct injury or mortality from vehicle strikes threaten all special status species animals described in the Other Special Status Species section of **Chapter 3**. The closure of roads to motor vehicles either permanently or seasonally would reduce the risk of impacts on special status species described above. Recreational OHV travel impacts would still occur in areas limited to designated routes due to noise disturbance, human presence, potential for weed spread and subsequent habitat degradation, and potential for injury or mortality to special status wildlife from vehicle collisions.

Under Alternative A, 797,000 acres would continue to be open to cross-country travel with no new restrictions to GRSG habitat management. Management proposed under Alternative B would limit travel to existing roads in PHMA on BLM-administered lands. Vehicle traffic would continue to be limited to existing roads on National Forest System lands. In addition, management actions under Alternative B in PHMA would evaluate permanent or seasonal road closures and limit new route construction to reduce impacts on GRSG habitat. Reducing the development of new roads or restricting vehicle use on existing roads as proposed under Alternative B would reduce the potential for impacting all special status species described in the Other Special Status Species section of **Chapter 3**. Specific management direction to reduce impacts from travel in GRSG habitat would also reduce the potential for impacting special status species that overlap GRSG habitat. Under Alternative C, no acres would be open to cross-country travel, which would reduce potential impacts from travel to special status species more than Alternative B. In addition, under Alternative C within PHMA, no new roads would be constructed within 4 miles of active leks. In addition, approximately 555,700 of mapped occupied habitat would be closed to OHV travel. This includes 32,200 acres that are currently closed as well as 523,500 acres of new closed areas. Closed areas, which are shown on **Map 2.56**, would reduce the risk of trampling or removal of vegetation, although the majority of the closed areas are absent mapped routes. Management under Alternative C would reduce impacts from OHV travel on special status species that overlap GRSG habitat on BLM-administered and National Forest System lands but the proposed actions could push cross-country travel on to adjacent nonfederal lands or increase traffic on routes outside of sagebrush habitat. Travel and transportation management proposed under Alternative D would close cross-country travel similar to Alternative C and impacts on special status species from other proposed management actions in Alternative D would be similar to Alternative B. Under Alternative E, routes not designated in a travel management plan in PHMA areas within GRSG winter and nesting habitat would be managed as limited to existing routes. In these areas within PHMA, existing route designations would be revised based on the potential for impacting GRSG habitat. Also,

Alternative E would provide the most acres open to cross-country travel of all the action alternatives; with impacts on special status species similar to those described under Alternative A but over a smaller area. Special status species in occupied GRSG habitat would have an increased risk of impacts on habitat (loss, degradation, and fragmentation) or direct injury and mortality (vehicle strikes) under Alternative E compared to the other action alternatives. However, under Alternative E, special status species outside of BLM-administered and National Forest System lands listed in the Other Special Status Species section of **Chapter 3** would have a reduced risk of impacts from travel management actions compared to the other action alternatives. Travel and transportation management under the Proposed Plans would limit OHV use similar to Alternative E, though all PHMA and GHMA (over 3.3 million acres) would be managed as limited to existing or designated routes. Impacts on special status species from other proposed management actions in the Proposed Plans would be similar to Alternative D.

Other Actions

Substantial analysis and planning would need to be implemented in order to determine the locations and types of recreation activities that would occur, such as camping, bicycling, and hunting. However, these uses are not subject to site-specific environmental review and monitoring requirements, and impacts on habitats or species would not be apparent until after damage has occurred. Overuse from recreational activities can directly impact special status species described in the Other Special Status Species section of **Chapter 3** through habitat loss or degradation and direct injury or mortality to special status plants, fish, and wildlife species. Examples of impacts on special status fish and wildlife from recreational use include habitat loss, fragmentation, or degradation; animal mortality or injury; waterway sedimentation; increased turbidity; decreased water quality; disturbance to species during sensitive or critical periods in their life cycle such as spawning, nesting, or denning; short-term displacement; and long-term habitat avoidance by species that are sensitive to noise or human presence, such as raptors. Some species may adapt to disturbances over time and could recolonize disturbed habitats.

On-site management of recreational activities could prevent or reduce impacts on other special status species. Under Alternative A, recreational use would continue throughout the planning area. As described in **Section 4.8**, no new ACECs or Forest Service Zoological Areas would be added to provide additional habitat protection under Alternative A. Recreation management actions proposed under Alternative B would restrict the BLM and Forest Service from issuing recreation permits within PHMA unless the proposed activity would have neutral or beneficial effects on GRSG. Management proposed under Alternative C would place similar restrictions on issuing permits within PHMA as Alternative C but also includes seasonal restrictions for some recreational activities within 4 miles of active leks. Impacts on special status species that overlap GRSG habitat would be reduced by limiting permitted recreational use in PHMA across Alternatives B, C, and D, and the Proposed Plans. Construction of new recreation facilities would also be limited in PHMA under the Proposed Plans. Such management, however, could push non-permitted recreational use outside of PHMA. Additionally, management proposed under Alternative C would create 15 new ACECs and Forest Service Zoological Areas that would be managed as sagebrush reserves to conserve GRSG habitat. Habitat for special status species that use GRSG habitat would increase in size and quality under Alternative C however, impacts from recreational use on special status species not associated with sagebrush would continue. In addition to management impacts described above for Alternative D and the

Proposed Plans, existing recreation permits would be evaluated and modified to avoid impacts on GRSG or restore habitat following permitted recreational activities. No new ACECs or Forest Service Zoological Areas would be included under Alternatives D and E or the Proposed Plans. Alternative E however, would include recreational use stipulations to limit surface disturbance activities within 1 mile of occupied leks and other sensitive GRSG habitat. These measures proposed under Alternative E would also protect habitat for special status species that use GRSG habitat but would not increase habitat protection for those special status species outside of GRSG habitat. The proposed stipulations for recreational use within GRSG habitat could also push non-permitted recreational activities on to adjacent habitats outside of GRSG habitat.

4.10 FISH AND WILDLIFE

4.10.1 Methods and Assumptions

Similar to **Section 4.9**, Other Special Status Species, available species information including locations and habitat descriptions are included in the following analysis. Additionally, the potential for species to occur outside of these areas were considered and discussed in general terms. Below are general descriptions of impacts that could result in the decline of wildlife habitat. Impacts from the proposed management actions are not expected to impact fish and aquatic species any different than those impacts disclosed for special status fish species (which are very limited if any) within the Other Special Status Species section above, therefore there will not be a discussion of those impacts in the Fish and Wildlife impact analysis.

Impacts on wildlife species and their habitats would result from disturbance and/or loss of plant communities, food supplies, cover, breeding sites, and other habitat components necessary for population maintenance. Impacts on wildlife would result from disturbance and/or loss of seasonally important habitat (e.g., critical for overwintering or successful breeding) to a point that would cause the species' population to decline. In addition, wildlife species could be impacted by interference with a species movement pattern that decreases the ability of a species to breed or overwinter successfully to a degree that would lead to substantial population declines.

Indicators

Indicators of impacts on wildlife are as follows:

- Amount and condition of available habitat
- Likelihood of mortality, injury, or direct disturbance
- Likelihood of habitat disturbance

Assumptions

In addition to the assumptions in **Section 4.2.1**, this analysis includes the following assumptions:

- Short-term effects would occur over a timeframe of 5 years or less, and long-term effects would occur over longer than 5 years.

- If monitoring reveals that mitigation is unsuccessful in reducing or eliminating impacts, immediate measures to prevent further impacts would be implemented as appropriate to the species affected.
- Impacts on big game populations that reduce the herd number of any herd unit that currently exceeds population objective levels would not be considered significant if the impacts would not reduce the population below the objective levels.

Implementing the management actions for GRSG would have mostly negligible or beneficial impacts on wildlife species; therefore, impacts from each alternative are not discussed in detail. The key impacts from resource uses, as well as management actions for GRSG, that would reduce these impacts on wildlife species are described below.

4.10.2 Alternatives Analysis

Wildlife habitat conditions within the decision area are directly linked to vegetation conditions, water quality and quantity, and progression towards land health standards, as described in **Section 4.7** and **Section 4.8**. Impacts from the action alternatives on wildlife species would be similar to those described in **Section 4.9**. Impacts that are specific to wildlife species are described below.

General Management Decisions

The establishment of disturbance thresholds to limit impacts on GRSG habitat is fundamental to developing management actions to increase the success of GRSG populations. Wildlife species throughout the population areas would be impacted by the disturbance limits imposed by the BLM and Forest Service to improve the management of GRSG. As described in the Fish and Wildlife section of **Chapter 3** over 600 species of vertebrate wildlife species inhabit Utah; however, the analysis of impacts on wildlife species will focus on migratory birds and big game as federal and state management agencies maintain explicit population trend data for these species for regulatory and wildlife management objectives. Surface disturbance could directly degrade or remove wildlife habitat or result in mortality or injury to wildlife species. In general, actions to reduce disturbance on GRSG habitat would also result in reduced disturbance and improve habitat for wildlife species that occupy GRSG habitat.

Alternative A provides the least amount of protection for wildlife that occupy GRSG habitat as surface-disturbing activities would continue under the management of existing LUPs without surface disturbance caps.

Management actions proposed under Alternatives B and C would provide the greatest quantity and quality of habitat protection by applying a 3 percent disturbance cap on anthropogenic disturbance in GRSG habitat. Wildlife species that occur in shrub steppe habitat for part of their life cycle could receive more habitat protection under Alternatives B and C compared with Alternative A. Refer to the Fish and Wildlife section of **Chapter 3** for more details regarding wildlife species that occupy GRSG habitat and that would benefit greatest by this protection.

Compared to the other action alternatives, Alternative C would provide the most restrictions on development within PHMA and, therefore, the greatest level of protection from impacts on migratory birds and wildlife species because of human activities. Distributions of big game

habitat, including crucial winter and fawning/calving habitat that occur within PHMA, would receive the most protection under Alternative C (**Table 4.16**). These sensitive habitats limit Utah big game herds and, by providing more protection for these crucial ranges, population trends could increase. However, the 3 percent disturbance cap on anthropogenic disturbances would limit the ability to do vegetation treatments that may be needed to increase the quality of crucial wildlife habitat within occupied GRSG habitat.

Alternatives D and E would provide fewer acres of protected habitat compared with Alternative C because of the differences in areas managed as PHMA/mapped GRSG habitat in SGMAs/core areas and via the proposed disturbance cap. The 5 percent disturbance cap proposed under Alternatives D and E would allow for some additional protection from disturbance above that seen in Alternative A, although not to the same degree as in Alternative C. Management under these alternatives, however, would provide more flexibility to implement habitat treatments that could increase the quality of crucial or important wildlife habitat while also improving GRSG habitat.

Impacts from GRSG management under Alternative E on migratory birds and wildlife would be similar to those described under Alternative D. However, Alternative E would provide fewer acres of protection to contiguous blocks of vegetation and the 5 percent disturbance cap would only apply to new disturbances. As a result, the level of protection of habitat from disturbance would be reduced.

Under the Proposed Plans, lands would be managed to conserve, enhance, and restore sagebrush ecosystems. Management actions would be applied within identified SFA, PHMA, and GHMA, as well as in certain areas outside of PHMA and GHMA, including vegetation objectives to achieve improvements in GRSG habitat. Under the Proposed Plans, a 3 percent disturbance cap (5 percent on National Forest System lands in Wyoming) on discrete anthropogenic disturbances would be applied in PHMA at both the BSU and project levels; however, habitat treatment areas would not be included under the cap. Additionally, a limit would be placed on the density of energy and mining facilities, which would reduce impacts on wildlife habitat caused by such disturbances as described under Alternative A.

Under the Proposed Plans, anthropogenic disturbances in PHMA and GHMA would also be mitigated to ensure a net conservation gain to GRSG, which would also maintain habitat for other wildlife species that use GRSG habitat. Conservation measures would be imposed to complement mitigation and further reduce anthropogenic disturbance in PHMA and GHMA, including RDFs and lek buffers (**Appendix F**).

The Proposed Plans would impose additional management measures within GRSG habitat that would also benefit wildlife that overlap with GRSG habitat due to reductions in disturbance and habitat loss. However, impacts on wildlife that do not use sagebrush habitats will likely continue as described in Alternative A. Nevertheless, the Proposed Plans will provide the greatest benefit for wildlife with respect to disturbance relative to the action alternatives.

Table 4.16
Acres of Elk, Mule Deer, Pronghorn (antelope), Moose, Bison, and Bighorn Sheep Habitat in GRSG Management Areas by Alternative

Habitat Type	Alternative A	Alternative B		Alternative C	Alternative D		Alternative E		Proposed Plans	
	Mapped Occupied Habitat	PHMA	GHMA	PHMA *(all mapped occupied habitat)*	PHMA	GHMA	GRSG Habitat in SGMAs/ Core Areas	GRSG Habitat outside SGMAs/ Noncore Areas	PHMA	GHMA
Elk										
Crucial (Winter)	1,338,000	802,700	534,400	1,338,400	835,400	502,900	760,100	581,400	801,600	540,100
Crucial (All)	2,827,800	2,098,900	738,700	2,843,700	2,166,300	672,600	2,033,300	836,300	2,166,600	733,700
Calving	782,200	1,700	16,300	782,200	112,300	422,500	1,700	18,000	0	0
Mule Deer										
Crucial (winter)	2,325,300	1,840,400	490,600	2,331,000	1,911,700	433,600	1,816,700	502,300	1,844,700	445,900
Crucial (All)	4,324,300	3,440,200	902,200	4,342,400	3,465,700	944,600	3,372,800	991,600	3,475,700	889,600
Fawning	1,647,600	1,321,700	372,500	1,641,000	1,234,200	360,900	1,295,600	371,700	1,322,300	329,900
Pronghorn (antelope)										
Crucial (Winter)	220,800	165,700	0	165,700	165,700	0	165,400	0	165,200	0
Crucial (All)	1,118,200	1,316,600	346,900	1,709,800	1,345,000	364,700	1,385,900	319,000	1,348,000	331,560
Fawning	394,300	171,200	223,000	394,264	171,200	223,000	170,000	223,600	170,200	223,400
Moose										
Crucial (Winter)	782,600	697,800	84,800	794,500	698,500	84,100	703,800	88,900	717,800	86,200
Crucial (All)	1,522,000	1,146,600	172,100	1,655,800	1,350,500	171,500	1,350,000	179,500	1,390,800	168,100
Calving	94,500	73,200	21,300	94,500	73,200	21,300	71,500	22,600	14,900	18,500
Bison										
Habitat	425,500	0	425,300	425,500	0	425,300	0	425,300	0	425,300
Bighorn Sheep										
Crucial (year-long)	228,400	63,400	234,600	228,400	430	192,000	21,600	206,800	95,700	204,200

Source: BLM 2012d, 2015

Infrastructure Development (including all ROWs and utility corridors)

Surface disturbing activities associated with the construction and maintenance of ROWs can result in a variety of impacts on wildlife species similar to the impacts described in **Section 4.9**.

Impacts including habitat degradation or loss, fragmentation, and human disturbance would be reduced by applying management actions that restrict surface-disturbing activities. The magnitude of these impacts on birds and wildlife species would depend on the location and nature of the restrictions, as well as the acres covered by the restrictions.

Under Alternative A, the potential for impacts from ROW and infrastructure development would continue for all migratory birds and wildlife species listed in the Fish and Wildlife section of **Chapter 3**.

Alternative B would limit the development of infrastructure by excluding new ROWs in PHMA (2,784,200 acres) and avoiding new ROWs in GHMA (529,600 acres). This action would greatly reduce the potential for impacts from surface-disturbing activities on species that inhabit sagebrush ecosystems compared with Alternative A. Under Alternatives B, C, D, and E2, ROWs no longer in use would be restored to natural habitat and could improve habitat connectivity for wildlife that occur in GRSG habitat. Land acquisitions to gain or improve GRSG habitat under Alternative B could reduce habitat fragmentation and improve habitat connectivity for all wildlife species in PHMA but would be focused on those that share habitat with GRSG. However, the management actions proposed under Alternative B could push infrastructure development to outside of GRSG habitat, which would thus concentrate impacts on those areas that are outside of federal ownership.

Alternative C would designate all occupied GRSG habitat as PHMA and would be ROW exclusion areas (3,313,800 acres). Although Alternative C would provide the greatest amount of habitat protection for birds and wildlife within PHMA from ROW development. The complete closure of new ROWs in GRSG habitat could push infrastructure development onto adjacent nonfederal land.

Under Alternative D, proposed management actions would provide flexibility in infrastructure development within GRSG habitat and would provide more protection of habitat near leks compared to the other action alternatives. Wildlife species habitat within 4 miles of an occupied lek would receive extra protection by designating linear ROWs as exclusion areas. Furthermore, lands beyond the 4-mile buffer from occupied leks would be designated as avoidance areas, which could further protect wildlife habitat in those areas. Big game and bird species known to occupy or forage in suitable lek habitat would have increased habitat protection under Alternative D. Land tenure adjustments and related impacts would be the same as described under Alternative B. See **Section 4.3.3**, Alternative B, for a detailed discussion of proposed management actions that would protect GRSG habitat.

Alternative E would be the least restrictive action alternative in terms of infrastructure development. Proposed stipulations under Alternative E would limit disturbance on GRSG and lek habitat. However, infrastructure development within mapped GRSG habitat in SGMAs/core areas would be permitted if project proponents demonstrate that avoidance of impacts on mapped GRSG habitat in SGMAs/core areas is not possible. This could result in additional loss

of important wildlife habitat in mapped GRSG habitat in SGMAs/core areas, particularly in areas with high mineral potential such as the Uintah Population Area where crucial winter and fawning/calving habitat occurs for many big game species including elk and mule deer.

The Proposed Plans would provide management flexibility in developing infrastructure similar to Alternative D, but would focus on GRSG habitats. Under the Proposed Plans, approximately 2,724,300 acres of PHMA would be ROW avoidance for new linear and site type ROWs, permits, and leases; high voltage transmission lines ROWs (100 kV or greater); major pipelines; and communication sites. Additional protection would be provided by managing PHMA and GHMA as ROW exclusions areas for solar energy development and PHMA as ROW exclusion areas for wind energy development. RDFs would be applied to further reduce impacts. Ensuring a net conservation gain to GRSG under the regional mitigation strategy may require projects to avoid, minimize, or compensate for their potential impacts on GRSG, which could reduce the loss or disturbance of habitat from specific projects. Offsite mitigation may not always benefit species impacted at the disturbed site. Therefore, there could be a local impact on certain species.

Under the Proposed Plans, PHMA and GHMA would be identified for retention with some exceptions for situations that would not result in impacts on GRSG or would have a net conservation gain. Retaining all GRSG habitat in public ownership would mean these lands were subject to the management actions above; such management would protect sagebrush obligate migratory birds and wildlife, but could push impacts into adjacent, non-sagebrush habitats.

Mineral Development (including geothermal)

In general, surface-disturbing activities because of mineral exploration and development result in short-term and long-term impacts on migratory birds and wildlife species as described in **Section 4.9**. Specifically, wildlife research indicates that big game species are known to avoid areas with active oil and gas wells and supporting service roads. Wilbert et al (2008) provided observations of wildlife responses to indicators including distance to nearest roads and well pads. Their findings indicate that elk habitat effectiveness is eliminated in nonforested habitats when road densities exceed 1 mile/square mile. Mule deer in shrub habitat avoid roads within 328 feet and the minimum distance from active oil and gas development that mule deer are likely to occur in range between 1.6 and 2.3 miles from well pads. Restricting surface-disturbing activities from mineral development through management actions would therefore reduce impacts on wildlife species and their habitat, generally for species within GRSG habitat.

Under Alternative A, 22,900 acres are unsuitable for coal surface mining in occupied GRSG habitat; and 138,500 acres are closed to fluid and nonenergy mineral leasing. Leasing stipulations apply to areas open to mineral leasing; however, management actions under Alternative A would provide the most acres of GRSG habitat available for mineral leasing and provide the least amount of habitat protection for all migratory birds and big game species.

In contrast, Alternatives B and C would close 3,341,300 acres and 3,821,580 acres respectively of fluid mineral leasing. This may reduce impacts from fluid mineral development and habitat fragmentation on wildlife within GRSG habitat on federal lands. The closure of PHMA to fluid mineral leasing would substantially increase the protection of crucial winter habitat for elk and mule deer in the Uintah Population Area from management actions proposed under Alternative

C. In addition, imposing a 3 percent disturbance cap would limit discrete disturbances in PHMA from roads as well as oil and gas well development reducing wildlife avoidance described by Wilbert et al (2008) above. However, this action could also push development to outside of PHMA. Any reduction in habitat fragmentation within the planning area would increase the connectivity for those wildlife species that prefer open continuous rangeland habitat.

Alternatives D and E, would open more lands to fluid mineral leasing than the other action alternatives but these lands would be subject to NSO and CSU/TL stipulations. Where there is an NSO, surface occupancy would be precluded in that area and impacts would be similar to the area being closed. Impacts on wildlife would be similar to Alternatives B and C in those areas. However, the stipulations in Alternatives D and E could also push development to outside of areas managed for GRSG as described above. In those cases, the effect would be the same as under Alternatives B and C where the NSO occurs. The CSU and TL stipulations would still allow for some development in GRSG habitat, though. Areas subject to NSO restrictions would be greater under Alternative D than under Alternative E.

Impacts under the Proposed Plans would be similar to Alternative B, but expansion of existing operations for nonenergy leasable and salable minerals could be considered in certain instances, causing impacts on habitat for migratory birds and wildlife as described for Alternative A. Restrictions under the Proposed Plans include closure of 3,370,000 acres (24 times more land than under Alternative A) to nonenergy mineral leasing and closure to mineral materials development on 3,340,200 acres (45 times more land than under Alternative A). Coal management would emphasize underground mining, which would reduce impacts on vegetation that serves as habitat for migratory birds and wildlife.

The same acreage of GRSG habitat and population areas would be closed to fluid mineral leasing as under Alternative A so impacts would be the same as Alternative A in those areas. Managing PHMA as NSO for fluid minerals would result in a similar effect as described for Alternative B because disturbance would be pushed outside of PHMA. While GHMA would be available for fluid minerals leasing and other types of minerals and energy development, such activities would be subject to conservation measures (i.e., net conservation gain, lek buffers, and RDFs). This would generally have a local beneficial impact on wildlife in those areas. SFA would also be recommended for withdrawal from the Mining Law of 1872, as amended, which would preclude development in SFA if withdrawn.

Livestock Grazing and Wild Horses and Burros

Wildlife species that use rangeland habitat can benefit from the proper management of livestock as discussed in **Section 4.9**. Conversely, improper management and overuse of rangeland can impact wildlife species by the degradation or loss of habitat and increasing competition for forage. Lack of suitable habitat could push wildlife species off these areas. The types of impacts from wild horses and burros on fish and wildlife are the same as described in **Section 4.9**.

Under Alternative A, the BLM Utah's Standards for Rangeland Health and standards and guidelines in Forest Service LRMPs and allotment-specific decision documents would continue to provide management direction for rangelands. Approximately 329,521 AUMs on BLM-administered lands and 265,373 AUMs on National Forest System lands in GRSG habitat would continue to be available for livestock grazing. Changes in livestock grazing practices to protect

GRSG habitat would increase the availability of forage and habitat for wildlife that rely on those resources. Competition between wildlife grazers (including elk, pronghorn, and bison) and livestock would be reduced because of the action alternatives. Some big game populations that occur within the areas made unavailable for livestock grazing could trend upwards due to the increased availability of forage.

Alternative B would permit the same number of AUMs as those under Alternative A; however, Alternative B would include GRSG habitat objectives within PHMA in BLM and Forest Service grazing allotments and management actions. Big game and migratory bird habitat within PHMA would likely increase in quality from the proposed range improvements compared with Alternative A.

By making over 3.3 million acres unavailable for livestock grazing under Alternative C1, there would be a reduction in competition between grazing wildlife and livestock which would increase the availability of forage plants for wildlife grazers including elk, pronghorn. However, the elimination of grazing within the population areas would end the maintenance of water improvements in areas previously used by livestock. The reduced availability of water under Alternative C1 would also locally impact browsers (mule deer). Livestock grazing management proposed under Alternative C2 would reduce available AUMs to 197,713 on BLM-administered lands and 159,224 on National Forest System lands compared with Alternative A. In addition, AMLs for wild horses would be reduced by 25 percent, which would reduce the competition for forage between wild horses and wildlife species. Many of the remaining management actions proposed under Alternative C2 would be similar to those described under Alternative B with a few exceptions. Under Alternative C2, no grazing would be allowed during the growing season within GRSG habitat and other seasonal grazing restrictions would be implemented to meet GRSG habitat requirements. Management actions under Alternative C2 would reduce the number of permitted AUMs on federal lands and reduce competition between big game and livestock for forage and slightly increase protection from grazing on wildlife habitat.

Under Alternative D, site-specific reviews during grazing permit renewals could allow for adjustments to the number of AUMs on federal lands. In addition, Alternative D would direct the agencies to collaborate with private landowners in PHMA to reduce habitat fragmentation and provide landscape level habitat improvements. Wildlife habitat connectivity within PHMA would increase as a result of the management proposed under Alternative D. Actions proposed under Alternative E would allow for continued grazing in mapped GRSG habitat in SGMAs/core areas but would adjust grazing practices to reduce impacts on GRSG through the use of BMPs. Livestock grazing management within mapped GRSG habitat in SGMAs/core areas would continue to degrade habitat and increase competition for forage with wildlife under Alternative E.

Impacts on wildlife from livestock grazing management under the Proposed Plans would be similar to those described for Alternative D. The Proposed Plans would further reduce impacts on riparian and wet meadow vegetation by prioritizing the review of grazing permits/leases in SFA in areas not meeting Land Health Standards, with a focus on those containing riparian and wet meadow vegetation. This action would provide beneficial impacts on wildlife, for which

riparian and wet meadow habitats provide important habitat. Impacts from wild horse and burro management would be similar to those described under Alternative B.

Vegetation Management and Fire (including invasive plants and juniper encroachment)
Habitat conservation and management of vegetation of sagebrush ecosystems not only benefit GRSG but also can increase habitat quality and quantity for a variety of migratory birds and big game. Bird species including the Brewer's sparrow, sage sparrow, and sage thrasher depend on functional sagebrush habitat as described in the Fish and Wildlife section of **Chapter 3**. Big game including elk, mule deer, and pronghorn would also benefit from increased habitat protection because of management actions aimed at improving and expanding GRSG habitat.

Current vegetation management is directed at fire and fuels management, habitat management, and habitat treatment to improve the quality of resources for wildlife, see **Section 4.8** for more details regarding impacts from vegetation management. Some LUPs prioritize vegetation management and habitat restoration efforts towards benefiting multiple resources including wildlife species. In addition, LUPs generally allow for prescribed fire and non-fire fuels treatments but they do not include specific fire management decisions aimed specifically at sagebrush habitat. However, under Alternative A, project designs would have to consider measures to reduce wildfire size and prevent the loss of sagebrush. This would increase protection of habitat for wildlife species, although the degree of protection would vary under different LUPs.

Under the habitat restoration and vegetation management proposed in the action alternatives, efforts to maintain, protect, and expand GRSG habitat would prioritize the implementation of restoration and treatment activities. Additionally, fire management under Alternatives B and C would implement fuels treatments with an emphasis on protecting sagebrush ecosystems. Management under Alternative C would emphasize restoring habitat affected by invasive weeds to recover and expand occupied sagebrush habitat. In addition, under Alternative C, areas affected by fire would be excluded from grazing to allow vegetation treatments to improve sagebrush ecosystems. Impacts from fire and prescribed fire treatments under Alternative C would be included in the 3 percent disturbance cap. The vegetation and fire management proposed under Alternatives B and C could increase the quantity and quality of habitat for wildlife species that use GRSG habitat. However, Alternative C could eliminate habitat treatments that are critical to the improvement of habitat for wildlife species that depend on portions or seral stage of sagebrush communities that are different from the needs of GRSG. Treatments could include the removal of understory plant communities or selectively enhancing different seral stages to improve sagebrush ecosystems that would effectively remove or modify the preferred habitat for other wildlife species.

Alternative D provides the most comprehensive habitat restoration and vegetation management of all the proposed actions for increasing habitat for wildlife species that use GRSG habitat. Vegetation treatments under Alternative D would include the removal of pinyon-juniper habitat and other plant species that have encroached on suitable sagebrush habitat. However, wildlife species including the black-throated gray warbler, ferruginous hawk, pinyon jay, and other migratory birds listed in the Fish and Wildlife section of **Chapter 3** that occupy pinyon-juniper habitat, would be impacted by treatments. It is expected that impacts on pinyon-juniper obligate

species from conifer removal activities would be minimal as these treatments would focus on the edge of encroaching conifers and would not occur in the nesting or breeding seasons. Additionally, proposed treatments to improve early brood-rearing habitat aimed at improving understory (grasses and forbs) would also increase forage for big game grazing species, including pronghorn that rely on those habitats for forage. For further details regarding vegetation management in the decision area, refer to **Section 4.8**.

Under Alternative E, vegetation treatments would focus on the removal of invasive plant species and encroaching pinyon-junipers in order to expand and improve sagebrush habitat. These treatments would have similar impacts on wildlife as described under Alternative D. Impacts from fire and fire treatment would also be subject to the 5 percent disturbance cap. Additionally, management under Alternative E would recommend that within mapped GRSG habitat in SGMAs/core areas, GRSG stipulations would take precedence over stipulations to protect other species if allowable by law. Therefore, management actions proposed under Alternative E would favor providing increased habitat protection for sagebrush obligate wildlife species over enhancing or protecting habitat for wildlife species that do not overlap with GRSG habitat.

Management under the Proposed Plans would be similar to that described for Alternative D but would include a comprehensive strategy for wildland fire management, including the FIAT. Vegetation treatments under the Proposed Plans would aim to achieve certain vegetation objectives, and include the removal of pinyon-juniper habitat and other plant species that have encroached on suitable sagebrush habitat. These vegetation treatments would not be counted towards the 3 percent disturbance cap (5 percent on National Forest System lands in Wyoming) under the Proposed Plans.

Impacts on migratory birds and wildlife species from vegetation management under the Proposed Plans would be similar to those described for Alternative D. However, the Proposed Plans would further reduce impacts on sagebrush and riparian/wetland habitats by including additional measures for conifer removal, including acres to be removed, improved management of wet meadows, and implementation of RDFs. Reduced impacts on these habitats would have a beneficial impact on migratory birds and wildlife that use them.

Impacts from wildland fire management under the Proposed Plans would also be similar to those described for Alternative D. The Proposed Plans would further reduce impacts on habitat for migratory birds and wildlife by including additional fuels management actions, such as removing encroaching conifer stands, prioritizing the use of native seeds, and avoiding sagebrush reduction treatments in certain areas. Though removal of conifers in particular may have negative impacts on some migratory birds in the short term, these actions would help to retain and increase vegetation extent and improve vegetation condition in the long term and therefore provide beneficial impacts on most species of migratory birds and other wildlife. Furthermore, the likelihood of catastrophic wildfire and subsequent impacts on habitat from wildland fire described under Alternative A would also be reduced.

Travel and Transportation

Habitat loss and fragmentation from the development and use of roadways as well as direct injury or mortality from vehicle strikes threaten all wildlife species described in the Fish and

Wildlife section of **Chapter 3**. Recreational OHV travel impacts would still occur in areas limited to designated routes due to noise disturbance, human presence, potential for weed spread and subsequent habitat degradation, and potential for injury or mortality to wildlife from vehicle collisions.

The permanent or seasonal closure of roads to motor vehicles would reduce the risk of impacts on migratory birds and big game species.

Under Alternative A, 797,000 acres would continue to be open to cross-country travel on BLM-administered lands. As such, the risk of impacting wildlife species within the decision area would not change from current conditions.

Alternative B would limit travel to existing roads in PHMA on BLM-administered lands. Vehicle traffic would continue to be limited to existing roads on National Forest System lands under all alternatives. Routes within PHMA would be evaluated for permanent or seasonal closures and new route construction would be limited to reduce impacts on GRSG habitat under Alternative B. Reducing the development of new roads or restricting vehicle use on existing roads as proposed under Alternative B would reduce the potential for impacting all wildlife species. Specific management direction to reduce impacts from travel in GRSG habitat would also reduce the potential for impacting wildlife species that also occupy that habitat. Areas open to cross-country OHV use are the same as those in Alternative A so impacts would be the same as under Alternative A.

Under Alternative C, no acres would be open to cross-country travel on BLM-administered lands, which would reduce potential impacts from travel on big game and migratory bird species more than Alternative B. Furthermore, 555,700 acres of GRSG habitat would be closed to OHV travel, including 32,200 acres that are currently closed. Closures overlap GRSG brood-rearing habitat, winter habitat, and/or are within 4 miles of an active lek. Brood-rearing habitat for GRSG consists of tall herbaceous understory vegetation for cover and access to riparian areas for forage. Preferred winter habitat for GRSG includes dense sagebrush canopy and forbs. Elk and bison are known to overlap with GRSG brood-rearing habitat in the decision area and would therefore receive increased habitat protection from human travel activities compared to the other action alternatives. In addition, under Alternative C within PHMA, no new roads would be constructed within 4 miles of active leks. Management under Alternative C would reduce impacts from OHV travel on sagebrush-obligate bird species on BLM-administered and National Forest System lands. However, the proposed actions could push cross-country travel outside of sagebrush habitat or outside of PHMA.

Travel and transportation management proposed under Alternative D would limit OHV travel to existing or designated routes similarly to Alternative B. Impacts on wildlife species from other proposed management actions in Alternative D would be similar to Alternative B.

Under Alternative E, routes not designated in a travel management plan in mapped GRSG habitat in SGMAs/core areas within GRSG winter and nesting habitat would be limited to existing routes. Big game species known to occupy GRSG winter and nesting habitat described in the Fish and Wildlife section of **Chapter 3** would receive increased habitat protection under Alternative E. In these areas, existing route designations would be revised based on the potential

for impacting GRSG habitat. Also, Alternative E would provide the most acres open to cross-country travel on BLM-administered lands of all the action alternatives; with impacts on wildlife species similar to those described under Alternative A but over a smaller area. Sagebrush-obligate migratory birds would have an increased risk of impacts on habitat (loss, degradation, and fragmentation) or direct injury and mortality (vehicle strikes) under Alternative E compared to the other action alternatives. However, because areas would be available for cross-country OHV travel under Alternative E, the level of such use that would be pushed to outside of SGMAs would be less than under the other action alternatives.

Travel and transportation management under the Proposed Plans would limit OHV use similar to Alternative E, though all PHMA and GHMA would be managed as limited to existing or designated routes. Impacts on wildlife from travel and transportation management under the Proposed Plans would be similar to those described for Alternative D. The Proposed Plans would have greater potential to increase the extent of sagebrush vegetation and habitat for associated migratory bird and wildlife species under travel and transportation management actions by considering the use of transplanted sagebrush when reseeding roads, primitive roads, and trails. In addition, there would be potential beneficial impacts on habitat from applying lek buffers and the 3 percent disturbance cap (5 percent on National Forest System lands in Wyoming). These measures could reduce the likelihood of loss or disturbance of habitat for migratory birds and wildlife from travel and transportation management as described under Alternative A. However, impacts on migratory birds and wildlife that do not use sagebrush habitats will likely continue as described in Alternative A. Nevertheless, the Proposed Plans will provide the greatest benefit for wildlife relative to the action alternatives because of the flexibility in management.

Other Actions

All wildlife species can be directly impacted from the overuse of habitat by a multitude of recreational activities. Examples of impacts on wildlife from recreational use include habitat loss, fragmentation, or degradation; animal mortality or injury; disturbance to species during sensitive or critical periods in their life cycle; short-term displacement; and long-term habitat avoidance by species that are sensitive to noise or human presence. Some species may adapt to disturbances over time and could recolonize disturbed habitats.

Recreation management actions proposed under Alternative B would restrict the BLM and Forest Service from issuing recreation permits within PHMA unless the proposed activity would have neutral or beneficial effects on GRSG. Management proposed under Alternative C would place similar restrictions on issuing permits within PHMA as Alternative B but also includes seasonal restrictions for recreational activities within 4 miles of active leks. Impacts on sagebrush obligate bird species as well as big game that use these habitats would be reduced by limiting permitted recreational use in PHMA across Alternatives B, C, and D. This management action however could push non-permitted recreational use outside of PHMA.

Under Alternative A, recreational use would continue throughout the planning area; no new ACECs or Forest Service Zoological Areas would be added to provide additional habitat protection under Alternative A. Management proposed under Alternative C would create 15 new ACECs and Forest Service Zoological Areas that would be managed as sagebrush reserves

to conserve GRSG habitat. Sagebrush obligate bird species and other wildlife habitat would increase in size and quality under Alternative C however, impacts from recreational use on species not associated with sagebrush would continue. In addition to management impacts described above for Alternative D, existing recreation permits would be evaluated and modified to avoid impacts on GRSG or restore habitat following permitted recreational activities. No new ACECs or Forest Service Zoological Areas would be included under Alternatives B, D, or E, or the Proposed Plans.

Alternative E would include recreational use stipulations to limit surface disturbance activities within 1 mile of occupied leks and other sensitive GRSG habitat. These measures would increase habitat protection for sagebrush-obligate bird species and big game but would not increase habitat protection for wildlife outside of GRSG habitat. The proposed stipulations for recreational use within GRSG habitat could also push non-permitted recreational activities to outside of GRSG habitat.

In general, impacts from recreation would be similar among all alternatives and the Proposed Plans, as dispersed casual recreation would continue throughout the planning area. Construction of new recreation facilities would also be limited in PHMA under the Proposed Plans.

4.11 WILD HORSES AND BURROS

4.11.1 Methods and Assumptions

Indicators

Indicators of impacts on wild horse and burro management are as follows:

- Changes to AML for HMAs in mapped GRSG habitat
- Changes to ability to manage or HMAs due to changes in forage availability and sufficient volume, quality, and distribution (location) of water sources
- Ability to perform necessary management activities in HMAs such as fertility treatments and horse gathers

Assumptions

In addition to the assumptions in **Section 4.2.1**, this analysis includes the following assumptions:

- Horses are dependent on the herbaceous component of a shrub/grass plant community. Encroachment of shrubs or pinyon-juniper onto established rangelands are adverse, and increases in grasses and forbs are beneficial. Vegetation treatments such as prescribed burns or weed control can enhance the plant community composition and forage availability.
- Heavy or poorly timed grazing will adversely affect plant composition, plant succession, and ground cover.
- Water is the primary resource associated with wild horse distribution. Water developments can improve wild horse distribution.
- Fences and other disturbances can restrict wild horse movement and access.

- While wild horses and burros may be found on lands outside HMAs, areas outside HMAs are not managed for wild horses and burros.

The Forest Service does not manage any wild horses or burros in mapped occupied GRSG habitat in the planning area; therefore, no impacts on wild horse or burro management would occur on National Forest System lands.

4.11.2 Alternatives Analysis

Implementing management for the protection of GRSG generally involves reducing or otherwise restricting land uses and activities that could potentially reduce forage availability or disturb wild horse populations. For example, mineral extraction, recreation, and construction activities within ROW grants may all reduce forage availability, result in disturbance of horses, or prohibit the ability of horses to move freely across HMAs. Protecting areas from these activities for the purpose of protecting GRSG would also protect forage for wild horse and burros and limit disturbance.

Impacts could occur to wild horse and burros and the ability to support AMLs when management options for HMAs are restricted. Prioritizing gather operations in PHMA could would ensure that AML is maintained along with the necessary forage for the wild horses in higher-level priority HMAs; however, it may increase the number of gathers needed to maintain AML, which could potentially increase the disturbance to the populations as well as possible disruption of herd dynamics. Prioritization could also put HMAs outside of GRSG habitat at risk for overpopulation; however, under this LUPA, provisions would allow for exceptions as needed for herd health-limiting impacts. Impacts from range improvement restrictions would generally vary based on type of range improvement affected; restrictions on fences would improve wild horse habitat by allowing free range, while limitations on projects that could enhance forage and water availability would not help to support the AML.

Across all alternatives, a total of 181,600 acres of HMAs would fall within mapped occupied GRSG habitat, all of which are in PHMA/mapped GRSG habitat in SGMAs/core areas. A breakdown of acres by HMA is included in **Table 4.17**.

Table 4.17
Comparison of Wild Horse- and Burro-Affecting Management Actions by Alternative

Alternatives A-E and the Proposed Plans: Acres of HMAs within mapped GRSG habitat on BLM-administered lands	
HMA	**Occupied Habitat**
Chokecherry	19,000
Opaque Mountain	98,300
Range Creek	38,000
Sulphur	25,300
Tilly Creek	1,000
Total	**181,600**

Source: BLM 2015
Note: All HMAs fall within areas classified as PHMA/mapped GRSG habitat in SGMAs/core areas in Alternatives B-E and the Proposed Plans

None of the alternatives, with the exception of Alternative C2, would change the acres or AML numbers within designated HMAs as part of the planning level decision. Impacts from management for wild horses and burros under all alternatives (other than Alternative C2) would be limited to any future implementation level changes that occurred as a result of AML adjustment based on habitat conditions and GRSG habitat objectives, as described in further detail below.

Under Alternative C2, in contrast, AMLs would be directly reduced by 25 percent for HMAs within PHMA as part of the planning level decision. This would result in a reduction of AMLs for the following HMAs that are located entirely or partially within mapped occupied GRSG habitat:

- Chokecherry (reduction to 23 heads)
- Onaqui Mountain (reduction to 158 heads)
- Range Creek (reduction to 94 heads)
- Sulphur (reduction to 188 heads)
- Tilly Creek (reduction to 38 heads)

Impacts would be concentrated under Alternative C2 in three population areas: Hamlin Valley (Chokecherry, Sulphur, and Tilly Creek HMAs), Sheeprocks (Onaqui Mountain HMA), and Carbon (Range Creek HMA). Because of AML reduction under Alternative C2, costs of wild horse and burro management would increase, due to a need for additional horse gathers for removal and/or fertility treatment.

Under Alternative A, all adjustments to HMAs, HMA plans, and priorities of gathers would continue during implementation level planning and would be based on monitoring data. As a result, impacts on wild horses under Alternative A would depend on the site-specific conditions as reported in monitoring data.

In contrast, management actions in Alterative B, C, and D, and the Proposed Plans would require examination of herd management plans, AMLs, range improvements, or other implementation level NEPA and management activities for wild horse and burros in light of GRSG habitat objectives and potential impacts on GRSG habitat. These actions would apply to PHMA as identified in **Table 4.17** in Alternatives B, C, and D, and the Proposed Plans. This could potentially result in indirect, long-term changes to wild horse and burro management should objectives for GRSG habitat not align with management objectives for wild horse management. In many cases, however, management actions to improve GRSG habitat would also improve wild horse rangeland conditions in the long term. For example, conifer removal and noxious weed control as identified in the VDDT approach or the prioritization for treatment/restoration projects as identified in the FIAT assessment approach would improve forage conditions for wild horse and burros.

Placing a cap on anthropogenic disturbance within PHMA under Alternative B and the Proposed Plans would prohibit and restrict development in HMAs, which would limit forage degradation and reduce harassment of wild horses and burros.

Indirect impacts on wild horses and burros may occur under Alternative C1 due to the removal of permitted livestock grazing from mapped occupied habitat. Due to removal of livestock, there is potential for additional forage to be available for wild horse and burro use. Under Alternative C1 there is also potential for impacts on available water sources for horses and burros, in instances where wild horses and burros are using livestock water sources, lack of maintenance or removal of these improvements could reduce available water for horses and impact ability to manage for AML.

Restrictions on management in HMAs under all action alternatives would include limitations on water developments in PHMA/mapped GRSG habitat in SGMAs/core areas and, under Alternative C, a closure to OHV travel in some areas. As a result, developments that are often used by wild horses would be limited, costs for water developments could be increased, and flexibility of management could be reduced. Ability to manage for AMLs could be impacted, particularly in drought conditions. While some routes could remain open for administrative use in the closed areas, it is possible that the closure could have some impact on the ability to perform gathers when necessary.

Other resource uses would be limited in PHMA/mapped GRSG habitat in SGMAs/core areas for all action alternatives, reducing disturbance to horses in GRSG habitat, with the greatest reduction in disturbance compared with Alternative A, occurring under Alternative C based on the acres classified as PHMA (see **Table 4.17**).

Reducing or otherwise restricting land uses in PHMA through the following specific allocation decisions in the Proposed Plans: ROW avoidance and wind exclusion; NSO for fluid minerals with waivers, modifications, and exceptions; OHV travel limited to existing (or designated) routes; and exclusion from new mineral material and nonenergy leasable mineral development would provide better forage availability for the wild horses and burros in the HMAs identified in **Table 4.17** more than under Alternative A and reduce disturbance to wild horse populations. Restricting land uses in PHMA could push development to areas outside of PHMA. Implementing the GRSG mitigation strategy, monitoring framework, and hard trigger adaptive management responses under the Proposed Plans would ensure that this increased level of protection of forage and water resources and reduction of wild horse and burro harassment would be maintained.

Additional limitation would occur in GHMA in Alternative D, particularly when within 1 mile of a lek, resulting in additional reduction in disturbance in these areas. Implementing the lek buffer distances as identified in **Appendix F** under the proposed Plans, would provide added protection on wild horse forage and fewer disturbances to wild horses and burros in these buffered areas.

In addition, restoration management and post fuels management actions may require short or long-term changes to wild horse and burro management under Alternatives B, C1, C2, and D, and the Proposed Plans. This could result in site-specific restrictions on grazing and reduction in available forage, and may require an adjustment in AMLs in the long term. As described from surface-disturbing activities, above, the level of restrictions would have the greatest change from Alternative A under Alternative C based on the acres classified as PHMA.

Under Alternative E, management for wild horse and burros would generally follow that in Alterative A; therefore, impacts from wild horse and burro management would be as described for Alternative A.

Under Alternative E, management actions for other resource uses and related reduction in disturbance would be focused on mapped GRSG habitat in SGMAs/core areas. In addition, under this alternative, many management actions would include site-specific and seasonal variations based on the type of GRSG habitat (e.g., breeding, winter, and distance to leks). As a result, the level to which other surface-disturbing activities would be reduced in each HMAs would depend on the GRSG habitat category for each HMA.

4.12 CULTURAL RESOURCES

4.12.1 Methods and Assumptions

Indicators

The use of indicators in NEPA analysis should provide information on determining the extent or degree to which cultural resources may be damaged, their physical integrity is lost, or the setting of the resource is damaged (36 CFR 800), and whether future opportunities for scientific research, preservation, or public appreciation are foreclosed or otherwise adversely affected by a proposed action. In other words, would the action have a significant adverse impact on the resource (43 CFR 1508.27)? When assessing whether the action would have significant impact, the following level-of-effect indicators are considered:

- Magnitude: The amount of physical alteration or destruction that can be expected. The resultant loss of cultural resource value is measured either in amount or degree of disturbance.
- Severity: The irreversibility of an impact. Adverse impacts that result in an irreversible and irretrievable loss of archaeological value are of the highest severity.
- Duration: The length of time an adverse impact persists. Impacts may have short-term or temporary effects, or conversely, more persistent, long-term effects on cultural resources.
- Range: The spatial distribution, whether widespread or site-specific, of an adverse impact.
- Frequency: The number of times an impact can be expected. For example, an adverse impact of variable magnitude and severity may occur only once. An impact such as that resulting from cultivation may be of recurring or ongoing nature.

Assumptions

In addition to the assumptions in **Section 4.2.1**, this analysis includes the following assumptions:

- Impacts on cultural resources are assessed by applying the criteria of adverse effect, as defined in 36 CFR Part 800.5a: "An adverse effect is found when an action may alter the characteristics of a historic property that qualify it for inclusion in the National Register of Historic Places in a manner that would diminish the integrity of

the property's location, design, setting, workmanship, feeling, or association. Adverse effects may include reasonably foreseeable effects caused by the action that may occur later in time, be farther removed in distance, or be cumulative."

- The BLM and Forest Service would follow 36 CFR 800, Section 106, and the BLM-Utah's statewide programmatic agreement when addressing federal undertakings; therefore, adverse effects on cultural resources would be appropriately avoided or mitigated.
- The information on cultural resources in the planning area is based on the results of industry, BLM, and Forest Service inventory projects and depicts the relative potential for cultural resource sites within the planning area. However, as these data are geographically biased toward past project-oriented undertakings and cannot accurately predict where and how many resources may exist in unsurveyed areas, this analysis does not attempt to quantify affected resources.
- Cultural resource protection and mitigation measures apply to all proposed federal or federally assisted undertakings and would be applied at project design and implementation phases.
- Cultural resource inventories, either federal undertakings or related programs, would continue into the foreseeable future and would result in the continued identification of cultural resources. The cultural resource data acquired through these inventories and evaluations would increase overall knowledge and understanding of the distribution of cultural resources in the region.
- Impacts on known cultural resource sites from authorized uses would be mitigated after appropriate Section 106 and/or consultation identified in BLM-Utah's statewide programmatic agreement Mitigation strategies can include, but are not limited to, project cancellation, redesign, avoidance, or data recovery.
- Degradation of known and undiscovered cultural resources from natural processes (e.g., erosion) would continue regardless of avoidance of human caused impacts.
- Potential impacts on cultural resources and their settings from subsequent undertakings (implementation of the planning decisions or site-specific project proposals) require separate compliance with NEPA and Section 106, and result in the continued identification, evaluation, and mitigation of cultural resources to the National Register of Historic Places. Per the BLM Utah's statewide programmatic agreement and standard BLM and Forest Service operating procedures, effects on cultural resources eligible for listing in the National Register of Historic Places and potentially eligible cultural resources would first be avoided or mitigated. If previously undiscovered resources are identified during an undertaking, work would be suspended while the resource is evaluated and mitigated to avoid any further impact.

4.12.2 Alternatives Analysis

Under Alternative A, the activities that involve surface-disturbing activities, such as vegetation management and habitat restoration treatments, ROW development and construction, fire/fuels treatments, and minerals development (including fluid, locatable, and salable minerals), would

have potential direct and indirect impacts on cultural resources, including damaging, destroying, and/or displacing artifacts and features, and construction of modern features out of character with a historic setting. Many cultural resources that occur on or just below the ground are susceptible to surface disturbance and erosion damage, including modifying spatial relationships of artifacts and destroying features and stratified deposits. The information loss is relevant to the site function, dates of occupation, subsistence, and past environments; all of these are important to understanding past culture. Depending on the extent and type of activity, the amount of physical disturbance could be from slight artifact shifts out of context in a small portion of the site to wholesale destruction of the entire site. Should a portion of a site be affected, it is possible that most of the information available from a site could be retrieved and contributed to the prehistoric record of the region, thereby reducing the severity of the impacts. However, adverse impacts that result in an irreversible and irretrievable loss of cultural resource value are of the highest severity.

Indirect impacts on cultural resources include changing the character of a property's use or physical features within a property's setting that contribute to its historic significance (e.g., isolating the property from its setting) and introducing visual, atmospheric, or audible elements that diminish the integrity of the property's historic features. Additionally, actions that result in increased human presence (e.g., more people visiting a recreation area or new access into a previously inaccessible area) could increase the risk of illicit collecting of surface artifacts, resulting in a loss of scientific information.

The potential for undiscovered buried cultural resources and human remains exists for any surface-disturbing activity despite previous archaeological surveys and investigations. Surface-disturbing activities impact undiscovered cultural resources and human remains by exposing buried material. While this may result in inadvertent artifact destruction or loss of scientific context, it may also lead to the discovery of cultural materials that would otherwise have been undiscovered and lead to an increased body of knowledge of the cultural history of the area. Indirect impacts result from the increased human presence, leading to possible illicit collecting of newly exposed materials.

On a project-by-project basis, the spatial distribution (or range) of disturbances would be largely focused on the specific site or location of a development or action. However, over time and as more actions occur throughout the planning area, the extent would be throughout the planning area.

Under the action alternatives and the Proposed Plans, actions that provide protections for GRSG or its habitat by limiting access into areas or excluding surface-disturbing activities, such as NSO and restrictions on surface and vehicle use that would protect cultural resources from effects due to surface disturbance, erosion, effects on setting and access leading to vandalism, inadvertent damage, and unauthorized collection of cultural resources. However, these protective measures could inhibit Native American cultural uses in some areas., and restrictions on surface and vehicle use that would protect cultural resources from effects due to surface disturbance, erosion, effects on setting and access leading to vandalism, inadvertent damage, and unauthorized collection of cultural resources.

The action alternatives and the Proposed Plans provide varying degrees of exclusion and closure allocations, but under all alternatives there is a marked increase in excluded/closed areas, resulting in more protections to cultural resources than areas that avoid or are open to ROWs, and/or closures, do not allow for leasing or development, which eliminates the risk of surface disturbance from associated project construction, and the direct and indirect impacts as described above under Alternative A would not occur. In ROW avoidance areas, the likelihood for the impacts would be reduced, as these areas provide for additional restrictions and stipulations to protect sensitive resources, as compared to open areas.

Vegetation management measures addressing land health and plant diversity, restoring natural processes, promoting desired plant communities, reducing effects on rangeland during drought, and eliminating weeds would largely be compatible with cultural resource management and preservation. Many of the measures would reduce the potential for cultural site erosion, maintain and improve soil health, maintain or restore the historic setting, and protect plant resources that could be important to Native American communities. However, mechanical, biological, and chemical treatments could affect cultural resources and could restrict access to resources for cultural purposes during treatment. Ground-disturbing mechanical vegetation treatments could modify the spatial relationships of artifacts and site features and break artifacts. Chemical treatments could alter the chemistry of soils and artifact residues and affect the reliability of dating surface features and affect artifact residue analysis. Use of fire as a treatment could affect flammable cultural resource artifacts and features, cause rock spalling and staining (either as a surface for rock art or as part of a feature or structure), and distort the temporal and functional analysis of artifacts. On the other hand, increased soil stability resulting from improving vegetation cover on a site can reduce the rate of erosion of resources on the surface.

Fire management would involve ground-disturbing activities that could also directly affect cultural resources by altering the spatial relationships within archaeological sites. In addition, fire-retardant chemicals and heat could affect the accuracy of paleo-botanical or radiocarbon data obtained from cultural resources. Removing vegetation increases the visibility of cultural resources and exposes previously undiscovered resources.

Sites exposed by fire or prepared for fire avoidance in prescribed burns are more susceptible to unauthorized collection, vandalism, and subsequent erosion. The risk of adverse effects on cultural resources is greatest from unplanned wildland fire because the locations of cultural resources are less likely to be known and avoided. Effects from prescribed fire are similar to those of wildland fire, but prescribed fire is subject to project-level analysis and the Section 106 process, which can prevent or reduce impacts through avoidance and other mitigation measures.

4.13 VISUAL RESOURCES

4.13.1 Methods and Assumptions

Indicators

Indicators of impacts on visual resources are as follows:

- Changes in the visual quality of the landscape

Assumptions

In addition to the assumptions in **Section 4.2.1**, this analysis includes the following assumptions:

- Management actions that reduce surface disturbance and other human modifications would maintain or improve visual resources.
- Vegetation cover is a component of visual quality, any changes to which could directly affect visual resources.
- Large-scale vegetation treatments to improve sagebrush habitat temporarily alters visual resources, but as desired vegetation regimes become reestablished, longer-term changes to visual resources would be less apparent.
- Collocating compatible activities and structures, such as fences, guy wires, or roads, reduces the visual impact of artificial elements in the natural landscape.
- Motorized vehicular travel and resulting ground and vegetation disturbances can degrade sagebrush habitat (and associated visual resources).

4.13.2 Alternatives Analysis

Implementing management for GRSG protection generally involves reducing or otherwise restricting land uses and activities that remove vegetation and allow development activities that would add visual contrast and decrease visual quality. Mineral extraction and construction activities within ROWs, such as infrastructure and energy development, present the greatest potential for impact on visual resources. Restricting these activities in mapped GRSG habitat would maintain or enhance visual resources.

Vegetation management actions that would enhance sagebrush vegetation cover instead of existing pinyon-juniper or other non-sagebrush vegetation regime could impact the visual qualities of particular areas. A taller, denser vegetation structure can provide screening and mitigate visual contrast otherwise produced by surface-disturbing activities. Management that favors a transition to sagebrush cover could result in increased visual contrast in certain areas (e.g., where vegetation mitigates contrast from man-made surface features such as roads, communication towers, or fences). Conversely, removal of tall conifer species could also open landscapes to view from key observation points that otherwise would have been obstructed.

Large-scale vegetation treatments such as fuels reduction and prescribed fire would impact visual resources, particularly in the short term, but with lesser impacts as desired vegetation regimes become reestablished. A more dispersed vegetation pattern could also result in long-term impacts on visual quality, particularly where vegetation is an essential component to the quality of existing visual resources (e.g., in areas where roadways are present). At the same time, a more diverse vegetation composition consisting of sagebrush, grasses, and forbs would also contribute to an area's visual quality.

Under the action alternatives, the BLM would, at a minimum, limit OHV travel to existing roads and trails. The Forest Service limits OHV travel to designated routes and will continue to do so under all alternatives. The limitation of OHV travel to existing routes would limit the creation of new linear ground disturbances and subsequent impacts on visual resources. Closure of existing

routes would not immediately impact visual resources, but could result in a long-term impact following a reseeding and restoration program.

All of the action alternatives would result in greater restrictions on surface-disturbing activities as compared with the continuation of existing management under Alternative A, including such measures as managing ROW exclusion areas and closing areas to mineral leasing and development. **Table 2.3** provides a quantitative overview of how BLM and Forest Service management actions across alternatives would affect visual resources.

Under Alternative A, the BLM and Forest Service would continue to manage visual resources as identified in the existing LUPs. Under Alternative A, new ROWs would be excluded on 102,500 acres of mapped occupied GRSG habitat, and the BLM would retain 177,700 acres of designated utility corridors. As a result, new utility corridor development, particularly electrical transmission lines, could result in short- and long-term direct and indirect impacts on visual quality through the placement of large vertical transmission line structures and associated ground disturbance. Fluid mineral development and surface mining would also impact visual quality through surface modifications and mining equipment.

Under Alternative B, new human modifications within GRSG habitat would result in little to no impact on visual resources. In particular, new ROWs would be excluded on 2,784,200 acres of mapped occupied GRSG habitat and avoided on 529,600 acres of mapped occupied GRSG habitat. Additionally, 3,341,300 acres of mapped occupied habitat would be closed to fluid mineral development, and 3,328,760 acres would be managed as unsuitable for surface mining.

Management under Alternative C would result in the fewest opportunities for new ROW and mineral development and therefore the fewest alterations to visual resources when compared with the other alternatives. Under Alternative C, all designated utility corridors in PHMA would be undesignated, and all areas within PHMA (3,313,800 acres) would be managed as ROW exclusion. A total of 87 percent (3,821,580 acres) of PHMA would be closed to fluid minerals, and 4,008,580 acres (including 694,780 acres of mineral split estate) would be managed as unsuitable for surface mining. Prohibitions on new human modifications in PHMA under Alternative C would maintain visual resources. In addition, the closure of some areas to OHV travel could result in a level of natural rehabilitation in these areas to their historical state, particularly if routes are not frequently used for nonmotorized forms of travel.

Because Alternative D would result in greater restrictions on new human modifications to the landscape as compared with Alternative A, Alternative D would reduce the potential for new impacts on visual resources. For example, aboveground linear infrastructure would be excluded on 1,422,300 acres and avoided on 1,368,900 acres of mapped occupied habitat. Refer to **Table 2.3** for a comparison of management of ROW development by type. No areas in mapped occupied habitat would be open to fluid mineral leasing with standard stipulations; however, 3,383,080 acres would be available for fluid mineral leasing with either CSU/TL stipulations (1,829,980 acres) or NSO stipulations (1,853,100 acres).

Impacts on visual resources under Alternative E would be similar to Alternative A, but would include additional management actions to avoid or minimize new human modifications (e.g., ROW and mineral development) if possible within SGMAs. Because Alternative E would result

in only slightly greater restrictions on new human modifications to the landscape as compared with Alternative A, there would be the potential for impacts on visual resources under Alternative E. Notably, Alternative E would manage 27,600 acres as ROW exclusion and 2,654,000 acres as ROW avoidance. Impacts on visual resources from mineral development would be similar to Alternative A, except that NSO and CSU/TL stipulations for fluid mineral leasing would apply to 688,100 acres and 2,642,700 acres of mapped occupied habitat, respectively. Under Alternative E, more acres would be treated to restore GRSG habitat than under the action alternatives. This could impact the characteristic landscape in the short term in areas where treatments are not prevalent but would have a minimal impact in areas that have been treated in the past and still show signs of such treatment. Over the long term, impacts would be minimal once the treatment objectives have been achieved.

Compared to Alternative A, the Proposed Plans would minimize future surface-disturbing activities (e.g., ROW and mineral development) if possible within PHMA and, to a lesser extent, within GHMA. Specific restrictions would vary based on the type of development. Refer to **Table 2.3** for a comparison of management of ROW development by type. In particular, new ROWs would be excluded on 28,100 acres and avoided on 2,764,800 acres of PHMA and GHMA, with an additional 165,500 acres of avoidance adjacent to PHMA. Most areas in mapped occupied habitat would be open to fluid mineral leasing subject to NSO stipulations, thereby minimizing visual impacts from aboveground fluid mineral production equipment. The Proposed Plans would also include sagebrush habitat objectives to restore and maintain desirable landscapes to support GRSG populations. Impacts on visual resources would be similar to those described under Alternative E. Because the Proposed Plans would result in greater restrictions on new human modifications to the landscape while enhancing the existing landscape, the Proposed Plans would reduce impacts on visual resources as compared with Alternative A.

4.14 WILDLAND FIRE MANAGEMENT

4.14.1 Methods and Assumptions

Indicators

Indicators of impacts on wildland fire ecology and management are as follows:

- Alteration of vegetative cover or composition that is likely to result in a shift in FRCC
- A change in the likelihood of human caused wildfire in the planning area
- A change in the size, extent, or occurrence of wildfire in the planning area
- Changes in the response to wildland fire or appropriate treatments to reduce impacts of wildland fire

Assumptions

In addition to the assumptions in **Section 4.2.1**, this analysis includes the following assumptions:

- Fire is an important functional, natural disturbance in many of the ecological systems in the planning area.

- A direct relationship exists between fuel characteristics and potential fire intensity and severity.
- Necessity for fuels treatments would likely continue over the life of the LUPA.
- There will be increased demand on suppression resources for managing wildland fires in order to protect values at risk.

4.14.2 Alternative A

Under Alternative A, few management actions would be applied specifically to GRSG habitat protection; therefore, impacts on fire management would vary across the planning area based on site-specific habitat objectives for other resource concerns.

Greater Sage-Grouse Management

Surface disturbance caused by development contributes to the modification of the composition and structure of vegetation communities (including increases in noxious weed proliferation) near developed areas, which contributes to fueling high-intensity fires and can shift FRCC away from historic conditions. This could cause an increase in program costs because of the increased fire potential. As such, management actions that minimize disturbance for GRSG from development would reduce the risk of fire potential.

Under Alternative A, special provisions for GRSG protection are limited. No PHMA or GHMA is designated, and there are few direct limitations on resource uses specifically for GRSG protection. There is limited potential for site-specific restrictions on development because of measures to protect, maintain, and enhance special status species habitat. In addition, many LUPs contain management actions to prohibit surface-disturbing or other disruptive activities within GRSG breeding and nesting habitat and, in some cases, winter habitat, within a certain distance and between certain dates. Where development restrictions are in place (specifically for GRSG or for special status species management), the level of risk for human-caused fire ignition are decreased. The level of impacts would depend on site-specific restrictions in place under current LUPs but is likely to be lower than all other alternatives.

Vegetation Management and Fire (including invasive plants and juniper encroachment)

Vegetation and weed treatments that decrease standing vegetation and associated fuel loads could reduce the size, extent, and occurrence of wildfire and could allow fires to be more easily controlled. For example, efforts to reduce incursion of nonnative annual grasses (primarily cheatgrass) and proliferation of other noxious and invasive weeds would likely promote healthy plant communities and an associated lower risk of high-intensity wildfire (USGS 2006b). Used appropriately, prescribed fire would be compatible with noxious and invasive weed control; however, the presence of noxious weeds and the potential of weed spread after a prescribed fire would need to be monitored on a site-specific basis. Conversely, management actions that retain shrub and cover could result in increased fuel loading and increase the likelihood and intensity of wildland fire.

Management actions that are intended to improve, create, or re-establish healthy ecological conditions in various vegetation types benefit the fire and fuels program in the long term by shifting FRCC towards historic conditions and promoting the most efficient use of fire

management resources. Current fire regime and condition class are shown for habitat type in **Table 4.18** and **Table 4.19**.

Treatment methods may include the use of fuelbreaks. A fuelbreak is a strategically located wide block, or strip, on which a cover of dense, heavy, or flammable vegetation has been changed to one of lower fuel volume or reduced flammability and is maintained as necessary as an aid to fire control. Fuelbreaks are not designed to stop fires but to allow suppression forces a higher probability of successfully attacking a wildland fire (Agee et al. 2000).

A reduction in fuel treatments would result in an incremental increase in hazardous fuels that leads to an increase in the potential for high-intensity wildfire that is uncharacteristic of the historical FRCC. Allowing a range of fuel-treatment options provides management flexibility to reduce large fire costs and achieve fire and fuels goals and objectives. Conversely, prioritizing fire suppression can limit management options and increase costs for fire management programs.

Under Alternative A, although fuels treatments would be designed to minimize the size of wildfire and prevent further loss of sagebrush, few specific management actions would be in place on fuels-management and fire-control methods in GRSG habitat. Alternative A would generally allow for the use of prescribed burns for vegetative manipulations where needed. Fire suppression would be prioritized to protect human life, human safety, and high-value resources. Impacts on FRCC and fire size, extent, and occurrence would vary throughout the planning areas based on site-specific habitat objectives and treatments applied.

While existing LUPs do not generally require prioritization of suppression in GRSG habitat, other existing policies (e.g., BLM IM 2013-128) have included such prioritizations and have for several years. This prioritization requires suppression resources to be focused on protecting GRSG habitat from wildfire.

Livestock Grazing and Wild Horses and Burros

Range management can impact the ability to manage fire as a natural process through changes in fine fuels availability (e.g., grasses). There are several ways that livestock grazing practices can affect the extent and severity of fires in sagebrush dominated ecosystems, including long-term effects that occur on decadal time scales to alter plant community composition and those observed as yearly changes in fuel loads. Livestock grazing can change the relative proportions of shrubs, perennial grasses, and annual grasses over decades, altering the fuel composition. On an annual basis, grazing can reduce the amount of herbaceous fine fuels, including cheatgrass, forbs, and small twigs of woody plants. The effects of grazing on both perennial and annual grasses depend on precipitation, soil characteristics, season of grazing, grazing intensity, and type of herbivore, and are variable and site-specific (Strand and Launchbaugh 2013). Some studies indicate that grazing may suppress competition from native plants and cause soil disturbance that can favor annual invasive grasses including cheatgrass, particularly in intense (high stocking rate) or severe (high use levels) grazing (Reisner et al. 2013, Bradford and Lauenroth 2006, Chambers et al. 2007, Loeser et al. 2007). In some situations, however, targeted livestock grazing can suppress annual grasses, including cheatgrass (Mosley and Roselle 2006). Moderate grazing may reduce fire spread and intensity by removing understory vegetation, reducing the amount of fuel,

Table 4.18
Acres of GRSG Habitat Classification by Fire Regime Group

Fire Regime	Alternative A	Alternative B		Alternative C	Alternative D		Alternative E		Proposed Plans	
	Mapped Occupied Habitat	PHMA	GHMA	PHMA *(all mapped occupied habitat)*	PHMA	GHMA	GRSG Habitat in SGMAs/ Core Areas	GRSG Habitat outside SGMAs/ Noncore Areas	PHMA	GHMA
Group I	353,700	230,300	123,600	353,936	222,300	131,600	223,000	128,400	236,400	114,460
Group II	60	0	60	60	0	60	0	60	0	60
Group III	1,674,700	1,280,118	397,200	1,677,300	1,305,00	372,300	1,282,800	422,300	1,340,600	352,600
Group IV	4,089,300	3,087,900	1,019,200	4,107,000	2,977,515	1,129,500	3,018,000	1,133,300	3,043,900	1,048,100
Group V	991,100	743,394	248,200	991,600	738,500	253,000	815,500	230,500	795,100	231,800

Source: BLM 2015

Table 4.19
Acres of Current Fire Regime Condition Class by GRSG Habitat Classification

Condition Class	Alternative A	Alternative B		Alternative C	Alternative D		Alternative E		Proposed Plans	
	Mapped Occupied Habitat	PHMA	GHMA	PHMA *(all mapped occupied habitat)*	PHMA	GHMA	GRSG Habitat in SGMAs/ Core Areas	GRSG Habitat outside SGMAs/ Noncore Areas	PHMA	GHMA
Class I	1,863,300	804,100	262,600	1,066,700	811,700	255,000	781,500	303,800	806,100	269,200
Class II	4,973,200	2,414,400	822,600	3,237,000	2,369,600	867,400	2,364,700	888,700	2,410,700	803,900
Class III	3,937,300	1,950,700	637,700	2,588,400	1,892,600	695,800	2,011,500	660,900	2,029,400	615,200

Source: BLM 2015

and accelerating the decay of litter through trampling (Davies et al. 2010). The effects of grazing could result in fires that burn at lower intensity, increased patchiness, decreased rate of spread, and increase subsequent survival of plants after fire, but the effects depend on the fire weather conditions and the structural composition of the plant community (Bunting et al. 1987). As fire weather conditions become extreme, the potential role of grazing on fire behavior is limited (Strand and Launchbaugh 2013).

Under Alternative A, there would be 329,521 permitted AUMs on BLM-administered lands and 265,373 AUMs permitted on National Forest System lands. Livestock grazing could result in site-specific reduction in fuels and the associated risk of wildland fire as described above, but level of impacts would be determined by weather conditions, grazing management and site-specific vegetative conditions.

Travel and Transportation

Transportation and travel management can impact fire frequency by increasing the potential for human-caused ignitions. The risk of ignition is increased where travel is less restrictive, particularly where motorized vehicles travel cross-country. All forms of travel facilitate the spread of invasive weeds (Commission for Environmental Cooperation 2012), particularly cheatgrass, which can shift fire regimes by decreasing fire intervals and increasing fire intensity. Conversely, if management restricts access, wildfire risk could be decreased. In some cases, transportation management could impact fire suppression efforts; when routes are closed and rehabilitated, they become unavailable for response to wildfires, limiting access opportunities.

Under Alternative A, potential for human-caused ignition would be highest in the 797,000 acres of BLM-administered lands open to cross-country use, with reduced risk in the 437,400 acres of BLM-administered lands limited to existing routes and 1,217,700 acres limited to designated routes. OHV use on National Forest System lands within the planning area is limited to roads, trails, and areas that have been designated through a transportation planning process and, therefore, risk of human-caused ignition from travel management would be the same across all alternatives on National Forest System lands.

Infrastructure Development (including all ROWs and utility corridors)

Lands and realty actions could result in development and an associate increase in risk of human-caused ignition. For example, issuance of ROWs can result in indirect impacts by increasing the risk of human-caused ignition should construction of transmission lines, renewable energy projects, or other development occur. As such, issuance of ROWs would increase fire management program costs because of the increased potential for fire in the ROW. However, critical-infrastructure ROW corridors would receive maintenance throughout their life to keep vegetation at a level that would moderate fire behavior and allow for some protection from an unplanned wildland fire. Limiting ROW grants may reduce roads and in turn reduce potential fire suppression control lines.

Under Alternative A, 3,219,000 acres would be open to ROW development, and 27,600 acres would be managed as ROW exclusion areas. As discussed above, risk of human-caused ignition from ROW development would be lowest in ROW exclusion areas and highest in areas open to new ROW development.

Mineral Development (including geothermal)

Development of energy and minerals resources increases the risk of wildfires by introducing new ignition sources (Shlisky et al. 2007). Associated facilities, infrastructure, and transmission lines can increase fire and fuels program costs, while decreasing fire-management flexibility with regards to suppression options. Energy development poses hazards to firefighters, including unknown toxins, facility protection, evacuation of industry personnel, and dangerous overhead power lines. Fire programs could incur additional costs to train firefighting personnel for emergencies associated with energy development. The road infrastructure supporting energy and minerals development would provide increased accessibility to remote areas for fire suppression and would provide fuelbreaks in the event of wildland fire, thus supporting ability to respond to wildland fire.

Limitations on mineral development would have an indirect effect of decreased fire due to less development, fewer vehicles, and less construction equipment, all of which would serve to decrease the chance of human-caused ignition. Development of federal minerals underlying nonfederal surface ownership could impact fire management on BLM-administered and National Forest System lands, particularly when ownership is in a checkerboard pattern, as fires ignited on nonfederal lands could quickly spread onto and impact federal lands.

Under Alternative A, management actions would generally be the least restrictive on mineral and energy development, with the most acres in GRSG habitat open to leases without restrictions (see **Table 2.3** for acres by alternative), and therefore has the highest risk of human-caused ignition from mineral development.

Other Actions

Level and type of permitted recreation can impact fire risk. Increased recreational use could increase the probability of unintentional fire starts from human-caused ignitions and the need for fire suppression. Recreation management could reduce this risk by providing targeted activities and outcomes.

Special designations such as ACECs, and the management of sensitive resources, can restrict fuels treatments on a site-specific basis. For example, in areas where preservation of particular species or habitats is emphasized, management options and fuels treatments may be limited. Under Alternative A, no ACECs include GRSG as a relevant and important value; however, limitations on fire suppression and management activities could occur in ACECs for other resource protection.

4.14.3 Alternative B

Alternative B would focus on fire suppression in PHMA and would impose limitations on fuels treatments in PHMA, resulting in higher levels of protection but reduced management options in this area.

Greater Sage-Grouse Management

Managing PHMA so that discrete anthropogenic disturbances cover less than 3 percent of the total mapped GRSG habitat regardless of ownership would decrease the chance of human-caused ignition in PHMA. In addition, managing or restoring PHMA so that at least 70 percent of the land cover provides adequate sagebrush habitat to meet GRSG needs would promote a shift

towards historic FRCC in sagebrush ecosystems. Should development in other parts of the decision area increase as a result of restrictions in PHMA, there is potential for a greater chance of human-caused ignition and a shift away from historic FRCC in these areas.

Vegetation Management and Fire (including invasive plants and juniper encroachment)
Restoration of native plants and creation of landscape patterns that most benefit GRSG, as well as reestablishment of sagebrush cover in PHMA, would result in a trend towards historic FRCC in the long term and a reduction in the size and extent of fire in PHMA.

Frequency and intensity of wildland fires, as measured by FRCC for PHMA, would trend towards natural conditions under Alternative B in the long term because post-fire, post-fuel, and restoration management would be designed to ensure long-term persistence of seeded or pre-burn native plants. Over time, the focus on long-term persistence of the preferred vegetation would result in fire regime conditions that more closely reflect desired historic conditions and therefore capable of withstanding wildland fire events without losing key ecosystem components. This would be of particular importance for the 1,950,700 aces in PHMA currently in Condition Class III and areas current classified as high-severity fire risk in PHMA (Fire Regime Classes II and IV; see **Table 4.18**).

Prioritizing wildfire suppression immediately after life and property would likely require more suppression resources (crews, engines, air support, etc.) and a resulting increase in suppression costs compared with Alternative A. Prioritizing suppression would also result in an increased risk to firefighter safety. However, the increased focus on constructing and maintaining fuelbreaks under Alternative B could increase the likelihood of suppressing wildfires making them easier to control. Combined with the increased focus on suppression, Alternative B would reduce acres burned compared with Alternative A.

Fuels management projects in PHMA would be designed to reduce wildfire threats in the greatest area, thereby decreasing risk of high-intensity fire in PHMA in the long term (currently 3,087,900 acres in PHMA are classified as Fire Regime Class IV, high-severity fire; see **Table 4.18**). Restrictions on the location of fuelbreaks and the season and location of other fuels treatments, however, would reduce management options and could increase fuel management costs. Exceptions would allow for treatments when determined necessary; therefore, the impacts on ability to manage wildfire would be limited.

Using targeted livestock in certain cases to reduce fine fuels would reduce the likelihood and severity of wildland fire in site-specific areas where this treatment was used, but level of impacts would depend on site-specific conditions.

If livestock grazing, travel management, and other activities affect the success of restoration projects, management could be changed to encourage a higher success rate. This would help stabilize shifts in FRCC and reduce the likelihood and severity of wildland fire by implementing more successful restoration projects across the planning area.

Livestock Grazing and Wild Horses and Burros
Potential restrictions on livestock grazing, including making allotments unavailable for livestock use in PHMA, could result in increase in fine fuels and resultant increased size or extent of

wildland fires should they occur. However, the risk of wildfire would be evaluated when considering making the area unavailable for livestock grazing was considered, thereby limiting the risk. Limiting the types of range improvements allowed in PHMA would decrease opportunities for human-caused ignitions during construction or maintenance.

Travel and Transportation

Limiting OHV travel in PHMA to existing roads and trails until travel management planning is complete, as well as limiting road upgrades or new roads in this area, would reduce the risk of human-caused ignition in PHMA on BLM-administered lands.

Infrastructure Development (including all ROWs and utility corridors)

Excluding new ROW authorization and related development in PHMA would reduce opportunities for human-caused ignitions. Reclamation of development in ROWs that are currently not in use in PHMA would result in short-term site-specific increases in the chance of human-caused ignition but would increase fuel build-up over time unless maintained. Collocation of development when possible in GHMA would also reduce the risk of ignition in this area. The rest of the decision area would continue to experience current levels of risk for human-caused ignitions and the resultant shift in FRCC away from desired historic conditions.

Mineral Development (including geothermal)

Alternative B would impose restrictions on mineral development in PHMA, including closure to nonenergy mineral leases, finding PHMA unsuitable to surface coal development, recommended for mineral withdrawal, and closure to mineral material sales and new fluid mineral leases. These restrictions and closures would reduce opportunities for human-caused ignitions. The rest of the decision area would continue to experience current levels of risk for human-caused ignitions and the resultant shift in FRCC away from desired historic conditions. Similarly, limitations on development in areas previously leased would limit the risk of human-caused ignition in PHMA. Exploration, especially when using overland travel, could temporarily increase the potential for human-caused ignitions.

Other Actions

Limiting special recreational uses in PHMA to those that are neutral or beneficial to GRSG could result in use restrictions that may reduce the risk of human-caused ignitions.

Impacts from ACEC management would be the same as discussed under Alternative A due the designation of no new ACECs.

4.14.4 Alternative C

Alternative C would generally have the broadest restrictions on resource uses and highest level of protection for GRSG habitat of all the alternatives, extending to all mapped occupied habitat, resulting in a high level of priority for fire suppression in GRSG habitat but a limitation on fuels-management activities.

Greater Sage-Grouse Management

Impacts would be similar in nature to those described in Alternative B. Expansion of measures to increase and protect sagebrush from human-related disturbance in all mapped occupied habitat would further reduce opportunities for human-caused ignitions in GRSG habitat.

Vegetation Management and Fire (including invasive plants and juniper encroachment)
Impacts from vegetation management would be similar to those described in Alternative B, with expansion of restoration priorities and associated shift in FRCC to all occupied GRSG habitat of particular importance for the 2,588,400 acres in mapped occupied habitat currently classified as Fire Regime Class III (see **Table 4.19**).

Impacts from fire management would be similar to those described under Alternative B. Prioritizing wildfire suppression immediately after life and property would still require more suppression resources (crews, engines, air support, etc.) and a resulting increase in suppression costs compared with Alternative A. Prioritizing suppression could also result in an increased risk to firefighter safety. However, unlike Alternative B, Alternative C places restrictions on vegetation and fuels treatments that remove sagebrush, as well as expanding prioritizations and restrictions to all occupied GRSG habitat. There are also restrictions on fuelbreaks. Should treatments in fuelbreaks be limited to mowing of grass, such treatments could be less effective than permitting other mechanical methods. The decreased effectiveness of the fuelbreaks could result in more acres of wildland fires. The result is that burned acres are anticipated to increase compared with Alternative A. The increase in burned acres combined with the increase in suppression resources would result in increased suppression costs under Alternative C compared with Alternative A.

Exclusion of livestock grazing from burned areas until woody and herbaceous plants achieve GRSG habitat objectives, and closure of burned areas that cannot be fenced from grazing until recovered, would result in a short-term increase in fine fuels in areas excluding grazing, which could increase fire risk. Due to the lack of authorized grazing (under Alternative C1) and reduction in permitted grazing (under Alternative C2), however, these management actions are not likely to add to fire size, extent, or occurrence, as discussed under Alternative C, *Livestock Grazing and Wild Horses*, above. Exclosures to study recovery could also lead to more efficient fire rehabilitation methods and associated improvements in wildland fire program resource allocations.

Livestock Grazing and Wild Horses and Burros
Under Alternative C1, no livestock grazing would be permitted within mapped occupied GRSG habitat. As a result, fine fuels are likely to increase throughout occupied habitat, and fire size, intensity, and occurrence could subsequently increase. However, the degree of impacts would be dependent on site-specific vegetation condition and climate, with hotter, dryer weather reducing the impact of grazing reduction on fire behavior as described in Alternative A.

Impacts from wild horse and burro management would be the same as described for Alternative B.

Under Alternative C2, impacts would be similar to those described in Alternative C1, but fire risk would be reduced in scale due to the existence of some level of permitted livestock grazing and wild horse use under Alternative C2. As the specific areas that would contain permitted grazing within mapped occupied GRSG habitat would be determined at permit renewal, site-specific impacts would vary and cannot be determined. The 25 percent reduction in AMLs for wild horses would occur in the HMAs that overlap occupied GRSG habitat in three population

areas: Hamlin Valley (Chokecherry, Sulphur, and Tilly Creek HMAs), Sheeprocks (Onaqui Mountain HMA), and Carbon (Range Creek HMA).

Prohibition of all structural range improvements in occupied habitat in both Alternatives C1 and C2 would limit the risk of human-caused ignition during construction.

Travel and Transportation

Impacts of travel management would be similar to but less than those described in Alternative B. The risk of human-caused ignition in Alternative C would be further decreased due to the closure of all mapped occupied habitat to cross-county OHV travel. In addition, the BLM would designate approximately 523,500 acres of GRSG habitat as closed to OHV use. These areas are currently designated as open or limited. Prohibiting use of OHVs in these areas could prevent OHVs from igniting fine fuels.

Infrastructure Development (including all ROWs and utility corridors)

Impacts would be similar in nature to those described in Alternative B. Under Alternative C, ROW exclusion areas would be extended to include all mapped occupied habitat, further reducing opportunities for human-caused ignitions in GRSG habitat.

Mineral Development (including geothermal)

Impacts would be similar in nature to those descried in Alternative B. Fire risk would be further decreased under Alternative C due to the expansion of mineral development restrictions in all mapped occupied habitat (see **Table 2.3** for acres).

Other Actions

Limiting special recreational uses in occupied habitat could result in use restrictions that could reduce the risk of human-caused ignitions, as described in Alternative B. In addition, limitations on camping and other recreational uses with 4 miles of occupied leks would further limit risk of human-caused ignition in these areas.

Restrictions associated with the management of 15 areas as ACECs could limit fire suppression tactics and fuels treatment methods, which could result in less efficient or less effective fire suppression and increases in fire suppression expenditures. ACEC designations could also result in fewer human-caused ignitions due to restrictive management.

4.14.5 Alternative D

Alternative D management actions and related impacts would be similar to those described in Alternative B, but with an added emphasis on region-specific habitat needs and variations in requirements for specific GRSG habitat types, resulting in more site-specific variation in fire management impacts.

Greater Sage-Grouse Management

Impacts would be similar to those described under Alternative B. The emphasis on maintenance and restoration of sagebrush to provide habitat for lekking, nesting, brood-rearing, winter, and transition areas could provide site-specific variation in FRCC changes and level of fire risk.

Management of GHMA for a range of 28 to 49 percent sagebrush cover across the landscape would trend FRCC in this habitat towards historic conditions.

Efforts to collaborate with local GRSG conservation efforts would improve habitat in the long term with related return of FRCC towards historic conditions.

As in Alternative B, anthropogenic disturbance would be capped and the risk of human-caused ignitions in this area would be reduced. Under Alternative D, maximum allowed level of disturbance would be 5 percent within a biologically based disturbance calculation area in PHMA. The 5 percent disturbance calculation does not include burned areas not yet recovered, which is a potentially significant acreage and could result in a total disturbance well over 5 percent. In addition, limitation on disturbance in specific habitat areas during specific time frames would reduce the chance of human-caused ignition in these areas, particularly when seasonal stipulations apply during fire season.

Vegetation Management and Fire (including invasive plants and juniper encroachment)
Impacts of vegetation management would be similar in nature to those described in Alternative B. Under Alternative D, actions would include treating PHMA to maintain and expand healthy GRSG habitat. Vegetation treatments would reduce fuel loading, which would affect fire size, extent, and allow fires to be more easily controlled. Vegetation treatments also create early seral stage vegetation communities that generally fuel low-intensity fires.

Restoration priority would include seasonal habitats identified as the limiting factor for GRSG distribution and/or abundance and would include collaborating with local government and planning agencies. As a result, restoration efforts would likely address management concerns for other resources than GRSG, including fire management. Actions would result in a trend towards historic FRCC and reduction in fire risk.

Impacts of fire management would be similar in nature to those described in Alternative B. Under Alternative D, however, additional fuels treatments and other habitat treatments would be permitted with an emphasis on maintaining, protecting, and expanding sagebrush ecosystems. Emphasis would be concentrated in PHMA; therefore, the long-term reduction in high-intensity fire risk would occur in these areas, of particular importance for the 2,977,515 acres currently in Fire Regime Class IV and 1,892,600 acres in Condition Class III in PHMA (see **Table 4.18** and **Table 4.19**). Seasonal restrictions could result in site-specific limitations on fuels management options but are not likely to impact the program objectives overall. Some additional flexibility would be incorporated into management, allowing for use of prescribed fire on a site-specific level within GRSG habitat, as appropriate, which could reduce wildfire severity and extent in these areas.

Creating and maintaining effective fuelbreaks in strategic locations, prioritizing suppression of fires in PHMA, and other proactive fire management activities in PHMA would likely reduce the size and extent of wildland fires in PHMA, but would also require additional suppression resources, as described under Alternative B. As a result, it is anticipated that suppression costs would generally be increased as compared to Alternative A.

Livestock Grazing and Wild Horses and Burros

Impacts from livestock grazing management would be similar to those described in Alternative B. Focusing management activities on allotments found not to be achieving land health standards and that have the best opportunities for conserving, enhancing, or restoring habitat for GRSG would result in habitat improvement and return to historic FRCC in the long term.

Travel and Transportation

Impacts under Alternative D would be similar in nature to those described in Alternative B. Under Alternative D, travel management planning on BLM-administered lands would be prioritized in the Bald Hills, Box Elder, Hamlin Valley, Ibapah, Rich, and Sheeprocks population Areas. As a result, risk of human-caused ignition would be reduced in these areas, which would be of particular importance in the Bald Hill, Box Elder, Hamlin Valley, Ibapah, and Sheeprocks Population Areas, where wildfire has been identified as a primary concern.

Infrastructure Development (including all ROWs and utility corridors)

Impacts under Alternative D would be similar in nature to those described in Alternative B. Under Alternative D, exclusion areas would be defined by particular types of ROW development, so there would be more site-specific variation in development and the level of human-caused ignition risk reduction (see **Table 2.3** for specific acres).

Mineral Development (including geothermal)

Impacts from mineral development would be similar in nature to those described in Alternative B. Closures and restrictions in Alternative D would focus on PHMA, and PHMA and GHMA adjacent to leks (see **Table 2.3** for acres). Therefore, the reduction in human-caused ignition risk would be the greatest in these areas.

Other Actions

Impacts from recreation management would be similar in nature to those described in Alternative B.

No ACECs would be designated; therefore, no impacts would occur on fire management.

4.14.6 Alternative E

Under Alternative E, management objectives would focus on reducing the threats to GRSG in the planning areas, including wildfire. Management actions would allow for some level of fuels treatments, thereby providing greater flexibility for wildfire management.

Greater Sage-Grouse Management

Impacts from GRSG management would be similar to those described under Alternative B. Under Alternative E, emphasis would be on sagebrush habitat protection and restoration within mapped GRSG habitat in SGMAs/core areas. Actions to increase the total amount of mapped GRSG habitat acreage within and adjacent to GRSG habitat in SGMAs/core areas by an average of 50,000 acres per year would result in long-term improvements in sagebrush habitat and associate shifts in FRCC to historic condition in these areas.

Mapped GRSG habitat outside of SGMAs/noncore areas would not be managed for GRSG conservation. No specific management actions are provided for in these areas. Fuels conditions and associated fire risk would be similar to Alternative A in these areas.

Disturbance limits in Alternative E would include a general limit on new permanent disturbance of 5 percent of habitat on state or federally managed lands within any particular SGMA. The 5 percent disturbance calculation under Alternative E includes burned areas not yet recovered, unlike the 5 percent disturbance calculation under Alternative D, which only includes burned areas that have been recovered. As a result, likelihood of human-caused ignitions would be reduced in these areas under Alternative E.

As in Alternative D, season- and GRSG habitat-specific restriction on development would result in site-specific variation in habitat changes and associated changes to FRCC and fire risk.

Vegetation Management and Fire (including invasive plants and juniper encroachment)

Under Alternative E, active vegetation treatments would be allowed under certain circumstances to improve sagebrush habitat. As discussed under Alternative D, where treatments occur, fuels levels would be reduced, high-intensity fire risk would decrease, and fire size and extent would likely decrease. In particular, aggressive removal of cheatgrass would reduce risk of high-intensity fire.

Impacts from fire management activities in Alternative E would be similar in nature to those described in Alternative B. Under Alternative E, habitat loss due to fire would be the single greatest threat to GRSG habitat. Statewide agreements, research, and prioritization of resources may improve the efficiency of fire treatments and response, with potential to decrease the risk of large-scale wildfire in GRSG habitat in the long term. Of particular importance for wildland fire management are actions in the 3,018,050 acres currently in Fire Regime Class IV and 2,011,500 acres in Condition Class III in mapped GRSG habitat in SGMAs/core areas (see **Table 4.18** and **Table 4.19**). The emphasis on fire suppression in GRSG habitat under Alternative E would require use of additional suppression resources, as described under Alternative B. As such, it is anticipated that suppression costs would generally be the increased as compared to Alternative A.

Livestock Grazing and Wild Horses and Burros

Impacts from livestock grazing would be similar in nature to those described in Alternative B. Under Alternative E, GRSG seasonal habitat requirements would be considered when managing sagebrush rangelands, resulting in more site-specific variation in management and related variation in fuel levels, and fire size, extent, and occurrence.

Aggressively responding to new infestations to keep invasive species from spreading would also reduce risk of fire and decrease fire size and extent.

Travel and Transportation

Impacts from travel and transportation would be similar in nature to those described in Alternative B. Under Alternative E, mapped GRSG habitat in SGMAs/core areas with nesting and winter habitat without designed routes would be limited to existing routes, and mapped GRSG

habitat in SGMAs/core areas with designed routes would be managed as limited to designed routes. As such, risk of human-caused ignition would be reduced.

Infrastructure Development (including all ROWs and utility corridors)
Impacts under Alternative E would be similar in nature to those described in Alternative B, with some additional limits to development and related reduced risk of human-caused ignition in opportunity habitat.

Mineral Development (including geothermal)
Impacts from mineral development would be similar to those described in Alternative B. Under Alternative E, mineral development management would include TL stipulations and GRSG habitat-type specific NSO stipulations. As a result, site-specific variation in the reduction of human-caused ignition risk would occur.

Other Actions
Impacts from recreation management would include reductions in GRSG habitat disturbance, including seasonal avoidance of activities in specific GRSG habitats, resulting in seasonal and spatial variation in human-caused ignition risk.

No ACECs would be designated; therefore, no impacts would occur on fire management.

4.14.7 Proposed Plans
Management actions under the Proposed Plans and related impacts would be similar to those described in Alternative B and D but with the addition of more specific objectives for GRSG habitat type and refined protocols for monitoring current conditions and developing site-specific management. These actions would result in less departure from historic reference conditions and fewer acres would shift towards FRCC 3 in GRSG habitat and a trend towards more historic frequency and intensity of wildfire.

Greater Sage-Grouse Management
Under the Proposed Plans, impacts would be similar to those described under Alternative B and D. As in Alternative D, management for GRSG seasonal habitat types could provide site-specific variation in FRCC and level of fire risk.

Under the Proposed Plans, guidance would include more specific indicators and desired conditions for each habitat type than any other alternative. In addition, specific acreage objectives have been identified for conifer removal (180,900 acres) and annual grass treatments 48,000 acres) on BLM and National Forest System lands in PHMA for a ten year period based on VDDT. These actions would allow for vegetation treatments that could target areas most in need of improvement, resulting in the reduction of annual invasive grasses, and conifer encroachment resulting in an increasing trend towards FRCC desired historic conditions.

As in Alternative B and D, anthropogenic disturbance would be capped. Under the Proposed Plans, a 3 percent disturbance cap (5 percent on National Forest System lands in Wyoming) on discrete anthropogenic disturbances would be applied in PHMA at both the BSU and project levels, and a limit would be placed on the density of energy/mining facilities. Anthropogenic disturbances in PHMA and GHMA would be also mitigated to ensure a net conservation gain to

GRSG, and conservation measures would be implemented in PHMA and GHMA such as RDFs (**Appendix G**) and lek buffers (**Appendix F**) to reduce impacts from human activities in PHMA and GHMA. These actions would further reduce the risk of human caused ignitions and, in the long term, improve vegetation condition, contributing to a reduction in FRCC (for example, a shift from FRCC 3 towards FRCC 2) and a trend towards desired historic fire occurrence and intensity.

Vegetation Management and Fire (including invasive plants and juniper encroachment)
Under the Proposed Plans, management actions and related impacts would be similar to those described under Alternatives B and D, but with added emphasis on sub-regional specific habitat needs and variations and requirements for specific GRSG habitat types. Strategic wildland fire planning would help return PHMA to historic FRCC and natural fire intensities and intervals. Emphasis would be concentrated in PHMA; therefore, the long-term reduction in high-intensity fire risk would occur in these areas, of particular importance for 2,029,400 acres in Condition Class III in PHMA (see **Table 4.18** and **Table 4.19**).

The Proposed Plans incorporate the concepts from Chambers et al. (2014) in the FIAT (**Appendix K**). This assessment process would allow for more accurate assessment of site-specific conditions and prioritization of fire operations, fuels management, post-fire rehabilitation, and habitat restoration. This plan would allow for more effective prioritization of fire management resources and improvement of vegetation conditions, which would reduce the size and intensity of wildland fires, and trend towards desired FRCC conditions in the long term.

Creating and maintaining effective fuel treatments in strategic locations, and prioritizing suppression of fires in SFA, followed by PHMA outside of SFA then GHMA when suppression resources permit would likely reduce the size and intensity of wildland fires but would result in an increase in both fuels management and fire suppression costs as compared to Alternative A.

Management under the Proposed Plans would prescribe added measures for fuels treatment effectiveness and post-fire rehabilitation activities and monitoring. These added measures would increase both fuels management planning and post-fire rehabilitation costs, but would increase effectiveness of treatments and increase the awareness and encourage partnerships with other agencies and resource programs.

Livestock Grazing and Wild Horses and Burros
Total acres available for grazing and permitted AUMs would be the same as described for Alternative D. Other management actions would be the similar to Alternative D. In addition, under the Proposed Plans, the review and processing of grazing permits/leases in SFA and PHMA would be prioritized, particularly in areas not meeting Land Health Standards. These measures would help to improve and protect habitat quality in SFA and PHMA, likely reducing the spread of invasive grasses and related fire risk.

Potential restrictions on grazing in the Proposed Plans, including potential retirement of voluntarily relinquished allotments could lead to increased fine fuels in those site-specific locations, and potentially result in a slightly higher risk of fire. However, the Proposed Plans also have management focuses on achieving ecological site potential, which would likely reduce annual invasive grasses and increase habitat health, minimizing the risk of wildfire.

Travel and Transportation

Under the Proposed Plans the nature and type of impacts would be as described under Alternatives A, B, and D. Under the Proposed Plans, 525 acres are available for cross-county travel (a 99-percent reduction in the decision area compared with Alternative A). Additionally, PHMA and GHMA would be limited to existing routes until travel management planning occurred (1,274,700 acres, 2.9 times more acres than Alternative A). As a result, risk of human-caused ignition is likely to be reduced in GRSG habitat compared to Alternative A. Under the Proposed Plans, temporary closures would also be permitted as determined necessary for resource protection. With a decrease in access, potential for human-caused ignition would be further reduced as compared to Alternative A.

Infrastructure Development (including all ROWs and utility corridors)

Under the Proposed Plans, the nature and type of impacts from ROW development would be as described under Alternatives A, B, and D. In the Proposed Plans, areas with designed aboveground corridors would remain open (25,100 acres). ROW development would be limited within the 2,764,800 acres of avoidance areas and 28,100 acres of exclusion areas. Reduction of ROW development would limit risk of human-caused ignition as compared to Alternative A. However, as discussed under Alternative A, limiting ROW grants may reduce roads and in turn reduce potential fire suppression control lines. Fire suppression response times could increase in the long term where limitations on new road construction restrict access. Limiting ROW grants could decrease the potential for using roads as fuelbreaks and control lines during fire suppression.

Under the Proposed Plans, there would also be a 3 percent cap on disturbance within GRSG habitat. With less surface disturbance compared to Alternative A, risk of human caused ignitions would be decreased and more areas will trend towards historic FRCC levels, however, development and related risk of ignition could potentially shift to areas outside of GRSG habitat if the cap is reached. In addition, requirements for the net conservation gain in the Proposed Plans would increase disturbance and move vegetation towards GRSG habitat objectives in the long term. This would affect the FRCC in GRSG habitat by trending towards more historic levels, which would decrease fire management cost, reduce fire size and intensity, and limit extent of wildfires.

Mineral Development (including geothermal)

Under the Proposed Plans restrictions would be applied to mineral and energy development as in Alternatives B and D. Restrictions under the Proposed Plans include the closure of PHMA and some portions of GHMA to nonenergy mineral leasing (3,370,000 acres closed, 24 times more than under Alternative A), and closure to mineral materials development on 3,340,200 acres (45 times more than under Alternative A). SFA (would be recommended for withdrawal from the Mining Law of 1872, as amended. Further, coal management would emphasize underground mining, reducing risk of development related ignition. Acres closed to fluid mineral leasing in GRSG habitat would be the same as Alternative A, but NSO stipulations would be applied on 3,258,300 acres (7 times more than under Alternative A).

As in Alternative B and D, anthropogenic disturbance would be capped. The 3 percent disturbance cap (5 percent on National Forest System lands in Wyoming) on discrete

anthropogenic disturbances would be applied in PHMA at both the BSU and project levels, and a limit would be placed on the density of energy/mining facilities. Anthropogenic disturbances in PHMA and GHMA would be also mitigated to ensure a net conservation gain to GRSG, and conservation measures would be implemented in PHMA and GHMA such as RDFs (**Appendix G**) and lek buffers (**Appendix F**) to reduce impacts from human activities in PHMA and GHMA. Development and related risk of ignition could potentially shift to areas outside of GRSG habitat if the cap is reached.

These actions would further reduce the risk of human caused ignitions and, in the long term, improve vegetation condition, contributing to a shift in FRCC in GRSG towards desired historic conditions.

Other Actions

Under the Proposed Plans, recreational activities would need to meet GRSG habitat objectives and the creation of new facilities would be prohibited; this could reduce human activity in PHMA and GHMA, which would lessen the potential for human-caused ignitions.

4.15 WILDERNESS CHARACTERISTICS

4.15.1 Methods and Assumptions

Indicators

Indicators of impacts on wilderness characteristics are the management actions and allowable uses that would either protect or degrade the inventoried characteristics to a level at which the value of one or more wilderness characteristic would no longer be present within the specific area. The inventoried wilderness characteristics are roadless areas of sufficient size, naturalness, outstanding opportunities for solitude or a primitive and unconfined type of recreation, and supplemental values, as described in the Wilderness Characteristics section of **Chapter 3**.

Assumptions

In addition to the assumptions in **Section 4.2.1**, this analysis includes the following assumptions:

- Some inventoried lands with wilderness characteristics have not yet been assessed in an RMP revision; therefore, no decisions have been made about whether to protect their wilderness characteristics. In this analysis, these lands with wilderness characteristics are treated like their wilderness characteristics are not protected.
- Management for GRSG has the potential to provide protection to lands with wilderness characteristics where the BLM has made a determination not to apply specific management to protect the wilderness characteristics, or are areas where no determination has yet been made in an RMP. This analysis discusses the impacts on the 86,100 acres of such lands.
- The BLM would continue to manage natural areas to protect their wilderness characteristics where a determination has been made to manage for wilderness characteristics. Management to protect GRSG under the various alternatives could provide additional protections for natural areas and, at a minimum, would provide

complimentary management. Impacts are not discussed further for the 52,000 acres of such lands.

4.15.2 Alternatives Analysis

Wilderness characteristics are primarily influenced by actions that impact the undeveloped nature of the area, or by activities that increase the sights and sounds of other visitors. Generally, actions that create surface disturbance degrade the naturalness of lands with wilderness characteristics, as well as the setting for experiences of solitude and primitive recreation. In addition, restrictions on dispersed recreation (e.g., prohibiting campfires or permitting camping only in designated sites) diminish the opportunities for unconfined recreation.

Management actions that could impact an area's natural appearance could include the presence or absence of roads and trails and use of motorized vehicles along those roads and trails, fences and other improvements, the nature and extent of landscape modifications, or other actions that result in surface-disturbing activities. All of these activities affect the presence of human activity and, therefore, could affect an area's natural appearance. Prohibiting surface-disturbing activities and new developments within lands with wilderness characteristics would protect naturalness.

Two other wilderness characteristics—outstanding opportunities for solitude or primitive and unconfined types of recreation—are related to the human experience in an area. Visitors can have outstanding opportunities for solitude or for primitive, unconfined recreation when the sights, sounds, and evidence of other people are rare or infrequent; where visitors can be isolated, alone, or secluded from others; where the use of the area is through nonmotorized, nonmechanized means; and where there are no or only minimal developed recreation facilities. High concentrations of recreation users (large group sizes or frequent group encounters) would decrease outstanding opportunities for solitude. Limiting visitor use to prevent substantial degradation to wilderness characteristics (i.e., naturalness and opportunities for solitude) would protect opportunities for unconfined recreation.

Allowing travel on designated routes could reduce opportunities for solitude by increasing sights and sounds of other people. Motorized and mechanized access would also reduce opportunities for primitive recreation. The existence of motorized and mechanized trails could reduce the natural appearance near the trails. Effects would be localized and might not be experienced in the unit as a whole. Due to the nature of these areas having wilderness characteristics, it is assumed that there are not any roads maintained by mechanical means. All access to the area would be limited to existing or designated routes, so the risk of new route creation, which would impact naturalness and size (if created by mechanical means), would be the same under all alternatives and the Proposed Plan, except Alternative C. Under Alternative C, approximately 555,700 of mapped occupied habitat would be closed to OHV travel, which includes 32,200 acres that are currently closed as well as 523,500 acres of new closed areas (**Map 2.56**). Where these closures overlap lands with wilderness characteristics, the areas' naturalness, opportunities for solitude, and opportunities for primitive types of recreation would be protected or enhanced.

Where vegetation treatments are implemented, both naturalness and solitude experienced by recreational users could be impacted in the short term. After the treatment is over, solitude would be restored. Over the long term, naturalness would likely be enhanced by restoring natural vegetation structures and patterns. Impacts would be the same under all alternatives and the Proposed Plan, though would be the least under Alternative C due to its focus on passive restoration. Short-term loss of solitude and naturalness would be greatest under Alternative E and the Proposed Plan given the levels of vegetation treatment proposed, though even under these alternatives, the impacts would be limited to the time of treatment, after which solitude would be restored and naturalness improved in the long-ter.

Management associated with wildland fire could impact lands with wilderness characteristics due to a focus on suppression in PHMA. In areas where suppression is a priority, there is the potential for vegetation modification to prevent the spread of fires, such as fire lines or fuelbreaks, potentially reducing the naturalness of appearance. Fire suppression, prescribed burns, and fuelbreaks could all have short-term impacts on wilderness characteristics by disturbing naturalness and solitude.

Allowing any type of energy or mineral development (i.e., fluid, coal, nonenergy solid, locatable, and salable minerals, as well as renewable energy) could result in surface disturbance that would diminish the area's natural characteristic. Any new roads authorized for access to the development area could eliminate wilderness characteristics of the entire unit if the road were to bisect the unit so that it would no longer be considered a roadless area of adequate size. In addition, regular access to the lease area or mine site by developers would reduce opportunities for solitude.

Impacts on lands with wilderness characteristics are possible from livestock grazing, particularly from new developments in these areas (e.g., water developments and fences), which could lessen the naturalness of appearance or could limit unconfined recreation. Existing range improvements used for grazing, such as fences, stock trails, springs, and stock ponds, would continue to be maintained. Structures could diminish the naturalness characteristic of lands with wilderness characteristics. Maintenance of range improvements could result in short-term impacts on solitude and naturalness.

Under current management (Alternative A), where surface-disturbing activities are not precluded, lands with wilderness characteristics are at risk of diminished wilderness characteristics if future activities are permitted in those areas **Table 4.20** displays the distribution of allocations that minimize or preclude certain surface-disturbing activities that would diminish wilderness characteristics. The table provides a comparative summary by alternative of how wilderness characteristics could potentially be impacted based on allocation decisions made to protect GRSG and its habitat under the various alternatives.

Overall, management under Alternative C would have the greatest potential to maintain lands with wilderness characteristics. Such allowable uses as ROWs, wind energy development, utility-scale solar energy development, nonenergy mineral leasing, coal leasing, mineral material disposal, and fluid mineral leasing would be prohibited. In addition, PHMA (i.e., all mapped occupied habitat) would be recommended for withdrawal from locatable mineral entry. These

Table 4.20
Acres of Allocations Potentially Affecting Lands with Wilderness Characteristics

Management Action	Alternative A	Alternative B		Alternative C	Alternative D		Alternative E		Proposed Plan	
	Mapped Occupied Habitat	PHMA	GHMA	PHMA *(all mapped occupied habitat)*	PHMA	GHMA	GRSG Habitat in SGMAs/ Core Areas	GRSG Habitat outside of SGMAs/ Noncore Areas	PHMA	GHMA
ROW exclusion	15	47,600	0	86,100			0	15	15	0
Aboveground linear					25,100	0				
Underground					15	0				
Wind					76,900	0			61,200	0
ROW avoidance	12,600	0	0	0			48,000	0	61,200	0
Aboveground linear					51,800	0				
Underground					76,800	0				
Wind					0	0			0	0
Closed to fluid mineral leasing	12,700	47,600	0	86,100	12,700	0	12,700	0	12,600	0
Open to fluid mineral leasing subject to NSO stipulations	3,000	0	1,300	0	19,700	1,300	100	2,900	48,600	1,800
Open to fluid mineral leasing subject to CSU or TL stipulations	32,300	0	1,900	0	44,600	7,800	35,300	32,200	0	21,100
Closed to nonenergy mineral leasing	12,700	47,600	0	86,100			12,700	0	61,200	0
Closed to all leasing					14,000	0				
Closed to surface mining					69,900	0				
Closed to mineral material disposal	4,200	47,600	800	86,100			3,300	900	61,200	900
Closed to all disposal					5,400	800				
Closed to commercial disposal					71,500	0				
Recommend for withdrawal from locatable mineral entry	39,300	32,700	6,600	86,100	300	39,000	300	39,000	0	0

types of activities and associated development can reduce the size of lands with wilderness characteristics and can impair the apparent naturalness of the area and the feeling of solitude. Precluding these types of activities would help protect wilderness characteristics on 86,100 acres of lands with wilderness characteristics. New disturbances would only result from vegetation or fuels treatments or wildland fire. As under the other alternatives, vegetation and fuels treatments could impact naturalness and solitude in both natural areas and lands with wilderness characteristics in the short term but would have limited long-term impacts. Impacts from vegetation treatments on lands with wilderness characteristics would also be diminished under Alternative C because an emphasis would be placed on passive restoration. Further, under Alternative C, some form of vegetation treatments would also be counted as surface disturbance, which is capped at 3 percent. As such, fewer treatments would occur in lands with wilderness characteristics and those treatments would likely be conducted using less invasive methods (e.g., hand thinning).

By the nature of these areas having wilderness characteristics, there are minimal discrete disturbances of the type subject to the 3 percent disturbance cap. Restoration or reclamation of disturbances on lands with wilderness characteristics would enhance naturalness over the long term.

In addition, under Alternative C1, livestock grazing would be prohibited in PHMA (i.e., all mapped occupied habitat). This would eliminate the need developments for livestock (e.g., fences, cattle guards, guzzlers, stock ponds, and access roads) and would protect wilderness characteristics. Impacts under Alternative C2 would be similar to other alternatives in that any existing structures for livestock are not precluding the areas from having wilderness characteristics. If future development occurred, naturalness could be affected.

Except for livestock grazing management, Alternative B would apply similar management to PHMA as under Alternative C, and impacts would be the same in these areas. However, because fewer acres would be managed as PHMA under Alternative B, there is less potential for wilderness characteristics to be maintained on all 86,100 acres with those characteristics. Where lands with wilderness characteristics overlap GHMA, restrictions on surface-disturbing activities could be applied to permits at the project phase to protect GRSG and its habitat; however, lands with wilderness characteristics could be at risk if surface-disturbing activities are not precluded.

Under Alternative D, the majority of lands with wilderness characteristics fall within PHMA. In general, most types of surface-disturbing activities would be allowed with stipulations, design features, or BMPs. Although stipulations, design features, and BMPs could mitigate some impacts on wilderness characteristics, any long-term disturbance would likely result in the loss of at least one of the wilderness characteristics.

Under Alternative E, no surface-disturbing activities would be outright precluded, so risks to lands with wilderness characteristics would be greater than under Alternatives B, C, and D. During project-level permitting, considerations to protect GRSG and its habitat could provide incidental protection to lands with wilderness characteristics by minimizing habitat disturbance and possibly avoiding certain areas altogether, depending upon the project.

Where lands with wilderness characteristics overlap mapped GRSG habitat outside SGMAs/noncore areas under Alternative E, impacts would be similar to those described for Alternative A because there would be no specific management in place to protect GRSG and its habitat. As such, management would be at least as protective of lands with wilderness characteristics as Alternative A.

In the Proposed Plan, the majority of lands with wilderness characteristics would be closed to such surface-disturbing activities as nonenergy mineral leasing and mineral material disposal. They would also be either closed to fluid mineral leasing or open subject to NSO stipulations and exclusion areas for wind energy development and avoidance areas for other types of ROWs. Where surface-disturbing activities are allowed, RDFs could mitigate some impacts on wilderness characteristics. Because disturbance under the Proposed Plan would be mitigated in the long term, there would be no long-term impacts on wilderness characteristics.