Nevada and Northeastern California Greater Sage-Grouse

Proposed Land Use Plan Amendment and Final Environmental Impact Statement

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Chapter 3
Affected Environment

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Changes to Chapter 3 between draft and final EIS:

- Additions, corrections, and clarifications.
- Added references, such as the USGS Open File Report 2014-1239 Conservation Buffer Distance; Estimates for Greater Sage Grouse-A Review (Mainer et al. 2014)
- Updated original habitat categories based on USGS-A Spatially Explicit Modeling of Greater Sage-Grouse Habitat in Nevada and Northeastern California: A Decision Support Tool for Management (Coates et al. 2014) and clarified habitat definitions (see Appendix A);
- Updated acreage numbers.

CHAPTER 3
AFFECTED ENVIRONMENT

3.1 INTRODUCTION

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

For this Proposed LUPA/Final EIS, the planning area is the entire Nevada and Northeastern California Sub-region (70,200,500 acres), which contains BLM-administered and National Forest System lands. In the Nevada and Northeastern California Sub-region planning area, there are 45,359,000 acres of BLM-administered land and 9,719,900 acres of National Forest System land.

The planning area is the geographic area in which the BLM and Forest Service will make decisions during this planning effort. The planning area boundary includes all lands regardless of jurisdiction. Lands addressed in the LUP amendments are public (including surface-estate and split-estate lands) managed by the BLM *and* National Forest System land in Greater Sage-Grouse habitats. Any decisions in the LUP amendments will apply only to federal lands administered by the BLM *or* part of the National Forest System.

3.1.1 Organization of Chapter 3

This chapter contains sections describing the biological, physical, and human resources of the planning area and follows the order of topics addressed as follows:

- GRSGs and GRSG habitat
- Vegetation (including invasive and exotic species/noxious weeds)
- Riparian areas and wetlands
- Fish and wildlife and special status species

- Wild horses and burros
- Wildfire and fire management
- Livestock Grazing
- Recreation
- Comprehensive travel and transportation management
- Land use and realty
- Renewable energy resources/mineral resources
- Special designations
  - Areas of Critical Environmental Concern
  - Wilderness Areas
  - Wilderness Study Areas
  - National Trails
  - Byways
  - Wild and Scenic Rivers
- Water resources
- Soil resources
- Cultural heritage resources
- Tribal interests (including Native American religious concerns)
- Lands with wilderness characteristics (BLM)
- Visual resources
- Air quality
- Climate change
- Socioeconomics and environmental justice

Each resource section contains a discussion of background information, including guidance and regulations. Each also discusses current conditions, which describe the location, extent, and current conditions of the resource in the planning area on BLM-administered and National Forest System lands. Conditions for a resource can vary, depending on the resource. Vegetation, fire management, livestock grazing, mineral resources, and lands and realty have a greater influence on GRSG populations and their habitat and are more likely to be affected by GRSG management actions. These are discussed in greater detail than those resources that have little to no influence (e.g., water, air quality, and soil resources).

The Nevada and Northeastern California Sub-region planning area is 70,200,500 acres; 45,359,000 acres of BLM-administered lands and 9,179,900 acres of National Forest System lands.

For each resource, a general description of the existing conditions is provided for the Nevada and Northeastern California Sub-region planning area, regardless of land status. This is done to provide a regional context for the resource. Then, a more detailed description of the existing conditions is provided for the BLM-administered and National Forest System lands managed according to the BLM and Forest Service plans being amended by this Proposed LUPA/Final EIS. This is done to provide an area-specific description of the existing conditions for the resource. When possible, greater emphasis is placed on describing the existing conditions of the resource as it pertains to GRSGs and their habitat. Generally, the existing condition acreage was determined using the resource information from the BER report (Manier et al, 2013) overlayed with the updated USGS GRSG habitat map, however in some instances local data was used in lieu of the BER report.

The BLM and Forest Service reviewed the LUPs being amended under this Proposed LUPA/Final EIS and other relevant information sources, such as LUPAs, maps, and state GRSG conservation strategies or plans, for existing conditions and trends for the resources listed above with respect to GRSGs and their habitat. This affected environment information is summarized below and, where appropriate, noted when the information is incorporated by reference.

3.2 GREATER SAGE-GROUSE AND GREATER SAGE-GROUSE HABITAT

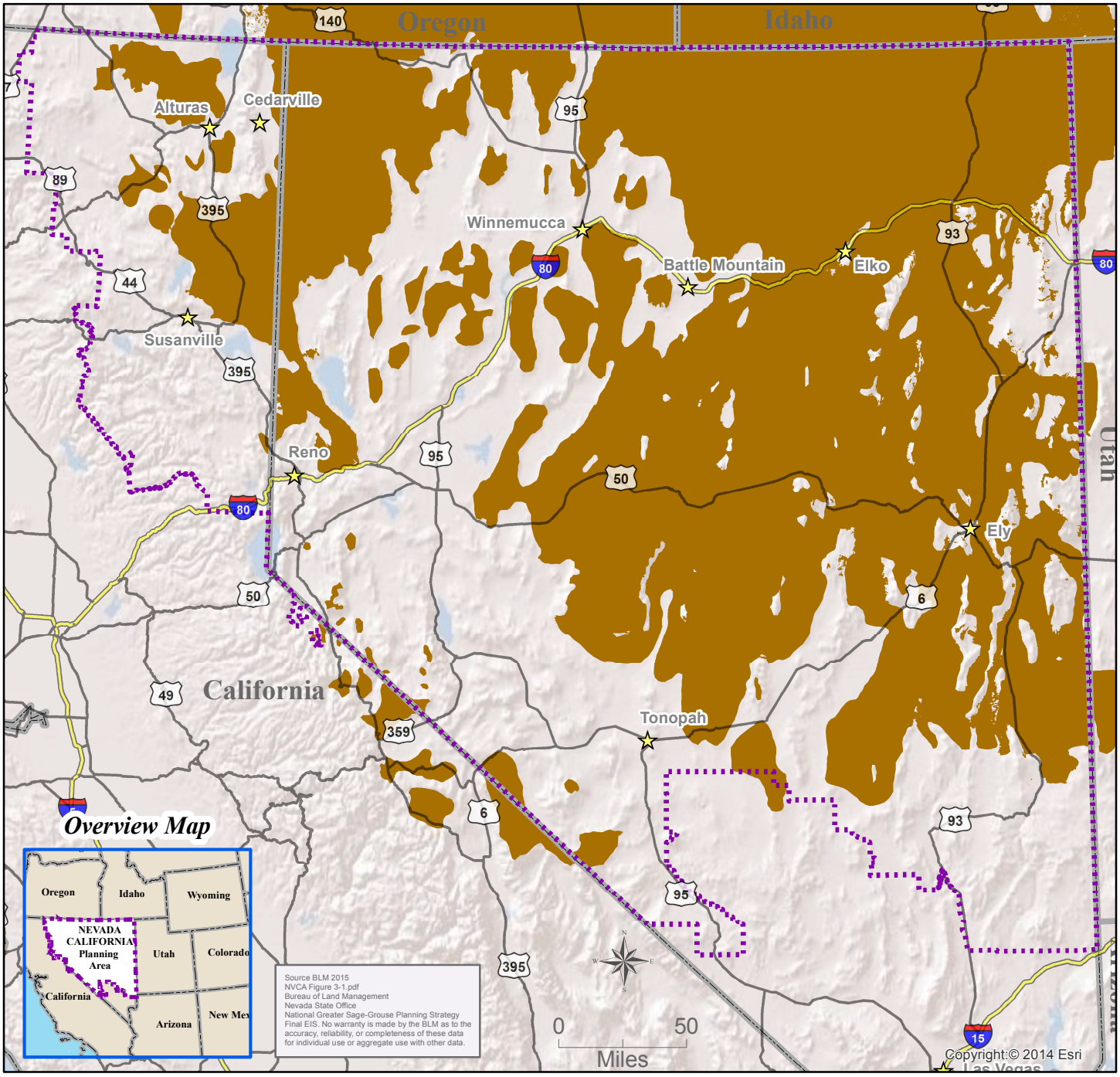
3.2.1 Range and Taxonomy

Greater Sage-Grouse (*Centrocercus* spp.) are the largest grouse found in North America. They are a ground-dwelling, sagebrush-obligate species. Historically, GRSGs were considered to be one species, with a range of fourteen states and three Canadian provinces before Euro-American contact (see **Figure 3-1**; Aldrich 1963; Johnsgard 1983; Connelly et al. 2004; Schroeder et al. 2004).

After considering splitting GRSGs into separate species and subspecies, based on a variety of genetic, morphological, and behavioral evidence, only the Gunnison Sage-Grouse has been determined to be a unique species. The bi-state population in southwestern Nevada and east-central California has been found to be genetically unique. Its status is widely debated, but the species remains taxonomically in GRSGs. The bi-state population, however, is not in the purview of this Northeast California/Nevada Greater Sage-Grouse Proposed LUPA/Final EIS.

The current range of GRSGs is eleven states and two Canadian provinces and is thought to be a reduction of 44 percent from the range prior to Euro-American contact (Connelly and Braun 1997; Schroeder et al. 2004). Regional population

Historic Greater Sage-Grouse Range



Legend

- Historic Greater Sage-Grouse Range
- Planning Area
- City/Town
- Interstate
- US Route
- States

declines have ranged from 17 to 47 percent (Connelly and Braun 1997). Although specific reasons for population decline differ across the range, the underlying cause is the loss, degradation, and fragmentation of suitable sagebrush habitat (Connelly and Braun 1997; Leonard et al. 2000; Aldridge et al. 2008). Sagebrush habitats increasingly overlap with natural resources (e.g., oil, gas, wind, minerals, agriculture, and recreation areas) and face increased landscape-level changes caused by invasive species, fire, and conifer encroachment (Connelly et al. 2004). Because of this, populations have declined substantially, raising conservation concern for the species.

3.2.2 Biology and Life History

GRSGs depend on a variety of shrub-steppe habitats throughout their life cycle and are restricted to several species of sagebrush, including Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), mountain big sagebrush (*A. t.* ssp. *vaseyana*), and basin big sagebrush (*A. t. tridentata*; Patterson 1952; Braun et al. 1976; Connelly et al. 2000a, 2004; Miller et al. 2011). GRSGs also use other sagebrush species such as low sagebrush (*A. arbuscula*), black sagebrush (*A. nova*), fringed sagebrush (*A. frigida*), and silver sagebrush (*A. cana*; Schroeder et al. 1999; Connelly et al. 2004). GRSG distribution is strongly correlated with the distribution of sagebrush habitats (Schroeder et al. 2004).

GRSGs exhibit strong loyalty, also known as site fidelity, to seasonal habitats for breeding, nesting, brood-rearing, and wintering (Connelly et al. 2004), even when areas are of lower value (Welch et al. 1990). Site fidelity in breeding birds could delay population response to habitat changes, and a clear response may require the death of most site-tenacious individuals (Wiens et al. 1986). Adult GRSGs rarely switch between some seasonal habitats once they have been selected, limiting their ability to adapt to changes.

During the spring breeding season, male GRSGs gather to perform courtship displays on areas called leks. Areas of bare soil, short-grass steppe, windswept ridges, exposed knolls, or other relatively open sites typically serve as leks (Patterson 1952; Connelly et al. 2004). Leks are often surrounded by denser shrub-steppe cover, which is used for escape, warmth, and feeding. The proximity, configuration, and abundance of nesting habitat are key factors influencing lek location (Connelly 1982; Connelly et al. 2000b, 2011). Leks can be formed opportunistically at any appropriate site in or next to nesting habitat (Connelly et al. 2000a); therefore, lek habitat availability is not considered to be a limiting factor for GRSGs (Schroeder et al. 1999). Nest sites are selected independent of lek locations, but the reverse is not true (Bradbury et al. 1989; Wakkinen et al. 1992). Thus, leks are indicative of nesting habitat.

Leks range in size from less than 0.1 acre to over 90 acres (Connelly et al. 2004) and can host from several to hundreds of males (Johnsgard 2002). Males defend individual territories in leks and perform elaborate displays with their specialized

plumage and vocalizations to attract females for mating. Males do not participate in egg incubation or chick rearing.

Females have been documented to travel more than 12.5 miles to their nest sites after mating (Connelly et al. 2000a), but distances between a nest site and the lek on which breeding occurs is variable (Connelly et al. 2004). The average distance between a female's nest and the lek on which she was first observed ranged from 2.1 miles to 4.8 miles in five studies examining 301 nest locations (Schroeder et al. 1999). Based on eight studies conducted between 1980 and 2011, over 80 percent of nests were documented within 4 miles of the lek. Hagen (2011) documented greater than 80 percent, Tack (2009) documented greater than 76 percent, Thompson (2006) documented greater than 77 percent, Holloran and Anderson (2005) documented 74 percent, Graham and Jones (2005) documented greater that 96 percent, Giesen (1995) documented greater than 90 percent, Autenrieth (1981) documented 85 percent, and Petersen (1980) documented greater than 85 percent of nests within 4 miles of the lek.

Productive nesting areas are typically characterized by sagebrush with an understory of native grasses and forbs (broad-leaved flowering plants). Horizontal and vertical structural diversity provides an insect prey base, herbaceous forage for pre-laying and nesting hens, and cover for the hen while she is incubating (Gregg 1991; Schroeder et al. 1999; Connelly et al. 2000a, 2004; Connelly et al. 2011).

GRSGs may also use other shrub or bunchgrass species for nest sites (Klebenow 1969; Connelly et al. 2000a, 2004). Studies document that various habitat features are central to GRSG nest survival, such as grass height (Gregg et al. 1994; Aldridge and Brigham 2002; Holloran et al. 2005), grass cover (Holloran et al. 2005; Moynahan et al. 2007), shrub height (Gregg et al. 1994; DeLong et al. 1995; Popham and Gutiérrez 2003), shrub cover (Wallestad and Pyrah 1974; Gregg et al. 1994; Watters et al. 2002), understory cover (Gregg et al. 1994; DeLong et al. 1995), rock cover (Popham and Gutiérrez 2003), and species of nesting shrub (Connelly et al. 1991).

Conversely, other studies have found negative or no relationships between nest survival and grass height (Popham and Gutiérrez 2003), grass cover (Aldridge 2000), shrub height (Autenrieth 1981; Sveum et al. 1998), canopy cover (Popham and Gutiérrez 2003; Aldridge and Boyce 2007), understory cover (Aldridge and Brigham 2002), and species of nesting shrub (Autenrieth 1981; Sveum et al. 1998).

In the sagebrush ecosystem, GRSG nest sites generally have greater cover of shrubs and grasses than the surrounding vegetation, which may include a mosaic of vegetation structure (Connelly et al. 2000). In Oregon, cover of medium-height shrubs (15 to 31 inches) and tall residual grass cover (.07 inch) was found to be greater at nest sites than in the surrounding area (Gregg et al. 1994). In

Washington, nests had greater shrub cover, shrub height, vertical cover height, residual cover, and litter cover than nearby random sites (Sveum et al. 1998). Holloran et al. (2005) found greater total shrub canopy cover and height at GRSG nest sites than at random sites in Wyoming, but no difference between sites in residual grass height or cover. In contrast, no differences in vegetation, except shrub height, were found between nest sites and random sites in northern California (Popham and Gutiérrez 2003; Kolada et al. 2009a). In northwestern Nevada, Lockyer (2012) found that shrub canopy cover was the single most explanatory factor selected by female GRSGs that resulted in increased daily survival rate of hens.

Hens rear their broods in 0.1 to 3.1 miles of the nest site for the first 2 to 3 weeks following hatching, based on two studies in Wyoming (Connelly et al. 2004). Forbs and insects are essential nutritional components for chicks (Klebenow and Gray 1968; Johnson and Boyce 1991; Connelly et al. 2004). Therefore, early brood-rearing habitat must provide adequate cover (sagebrush canopy cover of 10 to 25 percent; Connelly et al. 2000a) next to areas rich in forbs and insects to ensure chick survival during this period (Connelly et al. 2004).

GRSGs gradually move from sagebrush uplands to more mesic areas (moist areas such as streambeds or wet meadows) during the late brood-rearing period (3 weeks post-hatch) in response to summer desiccation of herbaceous vegetation (Connelly et al. 2000a). Summer use areas can include sagebrush habitats as well as riparian areas, wet meadows, and alfalfa fields (Schroeder et al. 1999). These areas provide an abundance of forbs and insects for both hens and chicks (Schroeder et al. 1999; Connelly et al. 2000a). GRSGs will use free water although they do not require it since they obtain their water needs from the food they eat. However, natural water bodies and reservoirs can provide mesic areas for succulent forb and insect production, thereby attracting GRSG hens with broods (Connelly et al. 2004).

As vegetation becomes desiccated through the late summer and fall, GRSGs shift their diet entirely to sagebrush (Schroeder et al. 1999). They depend entirely on sagebrush through the winter for both food and cover. Sagebrush stand selection is influenced by snow depth (Patterson 1952; Hupp and Braun 1989; Connelly et al. 2000; USGS in prep.), availability of sagebrush above the snow to provide cover (Connelly et al. 2004) and, in some areas, elevation, slope, and aspect (Beck 1977; Crawford et al. 2004).

Many populations of GRSGs migrate between seasonal ranges in response to habitat distribution (Connelly et al. 2004). Migration can occur between winter, breeding, and summer areas, or not at all. Migration distances of up to 100 miles have been recorded (Patterson 1952); however, distances vary depending on the locations of seasonal habitats (Schroeder et al. 1999). Migration distances for female GRSGs generally are less than for males (Connelly et al. 2004);

however, in one study in Colorado, females traveled farther than males (Beck 1977). Almost no information is available regarding the distribution and characteristics of migration corridors for GRSGs (Connelly et al. 2004). GRSG dispersal (when a population permanently moves to other areas) is poorly understood (Connelly et al. 2004) and appears to be sporadic (Dunn and Braun 1986).

Habitat and Population Trends

Considerable attention has been given to GRSGs since the 1980s, as evidenced by the National Sage-Grouse Habitat Conservation Strategy (DOI 2004). This conservation strategy provides national GRSG habitat conservation guidance. The plan identifies potential conservation actions that might be implemented in order to maintain and enhance GRSG populations and habitat.

Several factors related to GRSG habitat and the way they use it have been considered causes of the decline in GRSG distribution and abundance. These factors include habitat loss, alteration, and degradation (Braun 1995).

Historically, sagebrush-dominated vegetation was one of the most widespread habitats in the country and still covers much of the Great Basin and Wyoming Basin, reaching into the Snake River Plain, Columbia Basin, Colorado Plateau, Montana, southwestern Colorado, northern Arizona, and New Mexico. Across this area, big sagebrush predominates and has five known subspecies (West 1988; Kartesz 1994).

The sagebrush mosaic was historically subject to impacts from natural components of the environment, such as small and patchy fires, and periodic population explosions of jackrabbits, grasshoppers, and crickets. 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 itself in five years of a burn, but a return to a full pre-burn community (density and cover of sagebrush) cover can take 15 to 30 years (Bunting 1984; Miller and Rose 1999) for species that grow in higher precipitation zones, such as mountain big sagebrush. Species such as Wyoming big sagebrush, which grow exclusively in dry soils, can take 100 to 200 years to recover to pre-burn sagebrush canopy (Cooper et al. 2007; Eichhorn and Watts 1984).

Since Euro-American contact with the West began, the amount, distribution, and quality of sagebrush habitats and populations of GRSGs that depend on them have declined as a result of activities such as large-scale conversions to cultivated croplands or pastures, altered fire frequencies resulting in conifer encroachment at higher elevations and annual grass invasion at lower elevations, livestock grazing, herbicide use, mineral and energy development, and recreation related to urban growth and increased human populations. As a result, the 156 million acres of sagebrush that existed historically were reduced to 119 million acres by 2004 (Connelly et al. 2004). Currently, sagebrush communities and

GRSGs are at risk from multiple sources across multiple scales (BLM 2004d). About 56 percent of the potential distribution of habitat before Euro-American contact is currently occupied by GRSGs (Connelly et al. 2004).

The negative impacts of habitat fragmentation on GRSGs include reductions in courtship site persistence and attendance, winter habitat use, recruitment, yearling annual survival, and female nest site selection). Invasive plants are also a serious range-wide threat to GRSG habitat. Once established, invasive plants reduce and eliminate vegetation essential for GRSG food and cover. Invasive species can out-compete sagebrush and increase wildland fire frequencies, further contributing to direct loss of habitat. Sagebrush restoration techniques are limited and have generally been ineffective (USFWS 2010a).

GRSGs have declined dramatically in the past 20 years in large portions of their range. In March 2010, the USFWS concluded that GRSGs warranted protection under the Endangered Species Act (ESA); however, the USFWS determined that proposing the species for protection is precluded by the need to take action on other species facing more immediate and severe extinction threats. As a result, the GRSG was added to the list of species that are candidates for ESA protection. Habitat loss and fragmentation resulting from wildland fire, energy development, urbanization, agricultural conversion, conversion of sagebrush to other vegetation types (such as pinyon /juniper woodlands), and infrastructure development are the primary threats to the species (USFWS 2010a).

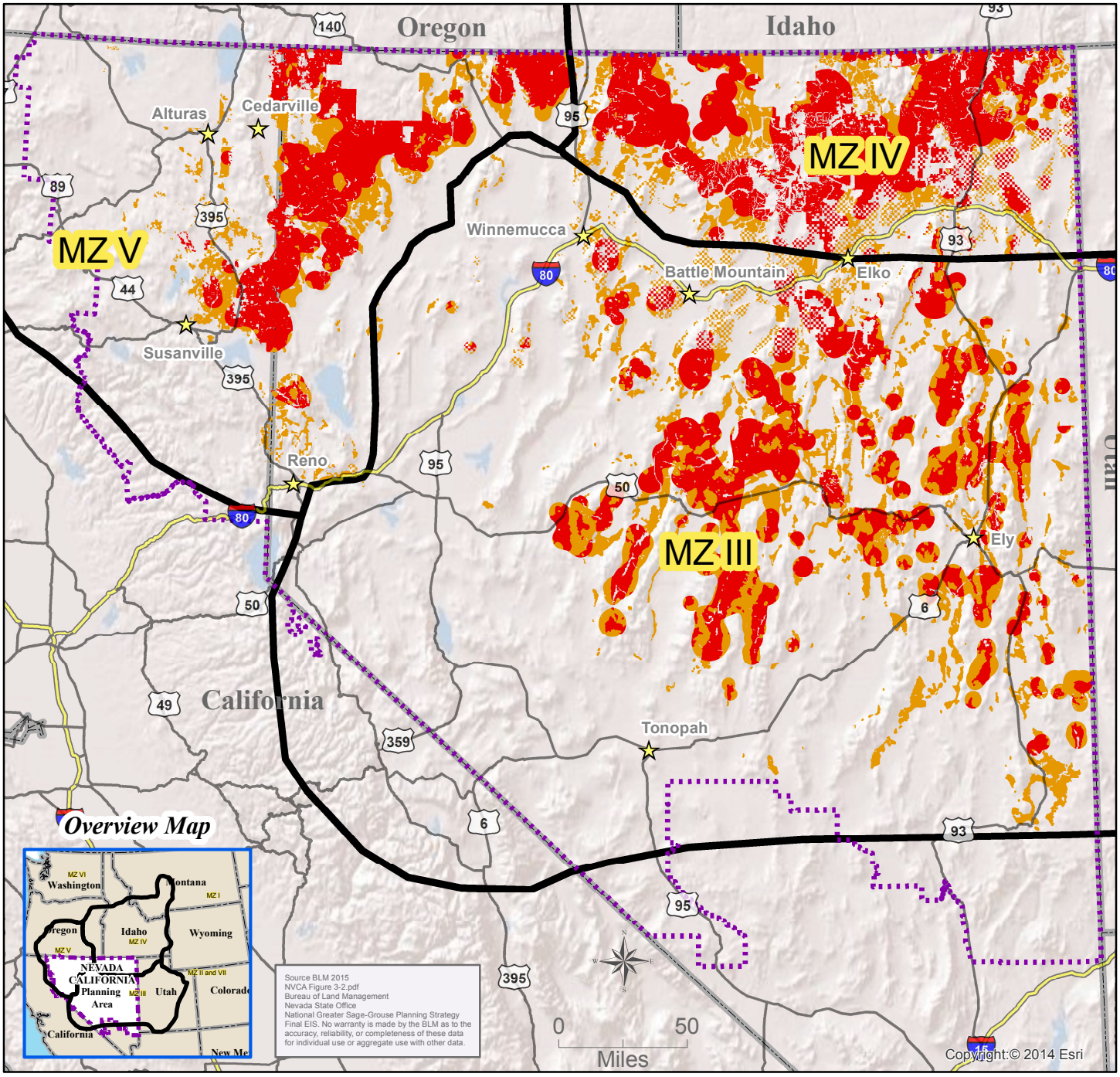
Habitat Selection

GRSGs are currently estimated to occupy 165 million acres across the western United States and Canada (Knick and Connelly 2011). Its range encompasses tremendous variability in habitat conditions, human activities, and GRSG populations.

The development of comprehensive monitoring approaches led to formal recognition that habitat selection assessments need to use approaches that address multiple spatial scales to represent the selection processes of GRSGs (Connelly et al. 2003b, 2011).

First-order selection is the geographic range and defines the GRSG population of interest. In this geographic range, second-order selection hinges on large, relatively intact regions of habitat and is often identified using subpopulation distributions (e.g., geographic proximity and potential connections among leks or regional population connectivity using genetics). Third-order selection represents refinement of habitats used by subpopulations by identifying seasonal habitats (e.g., nesting habitat), patch selection, and migration habitats. The fourth-order of behavioral classification can be assessed by quantifying food and cover attributes and foraging behavior at particular sites (Stiver et al. 2010, see **Figure 3-2**).

Preliminary Priority and General Habitat and WAFWA Management Zones



Legend

- Western Association of Fish and Wildlife Agencies' (WAFWA)
- Preliminary Priority Habitat (PPH)
- Preliminary General Habitat (PGH)
- City / Town
- Interstate
- US Route
- States
- Planning Area

In practice, selection of food items is incorporated in selecting feeding sites because selection of a particular site determines the array of food items available to be selected. Habitat value and use will best be determined using a combination of these characteristics (not one alone). To accurately characterize GRSG habitat selection for a given population at the first and second orders (landscape spatial scale), the migratory nature (e.g., seasonal movements) of the population must be well understood (Connelly et al. 2000a). This may include very large areas annually; it has been suggested that migratory populations may range across a habitat the size of Rhode Island (approximately 1,200 square miles; Connelly et al. 2003).

Habitat

Sagebrush occurs in two natural vegetation types that are delineated by temperature and patterns of precipitation (Miller et al. 2011). Sagebrush steppe ranges across the northern portion of GRSG range, from British Columbia and the Columbia Basin, through the northern Great Basin, Snake River Plain, and Montana, and into the Wyoming Basin and northern Colorado. In this type, sagebrush typically co-dominates with perennial bunchgrasses (Miller et al. 2011).

The second major type, Great Basin sagebrush, occurs south of sagebrush steppe and extends from the Colorado Plateau westward into Nevada, Utah, and California (Miller et al. 2011). The herbaceous component contributes a smaller portion of the total plant cover (Miller and Eddleman 2000) due to hydrologic patterns. In this habitat type, sagebrush is frequently the canopy dominant with little understory (Miller et al. 2011).

Table 3-1 describes GRSG habitat characteristics and provides the standard for seasonal habitat definitions.

Table 3-1
Characteristics of Sagebrush Rangeland Needed for Productive GRSG Habitat

	Breeding		Brood-Rearing		Winter[e]	
	Height (Inches)	Canopy (Percent)	Height (Inches)	Canopy (Percent)	Height (Inches)	Canopy (Percent)
Mesic sites[a]						
Sagebrush	16 to 31	15 to 25	16 to 31	10 to 25	10 to 14	4 to 12
Grass-forb	>7[c]	≥25[d]	Variable	>15	N/A	N/A
Arid sites[a]						
Sagebrush	12 to 16	15 to 25	16 to 31	10 to 25	10 to 14	4 to 12
Grass-forb	7[c]	≥15	Variable	>15	N/A	N/A
Area[b]	>80%		>40%		>80%	

Source: Connelly et al. 2000a; Tisdale and Hironaka 1981; Hironaka et al. 1983; Schroeder 1995
[a]Mesic and arid sites should be defined locally; annual precipitation, herbaceous understory, and soils should be considered.
[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.
[e]Values for height and canopy coverage are for shrubs exposed above snow.

Based on current research (see references listed under **Table 3-1** and **Table 3-2**) conducted in the Great Basin sagebrush type (as opposed to the sagebrush steppe), the Nevada and Northeastern California Sub-region has developed GRSG habitat standards to replace the Connelly guidelines in the sub-region or in the floristic provinces represented by WAFWA's MZs III, IV, and V. These guidelines, outlined in **Table 3-2** emphasize the role of sagebrush cover for nesting in the Great Basin sagebrush type, the importance of riparian condition and species diversity in brood-rearing habitat, and the site-specific habitat attributes in broader scales of habitat selection by GRSGs.

Table 3-2
Proposed Habitat Objectives for GRSGs

Attribute	Indicators	Desired Condition (Habitat Objectives)	References
General/Landscape-Level			
All life stages	Rangeland health assessments	Meeting all standards[1]	
Cover (nesting)	Seasonal habitat needed	>65% of the landscape in sagebrush cover	Aldridge and Boyce 2007
	Annual grasses	<%5	Blomberg et al. 2012
Security (nesting)	Conifer encroachment	<3% phase I (>0 to <25% cover) No phase II (25 to 50% cover) No phase III (>50% cover)	Casazza et al. 2011 USGS (in prep. A)
Cover and food (winter)	Conifer encroachment	<5% phase I (>0 to <25% cover) No phase II (25 to 50% cover) No phase III (>50%)	USGS (in prep. A) USGS (in prep. B)
	Sagebrush extent	>85% sagebrush land cover	USGS (in prep. A) Doherty et al. 2008
Lek (Seasonal Use Period March 1 to May 15)			
Cover	Availability of sagebrush cover	Has adjacent sagebrush cover	Blomberg et al. 2012 Connelly et al. 2000 Stiver et al. (in press) HAF
Security[2]	Pinyon /juniper cover	<3% landscape cover in .6 mile of leks	Connelly et al. 2000 (modified) Stiver et al. (in press) HAF Baruch-Mordo et al. 2013
	Proximity of tall structures[3]	Use Manier et al. 2014 Conservation Buffer Distance Estimates for GRSG-A Review; preference is 3 miles	Coates et al. 2013 Manier et al. 2014
Nesting (Seasonal Use Period April 1 to June 30)			
Cover	Sagebrush cover	≥20%	Kolada et al. 2009a, 2009b
	Residual and live perennial grass cover	≥10% if shrub cover is <25%[4]	Coates et al. 2013 Coates and Delehanty 2010 Kolada et al. 2009a, 2009b
	Annual grass cover	<5%	Lockyer et al. (in press)
	Total shrub cover	≥30%	Coates and Delehanty 2010 Kolada et al. 2009a Lockyer et al. (in press)

Table 3-2
Proposed Habitat Objectives for GRSGs

Attribute	Indicators	Desired Condition (Habitat Objectives)	References
	Perennial grass height	Provide overhead and lateral concealment from predators	Connelly et al. 2000, 2003 Hagen et al. 2007 Stiver et al. (in press) HAF
Security[2]	Proximity of tall structures[3] (3 feet above shrub)	Use Manier et al. 2014 Conservation Buffer Distance Estimates for GRSG-A Review; preference is 3 miles	Coates et al. 2013 Gibson et al. 2013 Manier et al. 2014
Brood-Rearing/Summer (Seasonal use period: May 15 to September 15; Early: May 15 to June 15; Late: June 15 to September 15)			
Upland Habitats			
Cover	Sagebrush cover	10 to 25%	Connelly et al. 2000
	Perennial grass cover and forbs	>15% combined perennial grass and forb cover	Connelly et al. 2000 Hagen et al. 2007
	Deep rooted perennial bunchgrass	7[5, 6] inches	Hagen et al. 2007
Cover and Food	Perennial forb cover	≥5% arid ≥15% mesic	Casazza et al. 2011 Lockyer et al. (in press)
Riparian/Meadow Habitats			
Cover and food	Riparian areas/meadows	PFC	Dickard et al. 2015 Prichard et al. 1998, 1999 Stiver et al. (in press) HAF
Security	Upland and riparian perennial forb availability and understory species richness	• Preferred forbs are common, with several species present.[5] • High species richness (all plants)	Stiver et al. (in press) HAF
	Riparian area/meadow interspersion with adjacent sagebrush	Has adjacent sagebrush cover	Casazza et al. 2011 Stiver et al. (in press) HAF
Winter (Seasonal Use Period: November 1 to February 28)			
Cover and Food	Sagebrush cover	≥10% above snow depth	Connelly et al. 2000 USGS (in prep C)
	Sagebrush height	>9.8 inches above snow depth	Connelly et al. 2000 USGS (in prep C)

[1]Upland standards are based on indicators including litter, live vegetation, and rock, appropriate to the ecological potential of the site.
[2] Applicable to phase I and phase II pinyon and/or juniper.
[3] Does not include fences.
[4]In addition, if upland rangeland health standards are being met.
[5]Relative to ecological site potential.
[6]In drought years, 4-inch perennial bunchgrass height with greater than 20 percent measurements exceeding 5 inches in dry years.

GRSG Habitat Mapping

A quantitative approach was used to develop a spatially explicit support tool for conservation planning, consisting of multiple steps. The overall modeling framework was made up of input data sets that were subjected to a series of processing steps to produce interim and final spatially explicit maps.

GRSG telemetry location data was compiled from multiple areas across Nevada and northeastern California. It was divided into three independent sets for model training (80 percent of locations), mapping classification (10 percent), and map validation (10 percent; see Habitat Suitability Model Development in Coates et al. 2014).

The training data set was linked spatially with corresponding environmental covariates (such as, data on land- cover types representing the dominant vegetation) to enable calculation of population-level resource selection functions (RSFs; Coates et al. 2014; Manly et al. 2002) in 12 sub-regions with adequate data. The relevant spatial scale and linear relationships of environmental characteristics were identified. Next, model-averaged parameter estimates for influential covariates among all candidate models were calculated to account for model selection uncertainty (Burnham and Anderson, 2002; see RSF Analyses). Then the estimates to develop spatially explicit models reflecting the relative probability of selection at each sub-region was used.

The following was completed for each of the 12 sub-regional RSF models:

- Transformed the model into habitat suitability index (HSI)
- Extrapolated the HSI across the extent of the region
- Averaged the HSI predictions generated from each sub-region to provide an unbiased region-wide HSI map

The independent classification telemetry data set was then used to extract the region-wide HSI predictions and categorize the continuous HSI value. This was based on the mean and variance of the extracted data that resulted in a region-wide categorical habitat map, grouped into four hierarchical classes of descending probability of selection.

The third independent data set was used to validate the region-wide map by calculating the proportion of locations in each category. The proportions for telemetry data in each of the training subregions and telemetry data from multiple independent sub-regions (that is, non-RSF sub-regions) was then calculated. Data from independent sub-regions were used to assess the map in interpolated areas. Locations of active leks were used as an additional dataset for map validation (see Region-Wide Habitat Suitability Index and implementation for Conservation Planning).

From the RSFs, information of the probability of selection was produced solely on predicted associations of GRSGs with environmental covariates. However, the model did not incorporate knowledge of GRSG abundance and density that represents space currently occupied by GRSGs. Therefore, a space use index (SUI) was created, based on lek count data and existing information regarding how GRSGs use space in relation to leks. Specifically, the SUI integrated information on lek density, size (average number of males attending leks), and

the nonlinear relation between probability of space use and distance to the lek; this was then used to create categories of high use or low-to-no use across the sub-region.

To provide a modeling tool that can aid conservation planning, the region-wide HSI (categorized into high, moderate, low, and nonhabitat, based on the variance distribution of HSI values) and high and low-to-no use SUI categories were combined into a single sub-regional map.

The map simultaneously reflects both the presence of GRSGs and the presence of habitat features associated with GRSG occupancy and can then be used to prioritize areas for different management scenarios. The strength of the map is to account for characteristics that describe the quality of the environment for GRSGs, as well as an index of population abundance (Coates et al. 2014).

The three management categories derived from this mapping process for the Nevada and Northeastern California Sub-region are priority, general and other habitat management areas. However, the State of Nevada's alternative refers to these management categories as core, priority, and general habitat.

Surface and Habitat Acres

Population/subpopulation surface acreage in the sub-region is dominated by BLM-administered lands at 72 percent. National Forest System lands comprise 11 percent, and all other ownerships comprise the remaining 17 percent (**Table 3-3**).

Table 3-3
Surface Ownership in WAFWA Management Zones by Population/Subpopulation

Population/Subpopulation	BLM	Forest Service	Other	Total
Management Zone III				
Central Nevada	9,549,100	2,459,100	1,786,200	13,794,400
Northwestern Interior	990,900	-	293,100	1,284,000
Quinn Range	1,712,300	222,900	50,500	1,985,700
Southeast Nevada	7,524,400	787,800	705,200	9,017,400
Management Zone IV				
North-central Nevada	1,333,000	316,200	403,400	2,052,600
Northeastern Nevada	3,401,300	678,000	1,897,000	5,976,300
Management Zone V				
Klamath (California)	-	-	69,700	69,700
Lake Area: northeastern California/northwestern Nevada	3,123,800	-	1,128,900	4,252,700
South-central Oregon/north-central Nevada	455,500	-	23,900	479,400
Warm Springs Valley	231,700	-	124,500	356,200
Grand Total	**28,322,000**	**4,464,000**	**6,482,400**	**39,268,400**

Source: BLM and Forest Service GIS 2015

Population/subpopulations in PPH and PGH in the Nevada and Northeastern California Sub-region are skewed toward BLM-administered lands comprising 71 percent and National Forest System lands comprising 9 percent (**Table 3-4**).

3.2.3 Management Zones

Due to the differences in the ecology of sagebrush across the range of the GRSGs, WAFWA further parcels sagebrush habitats into MZs I through VII, based primarily on floristic provinces. The boundaries of these MZs were delineated based on their ecological and biological attributes rather than on arbitrary political boundaries (Stiver et al. 2006). Vegetation found in each management zone is similar, and GRSG and its habitat in these areas are likely to respond similarly to environmental factors and management actions.

The Nevada and Northeastern California Sub-regional planning area includes GRSG habitat and populations in three management zones as delineated by WAFWA. To facilitate local planning and foster stakeholder involvement in state-led planning initiated by Nevada's governor in 2004, the Nevada and Northeastern California Sub-region was divided into 66 PMUs that remain a primary reference tool for describing the sub-regional populations (Nevada Governor's Sage-Grouse Conservation Team 2004). MZs in the Nevada and Northeastern California Sub-region are the following:

- Management Zone III—Southern Great Basin (includes Utah, Nevada, and California)
- Management Zone IV—Snake River Plain (includes Idaho, Utah, Nevada, and Oregon)
- Management Zone V—Northern Great Basin (includes Oregon, California, and Nevada)

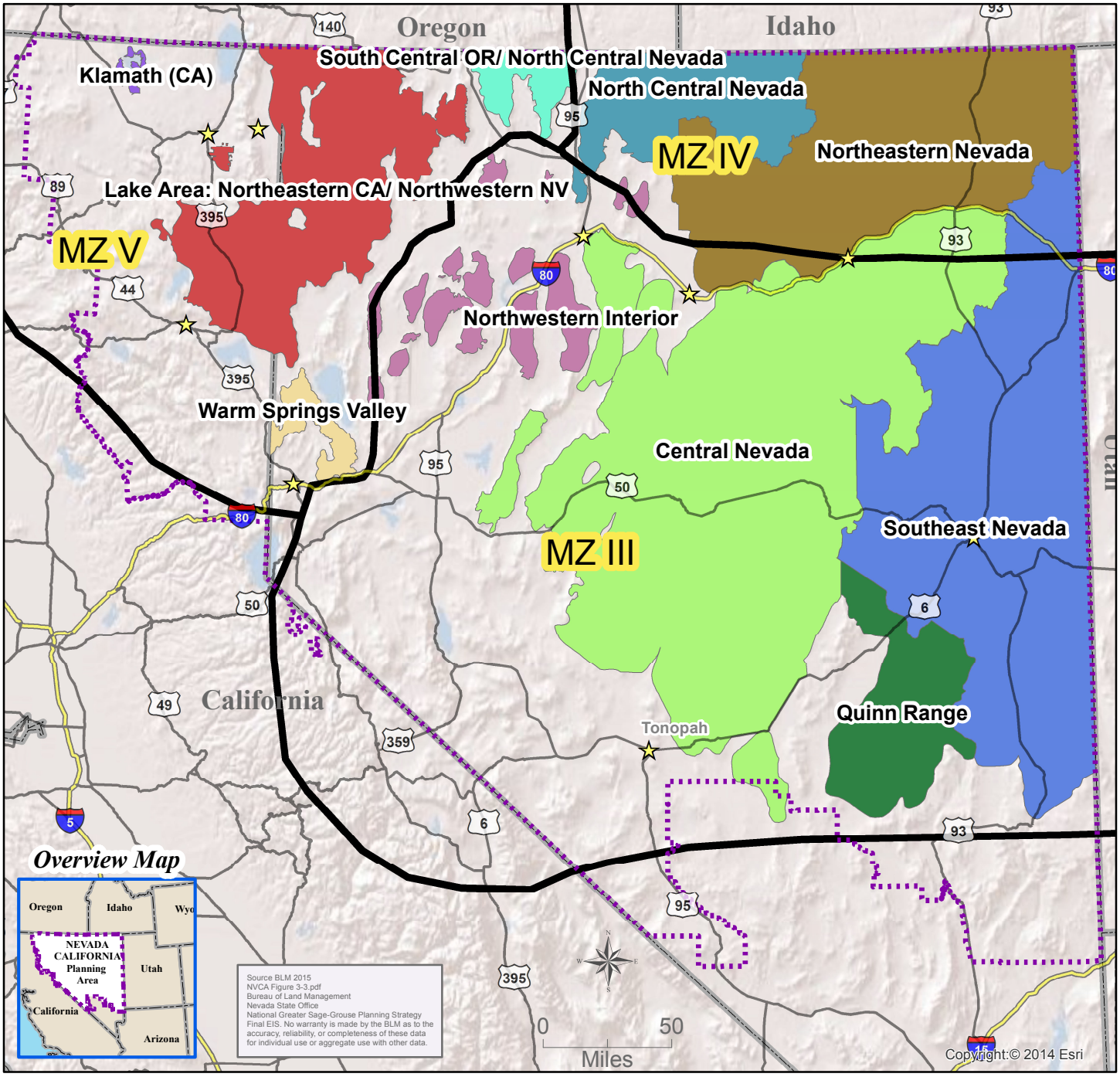
These MZs, their aggregate populations and subpopulations, and the PMUs in the sub-region are described in **Table 3-5** and **Figure 3-2**. They may cross population/subpopulation boundaries (Connelly et al. 2004). For planning purposes, MZ boundaries are adapted to the PMU boundaries described for the sub-region. Connelly et al. (2004) defined populations of GRSGs on the basis of isolation-by-distance or isolation-by-topography rather than political or jurisdictional boundaries. Some of these populations were further divided into subpopulations based on their large size, expansive distribution, differences in region, and a relatively small degree of separation. GRSG populations and subpopulations do not encompass the entire GRSG mapped habitat in the Nevada and Northeastern California Sub-region (**Table 3-5, Figure 3-3** and **Figure 3-4**).

Table 3-4
Acres of GRSG Habitat in Population/Subpopulations

Population/ Subpopulation	BLM		FOREST SERVICE		OTHER LANDS		TOTAL	
	PPH	PGH	PPH	PGH	PPH	PGH	PPH	PGH
Management Zone III								
Central Nevada	2,352,800	1,711,100	265,100	528,100	510,200	548,600	3,128,100	2,787,800
Northwestern Interior Nevada	12,000	84,600	-	-	3,900	23,100	15,900	107,700
Quinn Canyon Range Nevada		187,900	-	6,400	-	5,000	-	199,300
Southeastern Nevada	1,190,900	1,620,300	36,300	149,100	87,500	147,400	1,314,700	1,916,800
Management Zone IV								
North-central Nevada	701,300	318,400	189,000	50,500	124,800	208,900	1,015,100	577,800
Northeastern Nevada	2,140,100	714,500	323,500	152,100	979,300	482,900	3,442,900	1,349,500
Management Zone V								
Klamath, Oregon/California	-	0	0	0	18,700	44300	18,700	44,300
Lake Area Oregon, Northeastern California/northwestern Nevada	1,900,500	659,000	0	0	680,400	247800	2,580,900	906,800
South-central Oregon/north-central Nevada	306,700	86,400	0	0	14,200	4900	320,900	91,300
Warm Springs Valley Nevada	35,900	71,600	0	0	11,600	34,200	47,500	105,800
Grand Total	**8,640,200**	**5,453,800**	**813,900**	**886,200**	**2,430,600**	**1,747,100**	**11,884,700**	**8,087,100**

Source: BLM and Forest Service GIS 2015

Populations/Subpopulation, Population Management Units and WAFWA Management Zones



Legend

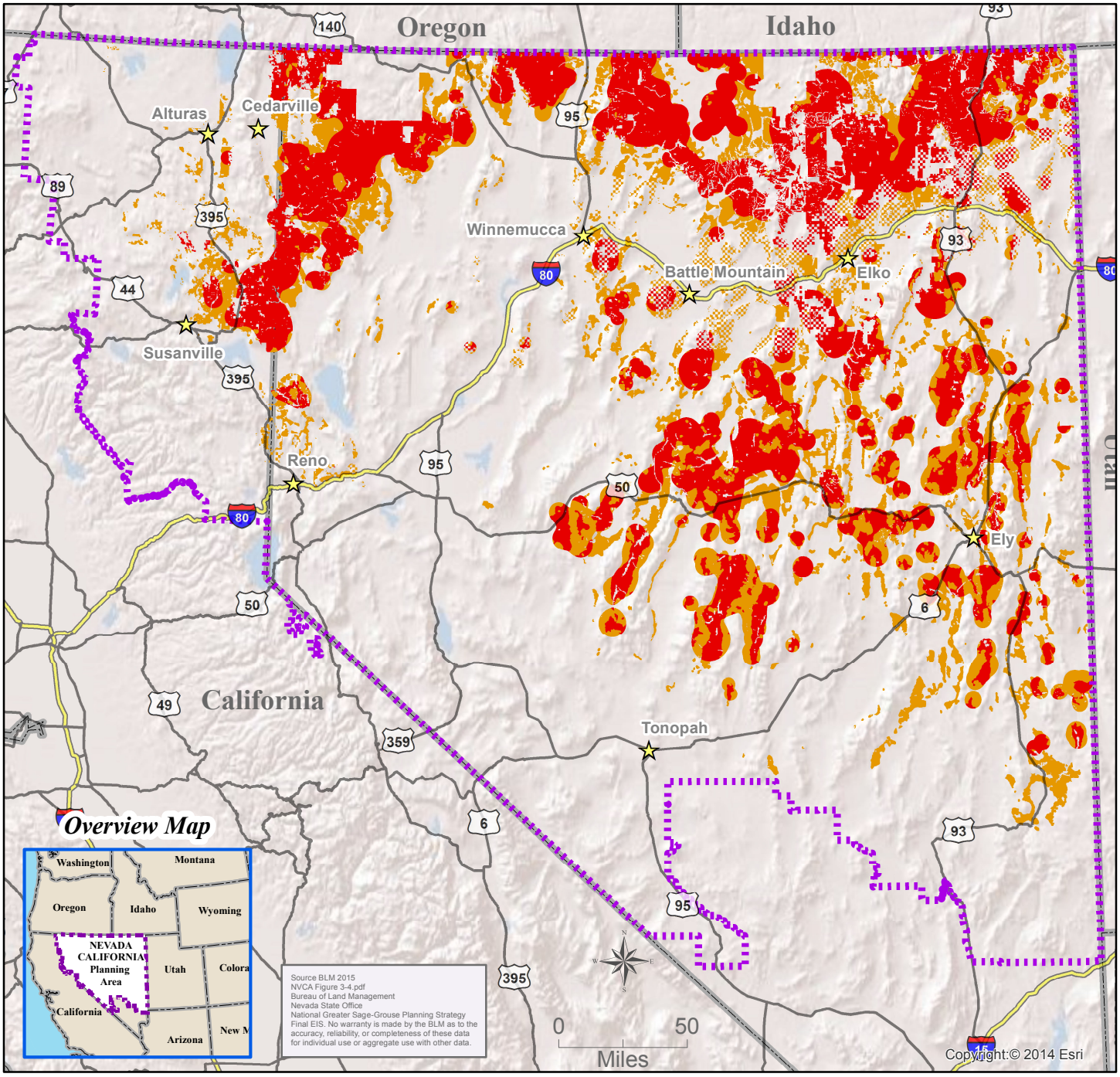
- Western Association of Fish and Wildlife Agencies' (WAFWA)

Population / SubPopulation

- Central Nevada
- Klamath (CA)
- Lake Area: Northeastern CA/ Northwestern NV
- North Central Nevada
- Northeastern Nevada
- Northwestern Interior
- Quinn Range
- South Central OR/ North Central Nevada
- Southeast Nevada
- Warm Springs Valley

- City / Town
- Interstate
- US Routes
- States
- Planning Area

Greater Sage-Grouse Habitat in the Nevada and Northeastern California Sub-region



Legend

- Preliminary Priority Habitat (PPH)
- Preliminary General Habitat (PGH)
- City / Town
- Interstate
- US Routes
- States
- Planning Area

Figure 3-4

Table 3-5
WAFWA MZs, Populations/Subpopulations, and PMUs in the Planning Area

WAFWA MZ	Populations/ Subpopulations	PMUs
III	Central Nevada	Cortez, South Fork,* Shoshone, Three Bar, Monitor, Reese River, Toiyabe, Kawich, Clan Alpine, Desatoya, Stillwater, Fish Creek, Sonoma, Ruby Valley,* Battle Mountain, Diamond
	Southeast Nevada	East Valley,* Butte/Buck/White Pine, Schell/Antelope, Spring/Snake Valley, Steptoe/Cave, Lincoln
	Northwestern Interior	Jackson, Slumbering Hills, Eugene, East Range, Humboldt, Trinity, Limbo,* Majuba 1,2,3,4, Sahwave 1,2, Nightingale,* Eden Valley*
	Quinn Range	Quinn
IV	North-central Nevada	Santa Rosa,* Desert
	Northeastern Nevada	Tuscarora, North Fork, Islands, O'Neil Basin, Snake, Gollaher
V	South-central Oregon/north-central Nevada	Lone Willow*
	Northeastern California/northwestern Nevada	Massacre, Vya, Sheldon, Buffalo-Skedaddle, Likely Tablelands, Devils Garden/Clear Lake, Black Rock, Pine Forest
	Klamath (California)	Devil's Garden
	Warm Springs Valley	Virginia/Pah Rah

Source: Stiver et al. 2006
*PMUs fall in other population/subpopulation

Greater Sage-Grouse Populations

The NDOW and CDFW lek database classifies leks into five categories defined as follows:

- Active—two or more males observed at least twice in the last 5 years
- Pending Active—Two or more males observed only once in the last 5 years, with no other visits conducted
- Inactive—Zero or one male observed during every visit (minimum two visits) in the last 5 years
- Historic—Zero or one male observed during every visit (minimum 5 visits) in the last 30 years
- Unknown—No other conditions met

Currently, there are 635 leks classified as active and 324 classified as inactive. Active leks are distributed among the population/subpopulations, as shown in **Table 3-6**.

Table 3-6
Leks in Population/Subpopulations

Population/Subpopulation	Active	Inactive	Total
Management Zone III			
Central Nevada	158	68	226
Northwestern Interior Nevada	0	0	0
Quinn Canyon Range Nevada	N/A	N/A	N/A
Southeastern Nevada	112	41	153
Management Zone IV			
North-central Nevada	47	30	77
Northeastern Nevada	180	118	298
Management Zone V			
Klamath, Oregon/California	N/A	N/A	N/A
Lake Area Oregon, northeastern California/northwestern Nevada	99	31	130
South-central Oregon/north-central Nevada	36	18	54
Warm Springs Valley Nevada	3	0	3

Source: NDOW and CDFW 2013

Lek data demonstrate where GRSGs in the sub-region are persistent in populations/subpopulations. (See management zone discussions below for summaries of population trends and habitat factors.)

Numbers of males per active lek in each population/subpopulation are characterized in **Table 3-7**.

Table 3-7
Percentage Distribution of Active Leks by Size Category in Population/Subpopulation

Population/Subpopulation	0 to 10 Males	11 to 21 Males	22 to 30 Males	31 to 40 Males	41 to 50 Males	51+ Males
Central Nevada	23	23	17	15	10	11
Northwestern Interior Nevada	0	0	0	0	0	0
Quinn Canyon Range Nevada	0	0	0	0	0	0
Southeastern Nevada	33	29	12	13	4	10
North-central Nevada	21	25	27	9	10	9
Northeastern Nevada	26	29	16	10	8	9
Klamath, Oregon/California	37	13	0	0	49	0
South-central Oregon/north-central Nevada	21	22	24	7	9	16
Lake Area Oregon, northeastern California/northwestern Nevada	18	19	15	17	10	21
Warm Springs Valley, Nevada	27	0	29	44	0	0

Source: NDOW and CDFW 2013

The distribution of lek categories among the population/subpopulations depicts their relative strength. Of note is the Lake Area Oregon, northeastern California/northwestern Nevada subpopulation, with a relatively flat distribution across lek categories indicating a disproportionate number of larger leks. Central Nevada exhibits a similar distribution. Northeastern Nevada and southeastern Nevada have a high number of small leks and a linear decrease in number of leks by size across the categories. The smaller but viable populations in south-central Oregon/north-central Nevada have fewer leks overall, but lek size distributions are similar to those of the most robust Lake Area Oregon, northeastern California/northwestern Nevada and central Nevada populations. These distributions generally correlate to wildland fires, annual grass invasion, and conifer encroachment influences among subpopulations.

Fire Occurrence

Fire has played a major role in the decline of GRSG habitat in the sub-region. Fire starts and total burned acres by both year and decade have increased substantially since 1980. Causes are attributable initially to the influence of invasive grasses on fire return intervals. The fine fuel bed created annually has the ability to ignite more frequently and to burn in larger, more continuous patches.

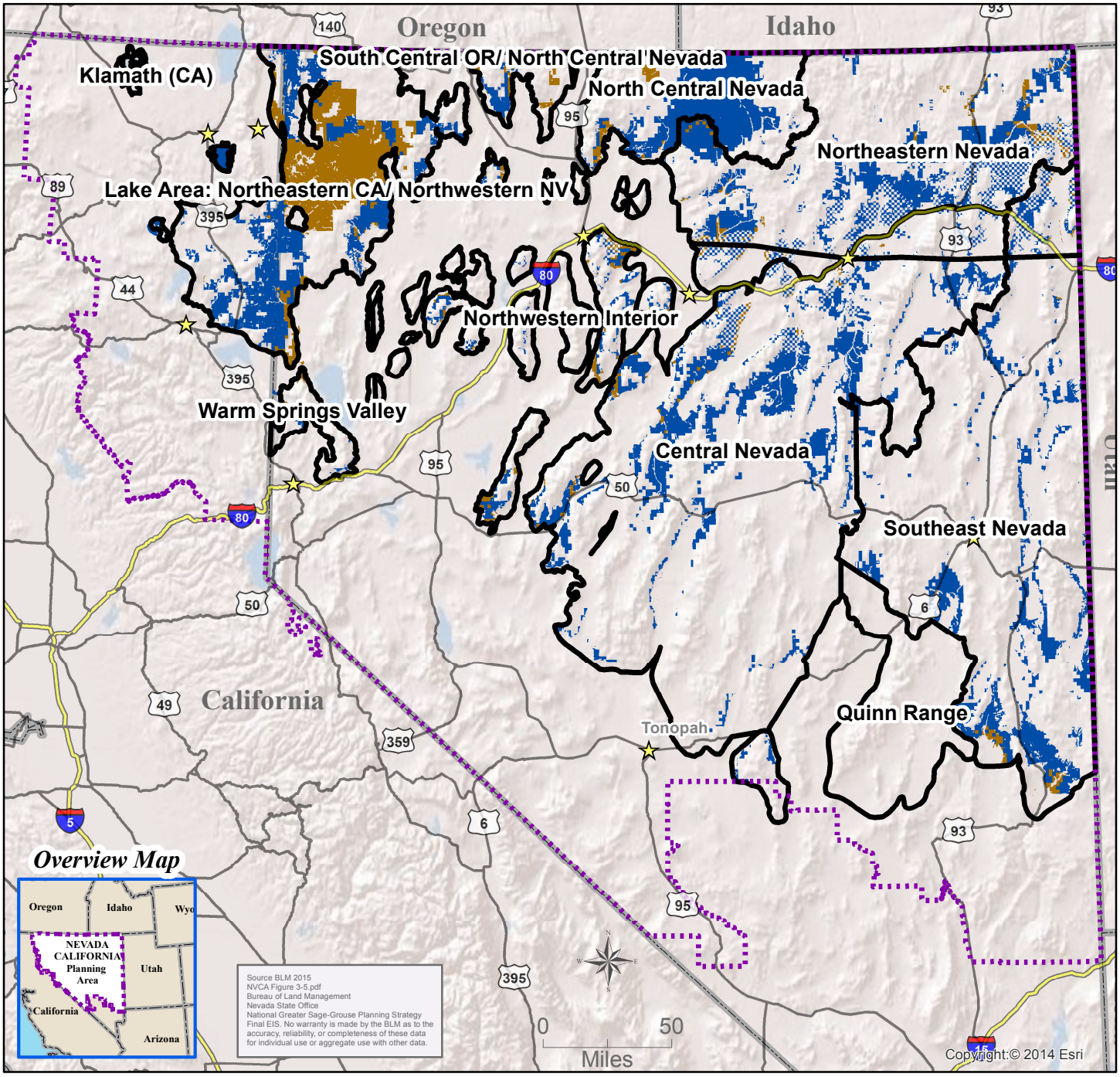
Of increasing importance is the role of climate change. Live fuel moistures are reaching lower values earlier than in recorded history, thus greatly increasing the flammability of larger fuels, such as sagebrush. This increases fire size and also intensifies fire behavior.

Figure 3-5 shows the areas of the sub-region with a high probability for cheatgrass to occur. The loss of GRSG habitat in the northwestern Interior population of the sub-region bears a direct relationship to the high risk of cheatgrass replacement following wildland fire (Connelly et al. 2004). Of note is the low risk for the Nevada portion of the Lake Area Oregon, northeastern California/northwestern Nevada, north-central, and northeastern Nevada subpopulations and the low to moderate risk in the central and southeastern Nevada subpopulations. This demonstrates some level of resilience to the effects of wildland fire and ultimately loss of habitat in these areas.

More recent fire history in the sub-region is shown on **Figure 3-6**, while the trends in fire starts and burned acres are depicted in **Table 3-8**.

Chart 3-1 displays fire data by decade and demonstrates the increase in fire size. Trends in fire starts reflect a general increase across the chart, while acres burned more than doubled from the 1980s to the 1990s and nearly quadrupled between 2000 and 2009.

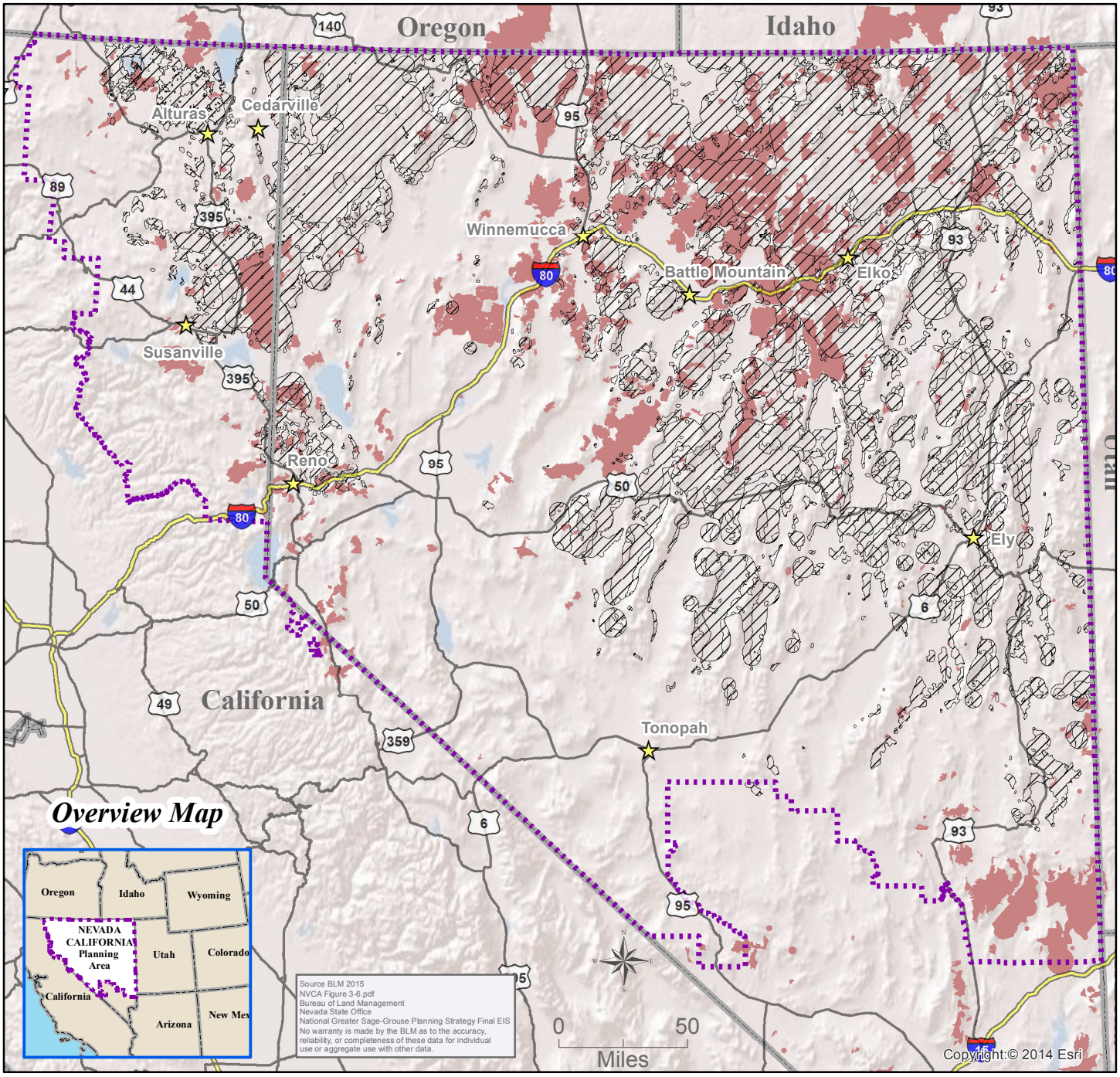
Areas with High Probability of Cheatgrass Occurrence



Legend

- Population Management Units
- **Cheatgrass within Habitat**
  - Low - Moderate Risk
  - High Risk
- City / Town
- Interstate
- US Routes
- States
- Planning Area

Large Fire History 1992-2014



Legend

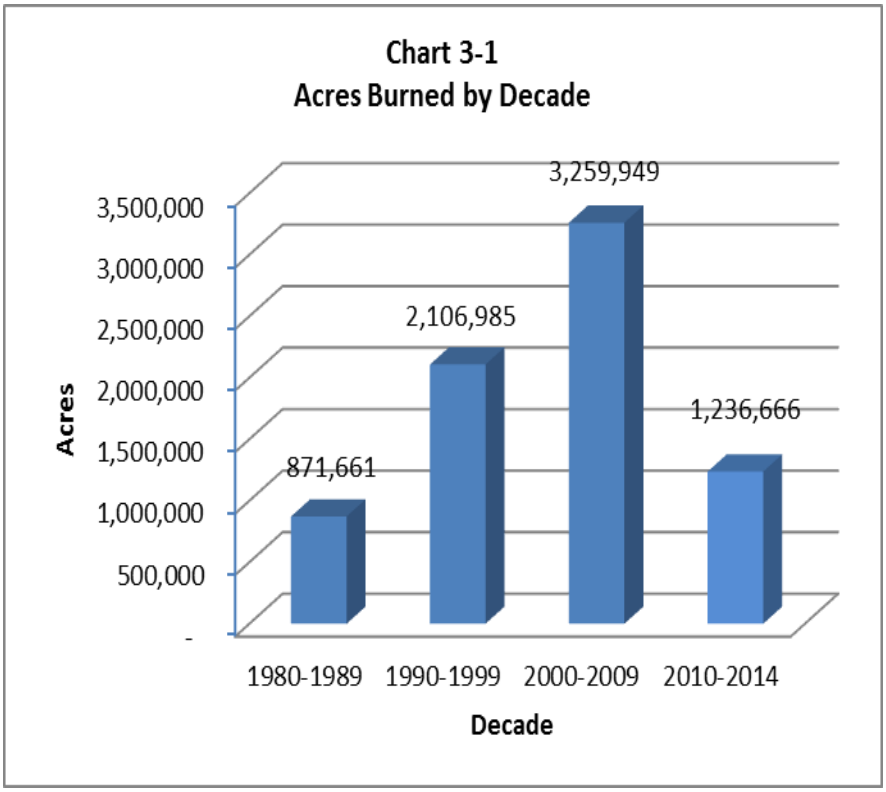
- City/Town
- Interstate
- US Route
- States
- Planning Area
- Preliminary Priority and General Habitat
- Fires >= 1,000 Acres '92-'14

Table 3-8
Fire Starts and Acres Burned by Decade[1] by Population/Subpopulation Area

Population/Subpopulation	1992-2001		2002-2012		Total Acres
	Starts	Acres	Starts	Acres	
Central Nevada	1,165	1,214,385	1,237	430,331	1,644,716
Klamath Oregon/California	645	63,562	482	28,691	92,253
Lake Area Oregon, northeastern California/northwestern Nevada	727	235,277	640	469,638	704,915
North-central Nevada	177	243,505	187	270,243	513,748
Northeastern Nevada	534	813,221	493	1,750,369	2,563,590
Northwestern Interior Nevada	116	536,357	82	73,818	610,175
Quinn Canyon Range Nevada	58	14,292	60	16,762	31,054
South-central Oregon/north-central Nevada	35	88,018	16	503,981	591,999
Southeastern Nevada	1,529	123,651	1,503	91,613	215,264
Warm Springs Valley Nevada	169	68,768	156	5,255	74,023
Grand Total	**5,155**	**3,401,036**	**4,856**	**3,640,701**	**7,041,737**

Source: Short 2013, BLM GIS WFMI 2015.

Chart 3-1
Acres Burned by Decade



Source: BLM/NDOW data not published

Chart 3-1 and **Table 3-8** reflect a relatively lower frequency and fire size in the 1980s. Burned acreage increased dramatically in central Nevada from 1993 to 2002 and remained high into 2012. Fires are concentrated in the northern third of this subpopulation next to the northeastern Nevada subpopulation, where fire activity more than doubled per decade, burning nearly 1.8 million acres between 2002 and 2012.

This general area of fire activity is in an apparent storm track that bisects the state from west to east and runs generally from the Warm Springs Valley Nevada population on the west, through the northwestern Interior Nevada population, and into the northeastern Nevada population. While certain spikes of fire activity are obvious, of note are the general increases in recent fire activity in those previously relatively unburned populations. These trends are noticeable in the Lake Area Oregon, northeastern California/northwestern Nevada, northeastern Nevada and south-central Oregon/north-central Nevada population/subpopulations, where the 2002 to 2012 decade demonstrates decadal highs. Populations of comparatively low fire activity are southeastern Nevada and the southern two-thirds of central Nevada. Higher terrain, varied fuel types, and monsoonal late-summer weather patterns may contribute to this effect.

Fire Effects on GRSGs

To depict the direct effects of fires and fire history on GRSG populations, **Table 3-9** uses the composite footprint of all wildland fires in the sub-region and overlays active and inactive leks (NDOW and CDFW 2012) and any leks that had wildland fire occurrence in a four-mile buffer to reflect impacted nesting habitat. An unknown number of "pending active" leks may be either active or inactive and are omitted from this analysis.

Table 3-9
Active and Inactive Lek Sites Burned Since 1984

Population/Subpopulation	Total Leks		Burned Leks	
			Lek Site Burned	
	Active	Inactive	Active	Inactive
Central Nevada	158	68	11	8
Northwestern Interior Nevada	0	18	0	5
Quinn Canyon Range Nevada	0	0	0	0
Southeastern Nevada	112	41	5	0
North-central Nevada	47	30	8	6
Northeastern Nevada	180	118	52	89
Lake Area Oregon, northeastern California/northwestern Nevada	99	31	8	2
South-central Oregon/north-central Nevada	36	18	11	9
Warm Springs Valley Nevada	3	0	1	0

Source: BLM and Forest Service GIS 2015

In areas of high wildland fire frequency and extent, an extremely high percentage of active and inactive lek sites have been impacted. Many of these leks are assumed to have become inactive in the years following wildland fires. The northeastern Nevada subpopulation shows the highest percentage of impact on active and inactive leks burned. Approximately 29 percent of active leks and 75 percent of inactive leks have been burned. Virtually all leks have had varying amounts of associated nesting habitat burned. The effects of the 2012 wildland fires are shown in the south-central Oregon/north-central Nevada subpopulation, where 37 percent of active and inactive leks were burned and virtually all nesting habitat associated with active and inactive leks was impacted. In the Lake Area Oregon, northeastern California/northwestern Nevada subpopulations, nesting habitat associated with virtually all leks has been impacted, while fewer than 10 percent of active leks were burned.

Connectivity

A key feature relating to connectivity on the statewide scale in Nevada is the presence of the Interstate 80 corridor following the general centerline of the checkerboard landownership that bisects the state. The checkerboard ownership is a product of the Pacific Railroad Act of 1862, which conveyed to the railroads ten sections of land in alternating sections on either side of each completed mile of railroad in support of the construction and operation of the trans-continental railroad system. The act facilitated a 40-mile wide corridor (20 miles on either side of the railroad) of checkerboard ownership.

The railroad and the subsequent interstate highway provide a transportation network around which much of the infrastructure development in northern Nevada has occurred. While this infrastructure is not expected to expand drastically into GRSG habitats, development will continue to intensify in this zone (Comer et al. 2012a). The corridor contains the largest urban areas in northern Nevada, extensive mining and transportation infrastructure, and agricultural development. The combined effects of the corridor on GRSG and its habitats are well demonstrated, with consensus among the land and wildlife management agencies that very little seasonal range connectivity exists across this corridor. It is unknown whether enough episodic crossing occurs to facilitate genetic exchange.

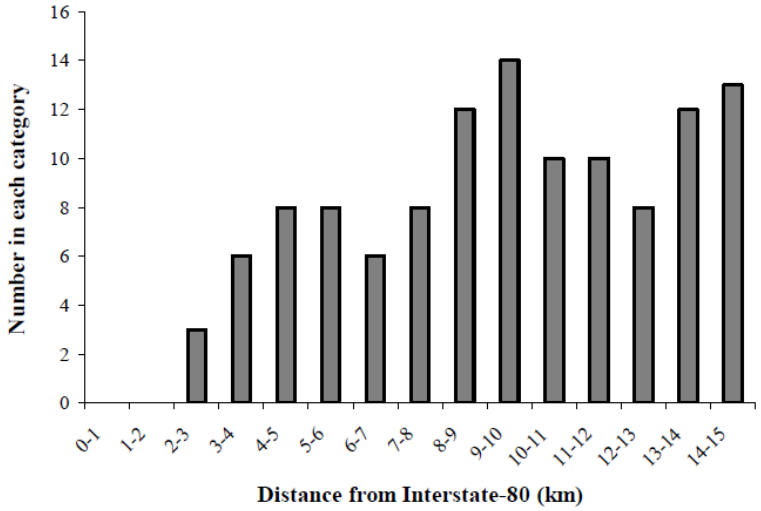
The detrimental effects of interstate highways on GRSG nesting has been documented in Wyoming and northeastern Utah (Connelly et al. 2004; Chart 2-5). This was determined by an analysis of active leks in distance buffers from the interstate and exhibiting similar landownership and concentration of infrastructure as in Nevada. The analysis found no leks within a mile of the interstate (a 2.5-mile-wide band) and only 9 leks between 1.2 and 2.5 miles of the interstate.

Only one equivalent-sized band 38.5 to 40 miles from the interstate had eight leks, with all other intervals having more. A similar analysis for Interstate 80 in Nevada shows similar results. In the Nevada analysis, active leks were counted

in 3.1-mile bands out to 37.3 miles on either side of the interstate, from Winnemucca to the Utah border. No leks occur in the 3.1-mile band (6.2 miles wide), nine occur in the 6.2-mile band (12.4 miles wide), and 10 occur in the 9.3-mile band (18.6 miles wide). An equivalent band, 13 to 15.5 miles away, contains nine leks. Of the highest five band counts, four occur beyond 24.8 miles, indicating that the corridor may be affecting GRSGs to that distance.

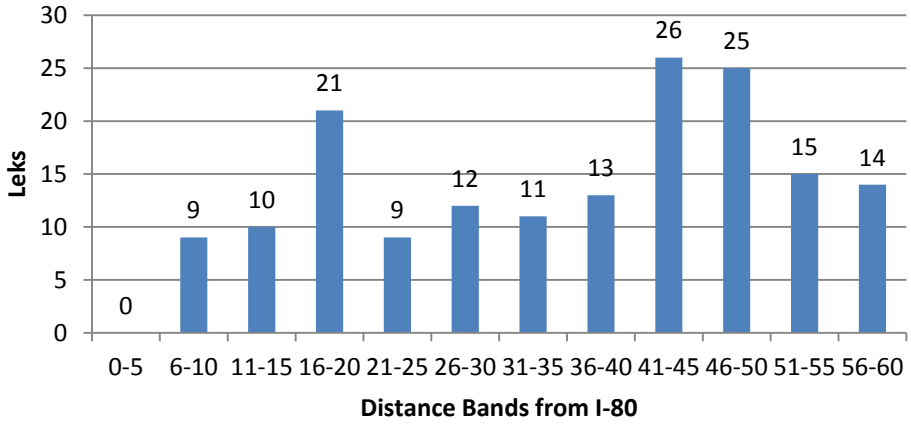
The distance and distribution of GRSG leks in relation to Interstate 80 are displayed in **Charts 3-2** and **3-3**, below.

Chart 3-2
Leks by Distance from Interstate 80



Source: Connelly et al. 2004

Chart 3-3
Nevada Lek Distribution—Interstate 80



Source: NDOW and CDFW 2012

Management Zone Conditions

Management Zone III

MZ III is the most arid and includes the southern extent of GRSG populations across all of central and south-central Nevada and five of seven subpopulations across Utah. The zone consists of four populations/subpopulations (Connelly et al. 2004) and all or portions of 39 PMUs in central and southeastern Nevada. Of the four populations/subpopulations, two are considered large but fragmented (central Nevada and southeast Nevada) and two are considered small and isolated (northwestern Interior and Quinn Range).

The central Nevada subpopulation includes portions of western Nye, eastern Churchill, Eureka, southern Elko, Lander, and western White Pine Counties, including 13.8 million surface acres and 4.9 million acres of PPH and PGH combined. Surface ownership includes a higher percentage of higher elevation lands managed by the Humboldt-Toiyabe National Forest. The BLM administers 9.6 million surface acres (69 percent) and Forest Service administers 2.5 million surface acres (18 percent).

The subpopulation contains 16 PMUs and is considered one of the four strongholds in Nevada. Vegetation modeling across GRSG populations was completed in 2013. It was updated in 2015 by the Forest Service, using the Vegetation Dynamics Development Tool (VDDT). This tool incorporated the Landscape Fire and Resource Management Planning Tools Project (LANDFIRE; USGS 2006a), available GRSG habitat information, expert opinion, and other related information.

VDDT modeling indicates that 44 percent of sagebrush habitats support 10 to 30 percent sagebrush cover, which is considered suitable habitat. Habitat condition trends, which include continued implementation of habitat treatments under current management, are projected to bring sagebrush habitats supporting 10 to 30 percent cover up to 68 percent in 50 years.

Current vegetation treatments are resulting in an improving trend. However, the central Nevada subpopulation is considered in long-range population decline (Connelly et al. 2004; Garton et al. 2011). The subpopulation area supports 158 active and 68 inactive leks. Seventeen percent of active leks have greater than 21 males in attendance, and 11 percent of active leks have greater than 50 males (NDOW 2013).

The Conservation Objectives Team (COT) report (USFWS 2013a) characterizes the population status as being "potentially at risk" because of limited or declining numbers, range, or habitat, even though GRSGs may be locally abundant in some portions of the subpopulation. The report highlights as threats conifers, weeds and annual grasses, fire, infrastructure, grazing, free-roaming horses and burros, and recreation.

Wildland fire activity has been concentrated in the northern end of the subpopulation next to the northeastern Nevada subpopulation where wildland fire has exerted the highest impacts in the state. The southern two-thirds of the central Nevada subpopulation remains relatively insulated from the occurrence and effects of wildland fire.

Generally, wildland fire has had less overall impact on habitats than in other populations/subpopulations in central Nevada, while conifer encroachment plays a larger role. Annual grasses model at or below 45 percent probability of occurrence throughout the entire subpopulation, giving it a lower but still moderate ranking of fire regime departure (projected to increase in frequency and extent) but reflective of the current level of annual grass invasion that has already occurred. Overall, compared to the habitats of other Nevada subpopulations, these habitats maintain the highest integrity in the state, with respect to potential abundance of annual grasses.

Change in extent of pinyon /juniper woodlands is moderate, indicating a significant level of continuing expansion into sagebrush habitats. Summarizing the effects of climate change on GRSG habitats indicates a strong predicted influence. Increased temperature regimes are shifting lower elevation sagebrush habitats into mixed salt desert scrub on a significant scale. Sagebrush habitat is expanding at higher elevations, retaining significant habitat as potential projected climate change focal areas for GRSGs and other species (Comer et al. 2012).

The southeastern Nevada subpopulation includes portions of far southeast Elko, the eastern portion of White Pine, and the northern portion of Lincoln Counties, including 9 million surface acres and approximately 3 million acres of PPH and PGH combined. It contains all or portions of six PMUs. GRSG habitats here are considered important as a stronghold in the state, but they are recognized as having generally smaller population size (lek size) on average, compared to other stronghold areas.

The southeastern Nevada subpopulation supports 112 active and 41 inactive leks. Only 12 percent of leks have greater than 21 males in attendance, and 10 percent have greater than 50 males (NDOW 2014). VDDT modeling indicates that 36 percent of sagebrush habitats support 10 to 30 percent sagebrush cover, which is considered suitable habitat.

Habitat condition trends, which include continued implementation of habitat treatments under current management, are projected to bring sagebrush habitats supporting 10 to 30 percent cover up to 54 percent in 50 years. Current vegetation treatments are resulting in an improving trend.

Topography in this subpopulation is a north-south basin and range configuration, with invasive conifer occupying an elevation zone between breeding and summer brood-rearing habitats. GRSGs complete one- and two-stage migrations in this subpopulation between these seasonal ranges. The COT

Report (USFWS 2013a) characterizes the seasonal ranges as "disjunct, but connected."

As with populations throughout Nevada, the population is considered to be in long-term decline (Connelly et al. 2004; Garton et al. 2011). The COT report (USFWS 2013a) does not differentiate between the central and southeastern Nevada subpopulations. The report characterizes the population status as being "potentially at risk" because of limited or declining numbers, range, and habitat, even though GRSGs may be locally abundant in some portions of the area.

The report highlights as threats conifers, weeds and annual grasses, fire, infrastructure, grazing, free-roaming horses and burros, and recreation. Annual grasses have potential abundance at or above 45 percent throughout the basins, with low to no risk on mountain topography.

Climate change projections indicate a substantial decline of sagebrush habitats from the southern end of the subpopulation. This is due to an increase in salt desert scrub and northerly encroachment of Mojave Desert species with only minor expansion of pinyon /juniper woodlands. Intact habitats will persist at higher elevations (Comer et al. 2012).

The northwest Interior Nevada population consists of Pershing and portions of southern Humboldt Counties and is relatively small (1.9 million acres). The population contains all or portions of 16 small and isolated PMUs. The population is dominated by lower elevation Wyoming sagebrush habitats that have burned extensively and repeatedly for the last two decades due to the domination of invasive grasses and altered fire return intervals. Approximately 560,000 acres have burned since 1984.

Sagebrush canopy is absent over vast areas, marginalizing habitat value to GRSGs. NDOW mapped habitat on only small portions of seven of the PMUs in the northwest Interior population. This is due to the lack of active leks and the suspected inability of these areas to recover from wildland fire. The total of PPH and PGH combined is 96,600 acres.

VDDT modeling was not completed on this population. The COT report (USFWS 2013a) characterizes the population status as "high risk" because of extremely limited or rapidly declining numbers, range, or habitat. This makes GRSGs in this area highly vulnerable to extirpation. The NDOW lek database indicates no active leks and 18 inactive leks. The report highlights as threats the area's isolation and small size, fire, weeds, annual grasses, mining, infrastructure, grazing, free-roaming horses and burros, and recreation. The invasive grass potential is above 45 percent, with fire regime departures the highest in Nevada (Comer et al. 2012).

The Quinn Canyon Range Nevada population contains one PMU and is the southernmost extent of GRSG range in Nevada, located in east Nye and

northwest Lincoln Counties. The Quinn PMU encompasses 2 million surface acres (1.7 million BLM; 223,000 Forest Service).

VDDT modeling was not completed on this population. The COT report (USFWS 2013a) characterizes the population status as "high risk" because of extremely limited or rapidly declining numbers, range, or habitat, making GRSGs in this area highly vulnerable to extirpation. The report states the population as containing fewer than 200 birds and that Garton et al. (2011) does not model the population due to lack of data. The NDOW lek database indicates no active or currently inactive leks.

Moderate and imminent threats to the population are weeds and invasive grasses, conifers, infrastructure, livestock, and wild horses. Climate change modeling indicates the near elimination of sagebrush habitat for this population by 2060 (Comer et al. 2012).

Management Zone IV

This MZ is extensive, including subpopulations in Nevada, southern Idaho, northwestern Utah, and southeastern Oregon. MZ IV consists of the subpopulations in northeastern and north-central Nevada and all or portions of nine PMUs in north-central and northeastern Nevada, in the northern half of Elko and eastern Humboldt Counties.

Surface acreage and GRSG habitat in the northeastern subpopulation is 6 million acres and 3 million acres (PPH/PGH), respectively. Surface acreage and habitat for the north-central Nevada subpopulation includes 1.6 million acres and 1.3 million acres (PPH/PGH) acres, respectively. Of seven management zones, MZ IV is characterized as one of those supporting the highest densities of GRSGs but also is considered in long-range population decline (Connelly et al. 2004; Garton et al. 2011). The northeastern Nevada population supports 180 active leks and 118 inactive leks. Active lek size distribution is skewed toward those with fewer than 21 males (55 percent); 9 percent of leks have more than 50 males. The north-central Nevada population supports 47 active leks and 30 inactive leks. Forty-six percent of leks have more than 21 males and nine percent have over 50 males.

The critical factor affecting GRSGs and their habitats in Management Zone IV is wildland fires. Combined, these subpopulations have had approximately 1,400 fire starts burning over 3 million acres since 1992. Sixty (26 percent) of 227 active leks and 95 (64 percent) of 148 inactive leks have burned. Wildland fires have increased dramatically in both frequency and extent, leaving large areas devoid of sagebrush canopy and dominated by grasses in general but particularly invasive species.

Restoration has been moderately successful in some areas. VDDT modeling in the northeastern Nevada subpopulation indicates that 55 percent of sagebrush habitats support 10 to 30 percent sagebrush cover, which is considered suitable

habitat. Habitat condition trends, which include continued implementation of habitat treatments under current management, are projected to bring sagebrush habitats supporting 10 to 30 percent cover up to 62 percent in 50 years.

Current vegetation treatments are resulting in a stable to improving trend. VDDT modeling in the north-central Nevada subpopulation indicates that 56 percent of sagebrush habitats support 10 to 30 percent sagebrush cover, which is considered suitable habitat. Habitat condition trends, which include continued implementation of habitat treatments under current management, are projected to bring sagebrush habitats supporting 10 to 30 percent cover up to 70 percent in 50 years. Current vegetation treatments are resulting in an improving trend.

The COT report (USFWS 2013a) highlights fire and invasive plant species, conifer encroachment, and infrastructure development as threats. The potential abundance of invasive annual grasses is consistently above 45 percent over most of MZ IV, with the remainder in the 25 to 45 percent range, second only to the northwest Interior subpopulation area in invasive grass abundance. However, climate change modeling shows the expanding habitat types to be supportive of GRSGs through time, with an accompanying increase in juniper or pinyon encroachment. Considering the intermediate scores for landscape condition and invasive annual grasses, low likelihood of future development, and low climate change stress, habitat restoration opportunities are very high in MZ IV. This supports the potential for management as a stronghold in this MZ (Comer et al. 2012).

Management Zone V

This MZ consists of five populations/subpopulations in three states (Connelly et al. 2004) and all or portions of ten PMUs in northwestern Nevada and northeastern California. It represents the westernmost extent of the GRSG range in California and contains a mix of habitat issues that have had long-term effects on GRSG populations. The range of GRSG in this region has continued to shrink over the last three decades, while some populations in the MZ are relatively stable. When considered in its entirety, including south-central Oregon, population changes from 1965 to 2004 are statistically undetectable (Connelly et al. 2004). Of the seven MZs, MZ V is characterized as one of those supporting the highest densities of GRSGs.

The Klamath Oregon/California population in northern Modoc County, California, is shared with Oregon and contains the Devil's Garden PMU. It was once connected to PMUs in northeastern California and northwestern Nevada, but it is now virtually extirpated. Of 46 active leks known to have been extant in the PMU as late as the 1970s, only one active lek remains. It is on USFWS lands at Clear Lake and has been supported since 2005 through population augmentation, consisting of annual translocation of various numbers of GRSG males and females from other lek sites, mostly from the Sheldon National Antelope Refuge and other well-attended lek locations in Nevada. Habitat in this

area has been severely compromised by conifer encroachment and to a lesser extent by invasive grasses. The persistence of the Clear Lake population depends on the large-scale juniper removal by the Modoc National Forest. Planning for this PMU/population is not considered further in this Proposed LUPA/Final EIS.

The Lake Area Oregon, northeastern California/northwestern Nevada subpopulation includes portions of west Humboldt and north Washoe Counties in Nevada and east Lassen and southeast Modoc Counties in California. Total surface acreage is 4.3 million, with 2.6 million acres of PPH and PGH combined. The subpopulation includes a mix of extirpated, highly threatened, and relatively stable PMUs. In the COT report (USFWS 2013a), the USFWS generalizes threats to this subpopulation as isolation, small population size, conifers, fire, invasive plant species, livestock, and wild horses.

The California portion includes the Likely Tablelands PMU in eastern Modoc County, which is likely to become extirpated in the next decade. The population consists of only one lek that contained three strutting males in 2012 and no birds in 2013 or 2014. Up to eight leks were present on the Likely Tablelands in the 1980s. They were connected to other populations on the Devil's Garden and farther west onto Rocky Prairie and into Round Valley to the west and Big Valley in far northwestern Lassen County, all of which are extirpated.

The Likely Tablelands PMU is the site of an extensive invasion of nonnative grasses, including cheatgrass, but specifically medusahead. Repeated fires and the resulting continuous mat of medusahead have precluded all but a few localized areas of sagebrush from this landscape. The PMU is disconnected from the Buffalo-Skedaddle PMU to the south by a 20-mile-wide band of invasive conifer.

The Buffalo-Skedaddle PMU is one of mixed habitat quality and is discussed as a stronghold in many references. Of its 1.4 million acres, restoration mapping indicates 46 percent of potential habitat (mature sagebrush) understory is dominated by annual grass, annual forbs, bare ground, or 0 to 9 percent juniper cover (phase 1). An additional 19 percent of potential sagebrush habitat has crossed the threshold from sagebrush-dominated to juniper or annual grass-dominated communities (Armentrout and Hall 2005).

The PMU has been subject to a highly altered fire regime that has systematically reduced sagebrush cover. In 2012, the Rush fire burned 315,000 acres, or 23 percent of the PMU. The Rush fire burned nearly the entire length of the PMU and severed its remnant western half from the stronghold populations to the east, creating another isolated GRSG population along the western edge of the range.

Restoration of previous burns in the PMU has not proven successful due to the presence of invasive grasses, low-elevation Wyoming sagebrush sites, and low precipitation. Similar results are expected from the Rush fire.

Long-term population declines leading to extirpation of GRSGs in this PMU are likely over the next several decades due to isolation and habitat loss. This will greatly shrink GRSG range on the western edge and potentially eliminating them from northeastern California. No modeling has been completed to support this hypothesis.

As of 2012, 21 leks were active in Buffalo-Skedaddle PMU; 11 were burned in the Rush fire of 2012. Livestock grazing, both historic and present, and wild horse overpopulation are additional threats affecting this PMU, including both nesting cover and availability of late-summer brood-rearing habitats.

The remaining PMUs in the northeastern California/northwestern Nevada subpopulations are stronghold populations in northwestern Nevada and the far northeastern corner of California. The Massacre PMU has experienced much less wildland fire than the surrounding PMUs. Invasive grasses, though present, have not manifested extensively in the Massacre PMU.

GRSG populations remain high and stable and are connected with stronghold PMUs at the Sheldon National Antelope Refuge and into Oregon. As of 2012, 28 leks were active in the PMU, including two leks with over 100 males. Though the high level of fire activity since the 1980s characterizing much of northern Nevada has spared this PMU, recent wildland fire activity has affected up to 100,000 acres, including 60,000 acres lost in 2012. This potentially reflects a further heightening of wildland fire activity overall, due to the effects of climate change and resultant lowering of fuel moisture levels in larger fuel types such as sagebrush. Habitat quality is further threatened by both livestock grazing and wild horse and burro overpopulation, affecting both nesting cover and availability of late-summer brood-rearing habitats.

Next to the Massacre PMU, the Vya PMU is the northwestern-most Nevada PMU and includes a sliver of northeastern California. Similar to the Massacre PMU, wildland fire and invasive grasses are less manifested than in north-central and northeastern Nevada, with overall habitat quality relatively high; however, GRSG habitat is affected by conifer encroachment.

The agencies continue to conduct large-scale conifer control in this PMU. Livestock grazing and wild horse and burro overpopulation are additional threats. This PMU supports 16 active leks, with population declines apparent as the juniper encroachment increases fragmentation.

Overall, VDDT modeling for the northeastern California/northwestern Nevada subpopulations indicates that 56 percent of sagebrush habitats supports 10 to 30 percent sagebrush cover, which is considered suitable habitat. Habitat condition trends, which include implementing habitat treatments under current management, are projected to bring sagebrush habitats supporting 10 to 30 percent cover down to 45 percent in 50 years. The trend is down due to increasing annual grasses and conifer encroachment.

The south-central Oregon/north-central Nevada subpopulation contains 455,500 surface acres and 393,000 acres of PPH and PGH in Humboldt County, north of Highway 140 and west of Highway 95. It is denoted as the Lone Willow PMU and includes the Bilk Creek and Montana Mountains. The subpopulation is continuous into Oregon and also includes the Trout Creek Mountains and the Hart Mountain National Antelope Refuge.

Though relatively small, the subpopulation includes 36 active leks. Twenty-one percent of active leks have greater than 21 males and 16 percent have greater than 50 males, similar to other larger subpopulations considered as strongholds in the sub-region. It contains one of the most densely populated winter ranges identified in Nevada.

Fire activity is high, with nearly 25 percent of the area burning every decade. In 2012, the Holloway fire burned approximately 214,000 acres in the Nevada portion and another 245,000 acres in Oregon. VDDT modeling indicates that 30 percent of sagebrush habitats support 10 to 30 percent sagebrush cover, which is considered suitable habitat. Habitat condition trends, which include continued implementation of habitat treatments under current management, are projected to bring sagebrush habitats supporting 10 to 30 percent cover up to 35 percent in 50 years. Current vegetation treatments are an improving trend, though they are greatly impacted by recent fires. The COT report (USFWS 2013a) characterizes fire and annual grasses as substantial and imminent threats in this portion of the subpopulation, along with mining and infrastructure as substantial and not imminent.

The Warm Springs Valley population (Pah Rah and Virginia PMUs) encompass 231,000 surface acres of BLM lands and 107,500 acres of PPH and PGH in southern Washoe County. This area is bounded on the west by Highway 395, on the south by Long Valley, Interstate Highway 80, and the cities of Reno and Sparks, Nevada, and on the east and north by State Highway 446.

Wildland fires have burned approximately 35 percent of this PMU, converting sagebrush-dominated shrublands to annual grasses and invasive species. Wildland fires that occurred from 1999 through 2001 were particularly devastating, burning some of the last strongholds of GRSG habitat left in both the Pah Rah and Virginia Mountain Ranges. GRSGs in these two mountain ranges occur in small isolated pockets of suitable habitat in the northern Virginia Mountains.

GRSGs use approximately 54,000 acres (15 percent) of the 356,034 acres in this PMU. Only 65 percent is under BLM administration, while 24 percent is under private ownership, and 9 percent belongs to the Pyramid Lake Indian Tribe. Urbanization, particularly in the Pah Rah Range, threatens existing GRSG habitat. Of the estimated 53,760 acres of habitat used by GRSGs in the Pah Rah and Virginia Mountain Ranges, 27,520 acres, or 51 percent, are under private

ownership. In the Pah Rah Range, an estimated 69 percent of existing GRSG habitat is under private ownership.

VDDT modeling indicates that 60 percent of the remaining sagebrush habitats support 10 to 30 percent sagebrush cover, which is considered suitable habitat. Habitat condition trends, which include continued implementation of habitat treatments under current management, are projected to bring sagebrush habitats supporting 10 to 30 percent cover to 56 percent in 50 years.

Downward trends are slight and due to treatment rates not keeping pace with annual grass expansion. A qualitative population viability analysis was completed using parameters outlined in Appendix I of the Nevada Governor's GRSG Conservation Plan (State of Nevada 2004). NDOW analysis of factors in these mountain ranges indicates a high probability of extirpation in the next 20 years.

Only three active leks are known. Current population estimates based on these leks indicate declining numbers, with a spring breeding population of 150 to 200 GRSGs (NDOW 2004b). The COT report (USFWS 2013a) notes only two leks and characterizes the population at less than 200 males. It does not provide estimates for persistence. The report highlights such threats fire, infrastructure, annual grasses and invasive species, conifer encroachment, energy development, wild horses and burros, recreation, and urbanization. The report identifies the population as "at risk" overall.

3.2.4 Regional Context

Clear patterns in the distribution and current ecological condition of conservation elements are a direct response to change agents of invasive plant species, alterations to wildland fire regimes, and development.

Roads, other linear infrastructure, urban areas, mining, and other industries have a relatively small overall footprint in this ecoregion. Approximately 7 percent of the land surface is occupied by these uses. Development tends to occur in areas of productive soils, surface and groundwater availability, and areas topographically suitable for roads, transmission, and pipelines. These also tend to be favored for wildlife movement and may impact some of the most productive and sensitive resources (Comer et al. 2013).

Much more pervasive are the effects of expanding invasive species and their effects on wildland fire. Nearly every fifth field watershed is vulnerable to, if not already seriously infested with, invasive annual grasses, substantially altering effects on the behavior of natural wildland fires. Effects include wildland fires of increased size and severity, conversion from perennial bunchgrasses, forbs, and shrubs to annual grasses, and related fragmentation of habitat for species such as GRSGs. The relative size and frequency of wildland fires will in all likelihood continue to increase across the region.

Infrastructure

All development types occupy approximately 7 percent of the ecoregion and are expected to increase another 0.5 percent by 2025. The proportion of the ecoregion that would be developed by 2025 will increase from less than 7.1 percent currently to 7.6 percent by 2025. While this increase is proportionately small, it represents nearly 500,000 acres of additional development. Renewable energy development remains a key concern for managers. While the current and expected 2025 renewables footprint amounts to only 0.2 percent of the ecoregion, the potential (as mapped by the National Renewable Energy Laboratory) covers most of the area (Comer et al. 2013).

All of the indicators consistently show impacts for the heavily developed urban and agricultural use areas in the northwestern quadrant of the ecoregion, along the Wasatch Front, in the Owen's Valley, along the Interstate 80 corridor, and in certain interior watersheds where large mines and other impacts occur.

Consistent with forecasts of the development change agents, the summary map of landscape for current and projected 2025 conditions does not indicate a large degree of change. For the most part, increased urbanization is forecasted to occur in and around current locations. **Figure 3-7** shows the current landscape condition indicator in the Central Basin and Range (CBR), based on development change agents.

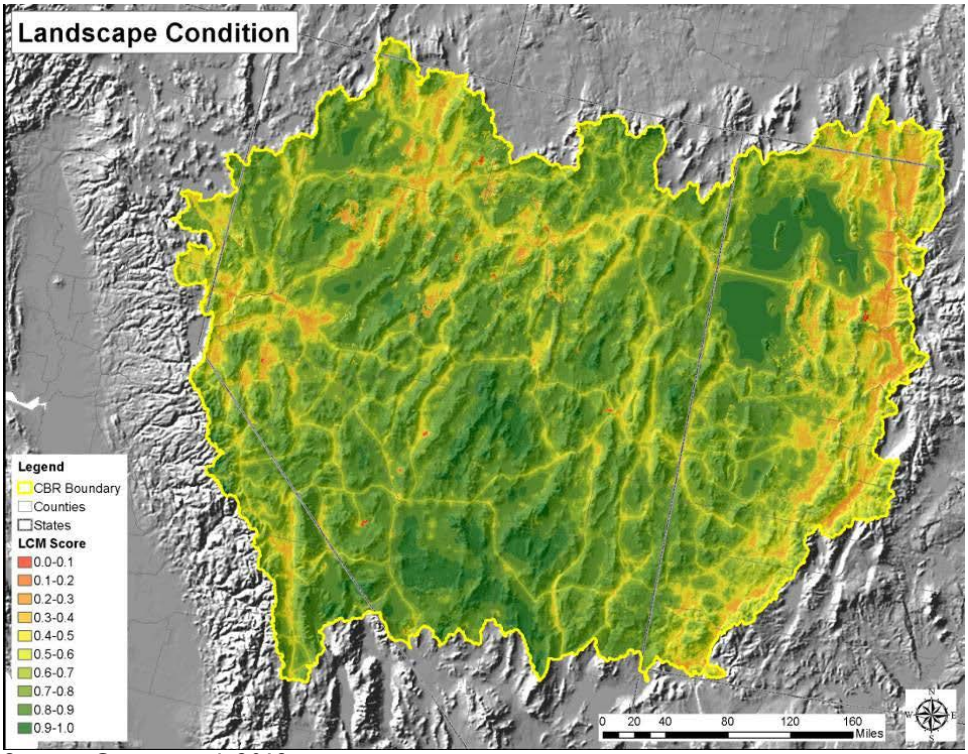
Invasive Species/Fire

Currently and by 2025, wildland fire and invasive annual grasses are by far the greatest management concerns.

An overwhelming proportion of the CBR is predicted by a landscape condition model to support annual grasses at 45 percent cover (Comer et al. 2013). Although disturbance is a driver of the competitive success of these invasive annual grasses, one can assume that future disturbances will continue in the present patterns. This is undoubtedly the most severe circumstance on an ecoregion scale in the western United States. Indicators suggest overall that substantial fire regime departure has occurred throughout the Montane Uplands (montane forest and shrub land vegetation) of the CBR.

Change from historic reference conditions (known as fire regime departure in fire analysis discussions) for upland ecosystems in the intermountain basins (such as salt desert scrub and big sagebrush shrub land) is overall more severe. It reflects a spatial pattern similar to that provided by the invasive annual grass indicator. While annual grasses and fire regime departure are linked processes operating on the landscape, the current mapping of invasive species is not yet fully coupled with fire regime departure. For example, fire frequency remains very low in some desert scrub types, while they appear to be accumulating invasive plant abundances.

Figure 3-7
Landscape Condition



Source: Comer et al. 2012a

Fire regime departure models from 2025 to 2060 indicate relative minor differences. Thus, management priorities guided primarily by the analysis of current conditions should hold for the upcoming decades. Where current conditions suggest needs for habitat restoration and management focus, forecasts for upcoming decades for landscape condition and fire regime departure suggest those same management directions.

Climate Change

Over the next 20 to 50 years, forecasts indicate the potential for truly profound transformation in many ecosystems across the CBR. Climate space trends indicate the potential for extreme growing season temperatures throughout most of the ecoregion. These forecasts appear most intense along the southern CBR, and throughout the other largest basins.

For November through June for the 2020s, less than 5 percent of the CBR area is projected to experience statistically significant increases in monthly maximum temperature of one standard deviation beyond the values of the twentieth century baseline. In contrast, for this same period, July, August, and September may see similarly significant maximum temperature increases over 50, 65, and 70 percent of the CBR ecoregion, respectively. The spatial distribution of these projected changes by the 2020s is concentrated toward the southern half of the ecoregion.

By 2060, the six global climate models forecast substantial increases in maximum temperatures for all months, with the greatest increases concentrated during the summer. For July and August, by 2060, 90 percent and 85 percent of the CBR, respectively, is forecast to experience monthly maximum temperatures 2 standard deviations beyond the values of the twentieth century baseline.

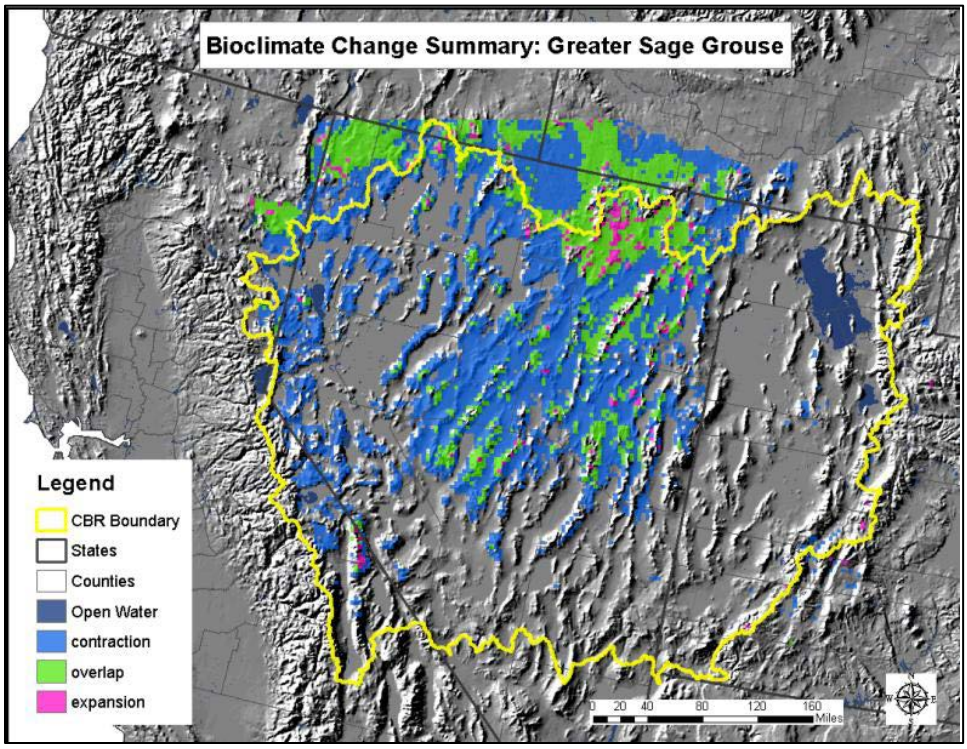
As early as the 2020s, July, August, and September minimum temperatures (i.e., night-time temperatures) are predicted to exceed one standard deviation beyond the twentieth century baseline for 90 percent of the CBR. By the 2050s, the increases in monthly minimum temperature become even more pervasive and severe. For every month during the 2050s, nearly all of the CBR is projected to exceed one standard deviation beyond the twentieth century baseline, and for July through September, the models predict that 90 percent of the region will experience monthly minimum temperatures two standard deviations beyond baseline values; 61 percent of the region will experience this in October. In some cases, substantially more than 50 percent of the area of the current climate distribution will be lost over the next 50 years.

Regarding landscape pattern effects, in most cases, a clear shift to higher elevation, and to the north, can be observed in each model. Differences among types tend to be in the forecasted magnitude of change (i.e., the relative proportion of current distribution where the climate envelope is forecasted to move elsewhere).

There is a tendency for mixed salt desert scrub to expand into adjacent lands currently occupied by big sagebrush shrub land. In the southern portion of the region mixed salt desert scrub is displaced with expansion by desert scrub species characteristic of the Mojave Desert. Farther upslope, the climate envelope for Great Basin pinyon /juniper woodland is forecast to retreat northward to some degree, but overall there appears to be considerable overlap throughout this region.

Dramatic climate envelope shifts are forecasted for GRSGs, with only a relatively small proportion of the current distribution forecasted to retain the climate regime close to that currently supporting this species (see **Figure 3-8**). Green areas indicate where current climate envelope distributions overlap with the forecast. Blue areas indicate potential contraction, where current climate characteristics supportive of GRSG habitat will be replaced by significantly different climate regime. Pink areas indicate where current climate regime for GRSG habitat is forecasted to occur outside of the current distribution by 2060. In more general terms, species that rely on sagebrush habitat have higher loss in climate envelope compared to other species. In particular pygmy rabbit, sage sparrow, and Columbian sharp-tailed grouse are projected to experience severe climate-related loss by 2060.

Figure 3-8
Bioclimate Change Summary: Greater Sage-Grouse



Source: Comer et al. 2012a

Lowest elevation basins throughout the ecoregion could transition from cool semidesert into very warm and sparsely vegetated desert landscapes more typical of the Mojave Basin and Range.

When the overlap areas of major vegetation type climate envelopes are combined, one can identify areas ranging in importance for retaining these vegetation types (i.e., focal areas). In some areas of the CBR, as many as seven major vegetation types show an overlap between current and forecasted climate envelopes. These areas are good indicators of potential climate change focal areas. Areas forecasted to experience the least amount of change are concentrated in north-central and south-central Nevada. These areas may be further evaluated in this light for their potential to provide some degree of climate change focal areas.

Restoration priorities and restoration focal areas can be identified in areas showing intermediate status scores for landscape condition and invasive annual grasses, low likelihood of future development, and low climate change stress by mid-century.

3.3 VEGETATION (INCLUDING INVASIVE AND EXOTIC SPECIES AND NOXIOUS WEEDS)

Vegetation serves multiple purposes on the landscape and provides many ecosystem services. It stabilizes soils, prevents erosion, uses carbon dioxide,

releases oxygen, increases species diversity, and provides habitat and food for animals and products for humans. Many of the BLM's and the Forest Service's land management policies are directed toward maintaining healthy vegetation communities. Vegetation can be characterized generally by ecological provinces and more specifically by plant communities.

The ecological provinces and plant communities discussed below are those that provide the most important land cover across the planning area.

The planning area falls in the Northern Basin and Range, CBR, Sierra Nevada, and Eastern Cascades Slopes and Foothills ecoregions (EPA 2010). These ecoregions are subdivided based on physical characteristics of the landscapes; they are further divided into vegetation communities, which are named according to the types of plant species that comprise them. Plant communities with the same name can occur in more than one ecoregion or subdivision; however, these communities often have subtle differences in their makeup. A description of each of the major vegetation communities in the planning area is provided below.

Acres of each vegetation community in PPH and PGH on BLM-administered and National Forest System lands in the planning area are shown in **Table 3-10**.

Table 3-10
Acres of Vegetation Communities in PPH and PGH

Vegetation Community	Bureau of Land Management		Forest Service		Other Landownership	
	PPH	PGH	PPH	PGH	PPH	PGH
Northern Basin and Range	4,138,200	1,462,200	491,500	199,600	1,280,800	672,100
Central Basin and Range	4,610,500	4,484,300	322,400	686,600	1,160,400	1,358,500
Sierra Nevada	-	12,100	-	-	-	15,300
Eastern Cascades Slopes and Foothills	10,700	108,500	-	-	37,100	583,800
Mojave Basin and Range	-	-	-	-	-	-
Cascades	-	-	-	-	-	-

Source: BLM and Forest Service GIS 2015

3.3.1 Weed Control Guidance and Programs

Integrated weed management is a systems approach for managing noxious weeds and invasive species. Walker and Buchanan defined integrated weed management as "the application of many kinds of technologies in a mutually supportive manner. Integrated Weed Management involves the deliberate selection, integration, and implementation of effective weed control measures with due consideration of economic, ecological, and sociological consequences" (Walker and Buchanan 1982).

Noxious weeds and invasive annual grass species out-compete native vegetation for resources through advantageous physiological characteristics. Weeds

threaten to degrade public lands in Nevada and California by spreading into and infesting sensitive riparian ecosystems, important rangelands, wildland fire scars, and developed lands maintained as ROWs or recreation areas. These threats can come in the form of unbalanced biodiversity, a weakened ecosystem, a higher propensity for soil erosion, increased frequency of wildland fires, and limited food resources for both terrestrial and aquatic wildlife. Weeds on private agricultural lands have the potential to spread onto federal lands and vice versa.

3.3.2 Current Condition

Noxious Weeds on BLM-Administered Lands

There are about 8.5 million acres of noxious weeds on BLM-administered land in the planning area. Most species are expanding at about 14 percent annually (BLM 1985c). Noxious weeds are regularly managed by federal, state, and county agencies, conservation groups, and private landowners.

Repeated wildland fires and other disturbance regimes tend to increase noxious and invasive weed presence and likelihood. Infestation rates have reached the point in many areas where complete eradication is no longer possible (BLM 1986c).

Noxious Weeds on National Forest System Lands

On the Humboldt-Toiyabe National Forest, invasive species account for less than 0.5 percent of the land base in Nevada. Approximately 29,000 acres of invasive species have been identified, approximately 16,000 acres of which is classified as noxious weeds. Of the 16,000 acres, 40 percent of the infestation is less than one tenth of an acre, and 30 percent of the infestations is half an acre or less.

The Forest Service has comparative data showing what vegetative community types are currently infested with noxious weeds. These data show that while mountain big sagebrush accounts for 18 percent of the vegetative types, it contains 27 percent of the weed occurrences. Comparatively, pinyon and juniper account for 37 percent of the vegetative types but contains 17 percent of the noxious weed occurrence.

When all riparian vegetative types are combined, they account for one percent of the vegetative types found on the forest but contain 24 percent of the noxious weed occurrence. The fact that riparian-related vegetation types support such a disproportionate amount of noxious weeds species makes managing riparian areas even more important. This is especially true in arid Nevada, where preserving the integrity of riparian areas is critical for wildlife, recreation, water quality, and grazing management.

Ecoregion Types

Northern Basin and Range

The Northern Basin and Range ecoregion contains arid intermontane basins, dissected lava planes, and scattered mountains. Shrub communities and aridisols are common, and non-mountain areas have sagebrush steppe vegetation. Mountain ranges are generally covered in sagebrush at higher elevations and other mountain browse species, with an understory of bunchgrasses and forbs. These areas are largely treeless and include a mosaic of native bunchgrasses and shrubs. In this type, sagebrush typically co-dominates with perennial bunchgrasses (Miller et al. 2011).

Common species include Wyoming, basin, and mountain big sagebrush as shrub components, with inclusion areas that contain low sagebrush, early sagebrush, and black sagebrush in shallower soils. Other mountain browse species can be found at higher elevations, which typically include antelope bitterbrush, serviceberry, and snowberry. Bunchgrasses are typically cool season grasses, such as Sandberg bluegrass, bottlebrush squirreltail, bluebunch wheatgrass, Great Basin wildrye, Indian ricegrass, needle and thread, and Idaho fescue. However the range of understory and diversity is based on successional stages that vary from early to mid to late.

Central Basin and Range

The CBR ecoregion is internally drained (Great Basin) and is characterized by a mosaic of xeric[1] basins, scattered low and high mountains, salt flats, and dry lake beds. It has a hotter and drier climate, more shrubland, and more mountain ranges than the Northern Basin and Range ecoregions to the north. Basins in this ecoregion are primarily covered by Wyoming and basin big sagebrush, with a limited understory of bunchgrasses and forbs, as well as salt desert and greasewood vegetation in the low valleys. The herbaceous component contributes a smaller portion of the total plant cover (Miller and Eddleman 2000), due to hydrologic patterns. In this habitat type, sagebrush is frequently the canopy dominant, with little understory (Miller et al. 2011).

Sierra Nevada

The Sierra Nevada is a deeply dissected block fault that rises sharply from the arid basin and range ecoregions on the east; it slopes gently toward California's Central Valley to the west. The eastern portion has been strongly glaciated, and much of the central and southern parts are underlain by granite. The vegetation is mixed conifer and in Nevada is predominately white fir and lodgepole pine on the west side and Jeffery pine and lodgepole pine on the east side. Higher elevations include red fir, mountain hemlock, and western white pine. There are many high mountain lakes, streams, and meadow/riparian areas. Alpine conditions exist at the highest elevations (EPA 2010).

[1]Very dry

Eastern Cascades Slopes and Foothills

The Eastern Cascade Slopes and Foothills ecoregion is in the rain shadow of the Cascade Mountains. Its climate exhibits greater temperature extremes and less precipitation than ecoregions to the west. Open forests of ponderosa pine and some lodgepole pine distinguish this region from the higher ecoregions to the west where fir and hemlock forests are common, and the lower drier ecoregions to the east, where shrubs and grasslands are predominant. The vegetation is adapted to the prevailing dry continental climate and is highly susceptible to wildland fire. Volcanic cones and buttes are common in much of the region (EPA 2007).

Vegetation Types

Vegetation Alliances

Vegetation Alliances are the largest division of plant formations. "An alliance is a vegetation classification unit containing one or more associations, and defined by a characteristic range of species composition, habitat conditions, physiognomy, and diagnostic species, typically at least one of which is found in the uppermost or dominant stratum of the vegetation" (Jennings et al. 2004).

There are four alliances in the management area: forest/woodland, shrubland, herbaceous, and wetland/riparian. Plant associations are used to describe a characteristic collection of diagnostic species according to local habitat conditions and physiognomy (Jennings et al. 2004), for example Great Basin mixed shrub or basin big sagebrush. Plant communities are used to describe a collection of plants living in close association that are linked by effects on one another and by their response to a shared environment (Jennings et al. 2004). The following is a list of the most common plant alliances, associations, and communities that provide habitat for GRSGs in the Nevada and northeastern California planning area.

Shrub Alliances

Shrubs are woody, relatively short plants that have multiple stems. Seven shrub associations have been identified in the planning area; a description of each follows. Because many disturbance factors affect these associations similarly, they are addressed in a general manner here. Disturbance means a significant, and relatively sudden, modification of the resource (i.e., an alteration of the plant community away from a stable state, accompanied by changes in species composition, growth patterns, and reproduction).

The key functional elements of any disturbance are its timing (seasonality), intensity (degree of resource modification/loss), frequency (recovery interval between disturbances), availability of abiotic (water and nutrients), biotic resources (plant species and effects of wildlife and domestic stock), and regime (connection with similar disturbances in time and space; Sousa 1984).

In the following discussion, variations in response to disturbance are noted for each plant community.

Past and current human influences on sagebrush-steppe ecosystems (particularly livestock grazing, fire, and recreation) are not perpetuating the original plant communities. West (1999) estimates that less than 1 percent of the sagebrush-steppe remains in unaltered condition. Furthermore, systematic disturbance has caused significant, and sometimes radical, changes in species composition in many areas. This has occurred in one of three ways:

1. Disturbances may enhance the competitive ability of a dominant species (e.g., sagebrush) and force formerly dominant species into a subservient role (e.g., perennial grasses)
2. Disturbances may enhance the competitive ability of a dominant species (e.g., a perennial grass) and eliminate the other formerly dominant species (e.g., sagebrush)
3. Disturbance may result in loss of the original dominants. In order to preserve the integrity of the original plant community

In all three scenarios, one or all of the originally dominant species must exhibit sufficient dynamism and adaptability to compete with various disturbance-adapted species (e.g., cheatgrass and medusahead). The natural dominants, having evolved under indigenous disturbance conditions, are not well adapted to this role.

Fire management, livestock, and wild horse and burro grazing in particular are difficult issues that involve much ecological uncertainty. The question is whether human activities will be sufficiently altered to rehabilitate and stabilize natural ecosystems, or whether compromised but fairly functional desired plant communities will be perpetuated. The present state of sagebrush-steppe ecosystems requires difficult decisions about fire, livestock, and wild horse and burro management to be made in order to salvage sagebrush steppe communities.

The effects of overgrazing, high-frequency fires, and other factors (particularly off-road driving) on sagebrush-steppe communities and soils are obvious (Blaisdell et al. 1982; Bunting et al. 1987; Vavra et al. 1994). Less obvious are the effects on other biota and more subtle changes. For instance, judicious grazing and prescribed fire are still associated with varying degrees of uncertainty regarding short-term and long-term outcomes in these plant communities. A degree of uncertainty can be expected because the manner in which these key disturbance activities are conducted varies with time and location. Furthermore, with a highly variable climate, they function more as a disturbance regime than as independent events (Eddleman and Doescher 1999).

Great Basin Mixed Shrub Association

This association includes several plant communities, a few of which have substantial variation in canopy cover or understory vegetation. Human and natural phenomena can have adverse effects on these communities. These include heavy, late-summer livestock browsing on snowberry, antelope bitterbrush, and other palatable shrubs, pinyon /juniper invasion, decreasing precipitation associated with long-term climate change, and short-term climate extremes, especially drought.

The risk of dominance and type-conversion to exotic annual grasses is high below 5,500 feet because of lower precipitation and a drier environment that supports hotter fires. Above this elevation, native plants normally receive more precipitation and respond better to disturbance; therefore, they compete successfully with invasive annuals such as cheatgrass.

A typical plant community is the mixed mountain shrub 25 to 39 percent perennial grass community. This is a moderate-to-dense, primarily broad-leaf community of 3-to 6-foot evergreen shrubs. Canopy cover is 25 percent to 39 percent.

The dominant shrubs are mountain big sagebrush and snowberry. Grasses are California brome, western needlegrass, Idaho fescue, bluebunch wheatgrass, and squirreltail. Understory forbs are mule's ears, old man's whiskers, and silvery lupine. This plant community grows between 6,600 and 7,600 feet and is frequently found on north-facing slopes throughout the region.

Another typical plant community is the Great Basin mixed shrub 10 to 24 percent perennial grass community. This is an open to moderately dense, broad-leaf evergreen and deciduous community dominated by 3- to 6-foot tall sagebrush. Canopy cover is 10 percent to 24 percent. Grasses are Sandberg bluegrass, squirreltail, bluebunch wheatgrass, basin wildrye, Thurber's needlegrass, and cheatgrass. Understory forbs are tapertip hawksbeard, silvery lupine, uncommon annual buckwheat, mule's ears, arrowleaf and Hooker's balsamroot, sulfur buckwheat, and rock eriogonum. This plant community occupies flats and moderate slopes at elevations of 4,500 to 5,800 feet.

Mountain Big Sagebrush Association

Most researchers believe that genus *Artemisia* (sagebrush) originated in Eurasia. Mountain big sagebrush, the most genetically primitive form, evolved during the middle Pliocene (5 million years ago) or earlier. During times of increased rainfall, mountain big sagebrush had a nearly continuous distribution. However, under tepid climatic conditions (and into recent times), mountain big sagebrush retreated into foothills and mountains, where deep, well-drained but summer-moist soils are prevalent (Trimble 1989).

Mountain big sagebrush is normally found at elevations above 5,000 feet (in locations where soils are deep, well-drained, and moist). This species is not a

fire responder, and recovery after fire may take 20 years (Bunting et al. 1987). Where undisturbed, canopy cover varies from 15 percent to 40 percent, though it may be 50 percent in wetter areas with deep, loamy soils and northerly exposures. Bitterbrush and snowberry are commonly associated shrubs (Tisdale 1994). Forbs are usually abundant, with 12 genera and many species. Idaho fescue, bluebunch wheatgrass, and Thurber's needlegrass are the principal grasses on drier sites. On deeper loamier sites, onion grass, western needlegrass, and subalpine needlegrass are more common.

A typical plant community is the big sagebrush, 10 to 24 percent perennial grass community. This is an open to moderately dense, broad-leaf evergreen shrub community dominated by 3- to 6-foot mountain big sagebrush. Canopy cover is 10 percent to 24 percent. The understory is primarily bluebunch wheatgrass; however, plateau gooseberry, antelope bitterbrush, snowberry, basin wildrye, Idaho fescue, arrowleaf balsamroot, mule's ears, and prickly gilia are also present. This community grows on flats or gentle-to-steep slopes, primarily at elevations of 5,500 to 7,800 feet.

Basin Big Sagebrush Association

Basin big sagebrush has trunk-like stems and is heavily branched, with uneven tops. Shrub heights normally range from 3 to 6 feet, though plants in heavily incised drainages may reach 15 feet. This plant grows in various soils, but prefers the dry, deep, well-drained soils of the plains, and valleys and foothills below 7,000 feet (Blaisdell et al. 1982). The presence of this subspecies often indicates productive rangeland because it frequently grows in deep, fertile soil (Blaisdell et al. 1982; Collins 1984).

Basin big sagebrush was once the most abundant shrub in North America. However, its lowland range has been largely converted to agricultural uses. This subspecies was thought to be intolerant of alkali; however, there are distinct species that grow in relatively alkaline areas in association with alkali-tolerant plants, such as black greasewood, shadscale, saltbush, and saltgrass (Blaisdell et al. 1982). Basin big sagebrush is killed by fire, and recovery may take as long as 50 years (Bunting 1990). Overgrazing can eliminate the understory of native perennial grasses. Communities in this association may then be easily dominated by exotic annual grasses (weeds) where this is allowed to happen.

A typical plant community is the big sagebrush 10 to 24 percent perennial grass community. This is an open to moderately dense, broad-leaf evergreen shrub community dominated by 3- to 6-foot basin big sagebrush. Canopy cover is 10 percent to 24 percent. It is associated with forbs and perennial grasses, especially bluebunch wheatgrass, which dominates the understory. Other common grasses are basin wildrye, Sandberg bluegrass, and Thurber's needlegrass. This community grows on flats at elevations of 4,700 to 7,800 feet.

Wyoming Big Sagebrush Association

The Wyoming big sagebrush association appears to have originated as a cross between basin big sagebrush, mountain big sagebrush, and black sagebrush (Trimble 1989). Although Wyoming big sagebrush grows in combination with the other two big sagebrush subspecies, it occupies the drier, shallower, and poorer soils. It is the shortest subspecies, reaching only 3 to 4 feet under normal conditions (Blaisdell et al. 1982).

Natural fire intervals in Wyoming big sagebrush communities appear to range from 10 to 110 years or more. Post-burn recovery to 20 percent canopy cover may take more than 40 years after a stand-replacing fire (Young and Evans 1989; Winward 1991). Grasses usually dominate the site before Wyoming big sagebrush reestablishes. Sites are reestablished from soil seedbanks and seeds from remnant and adjacent plants. Because Wyoming big sagebrush occupies drier soils and poorer sites, these communities are especially vulnerable to grazing impacts. Many have lost a substantial portion of the native perennial grass understory. This has opened these communities to invasion by exotic annual grasses such as cheatgrass, which has now replaced the native perennial grasses in most areas. A cheatgrass understory is highly susceptible to fire and greatly shortens the fire interval. As a result, these communities are dominated by exotic annual grasses and are severely degraded (Young and Evans 1989).

A typical plant community is the big sagebrush 10 to 24 percent perennial grass community. This is an open to moderately dense, broad-leaf, evergreen shrub community, dominated by Wyoming big sagebrush about 3 feet in height. Canopy cover is 10 to 24 percent. Low-growing sagebrush is associated with perennial grasses and forbs. Other co-dominants in Wyoming big sagebrush steppe are western wheatgrass, Sandberg bluegrass, bottlebrush squirreltail, Idaho fescue, Thurber needlegrass, and needle-and-thread grass. Although not often used in vegetation classifications, cheatgrass is also a dominant species in some Wyoming big sagebrush steppe communities. This community occurs on flats at elevations of 4,700 to 5,500 feet.

Low Sagebrush Association

Low sagebrush grows on very poor shallow soils that are dry, rocky, and frequently alkaline. In the warmer drier parts of its range, particularly in Nevada, it may grow at elevations above 9,800 feet. In some areas, low sagebrush grows in discontinuous, low- or high-elevation bands. Soils that support this species generally are rockier and contain more clay than those that support big sagebrush; they are also wetter in spring and drier in fall (Blaisdell et al. 1982). Low sagebrush stands generally escape fire when mixed with big sagebrush. However, under extreme conditions, low sagebrush will burn and recovery time is longer than for big sagebrush. If overgrazed, low sagebrush communities are susceptible to cheatgrass invasion. Where clay content is high, the invasive grass is usually medusahead (Blaisdell et al. 1982).

A typical plant community is the low sagebrush scrub 10 to 14 percent perennial grass community. This is an open, broad-leaf evergreen shrub community dominated by low sagebrush, usually less than 1 foot in height. Canopy cover is 10 to 24 percent. Associated plants are primarily perennial grasses and forbs, sometimes with scattered western juniper. Sandberg bluegrass dominates the understory; other associated species are antelope bitterbrush, plateau gooseberry, gray horsebrush, squirreltail, bluebunch wheatgrass, Idaho fescue, ballhead sandwort, desert yellow daisy, low pussy-toes, rock eriogonum, Bolander's yampah, Hooker's balsamroot, and cushion eriogonum. Tufts of perennial grasses are often elevated, indicating soil loss. This community occurs on rocky flats or gentle slopes at elevations of 4,200 to 6,800 feet throughout the region.

Black Sagebrush Association

Black sagebrush is generally 12 inches tall or shorter, with leaves less than half an inch long. This species flowers in the fall. Flower stalks often cast a slight orange appearance and often persist from year to year. The canopy is often loosely branched, with a short trunk, it but may have a compact rounded appearance if heavily grazed by wildlife or livestock. The stems are usually dark, and the leaves have tiny black dots, hence the name black sagebrush. Black sagebrush is found on sites from about 4,500 feet to 8,500 feet, where the annual precipitation ranges from less than 8 inches to over 16 inches.

Black sagebrush is often found on gentle slopes above the nearly level valley bottoms, the adjacent foothills, and on steep mountainside slopes. The primary factors that control its distribution are a soil with a low water holding capacity and usually a high level of calcium carbonates. Black sagebrush typically inhabits soils that have either bedrock or a caliche[2] layer at about 18 inches or less. Black sagebrush tolerates large amounts of soil carbonates better than the other sagebrush species. It is common on shallow soils derived from limestone. Soil profiles often have substantial amounts of gravel or rock that further limit the soil's water holding capacity.

Black sagebrush does not tolerate prolonged flooding, preferring to inhabit drier sites. It provides important forage for pronghorn, mule deer, GRSGs, and domestic sheep, particularly in the late summer, fall, and winter, when succulent forbs and grasses decline. Cattle may increase consumption of the plant in the fall and winter (Shultz and McAdoo 2002).

The perennial grasses associated with these communities are Idaho fescue, Webber ricegrass, bottlebrush squirreltail, Cusick bluegrass, Sandberg bluegrass, and pine bluegrass. Potential vegetative composition is about 50 percent grasses, 15 percent forbs, and 35 percent shrubs. Typically, the sparse vegetation of most black sagebrush communities normally precludes the occurrence of fire,

[2]Thick calcium carbonate that restricts rooting depth

except in exceptional years. Black sagebrush stands, where they form a major part of the community, are a valuable wildlife winter forage species and should not be burned on a large-scale basis.

Herbaceous and Grassland Alliance

By definition, herbaceous plants have succulent (not woody) stems; they include forbs and aquatic plants and may have annual or perennial life-cycles (Sawyer and Keeler-Wolf 1995). Herbaceous plants are usually a major part of the understory vegetation in tree- or shrub-dominated communities. However, in this alliance, forbs and grasses are the dominant plants. The herbaceous and grassland alliance is primarily seasonal or permanent meadow and seep communities (the latter are described under Wetland and Riparian Associations). Although herbaceous and grassland habitats are characterized by low species diversity, when compared with habitats with more complex structural diversity, they are very important in terms of regional biodiversity. There are three main plant associations.

Nonnative Perennial Grass Association

During the late 1950s and early 1960s, various forms of crested wheatgrass were used to control the invasive weed halogeton (*Halogeton glomeratus)* and to provide spring grazing deference on native ranges to improve rangeland conditions. These seedings were conducted primarily on gentle terrain at lower elevations (Wyoming big sagebrush sites). BLM records indicate that the cumulative acreage of rangeland seedings on BLM-administered lands in Nevada increased from approximately 30,000 acres in 1962 to 160,000 acres by 1965, 400,000 acres by 1969, and 500,000 acres by 1975. This acreage does not include private land seedings. The practice of range seeding to improve spring ranges peaked in Nevada as early as 1965, then underwent a slow, steady decline through the next decade until no acres were treated from 1978 through 1981. By 1999, the cumulative total of seeded acres had grown to 590,000 (State of Nevada 2001).

Native Perennial Grass Association

These areas also include areas of dominant native grasses and forbs that can occur following a wildland fire. Fire occurrences in the last 20 years have resulted in many acres of shrub-grasslands being converted to a vegetative community currently dominated by perennial grasses and forbs. Over time, shrubs will naturally reestablish and begin to dominate the vegetative composition of these areas. These areas are historic GRSG habitat that still have potential in the future to develop a shrub component capable of providing cover and forage for GRSGs. Some of these areas in higher elevations have had successful fire rehabilitation treatments and already have established sagebrush seedlings but currently do not have the height or structure to provide adequate habitat.

Annual Grassland Association

Annual grassland habitats composed of invasive weeds (primarily cheatgrass and medusahead) are highly undesirable and considered biological deserts. Exotic annual grasses (particularly medusahead and cheatgrass) are likely to persist, whether or not livestock grazing continues on BLM-administered lands. These plants persist because of abundant annual seed production and long-term viability of seed stored in surface litter and soil, plus earlier germination than native perennials.

Damage and loss of native perennial shrubland/bunchgrass communities because of persistent grazing and frequent wildland fires has greatly accelerated introductions and domination by exotic annual weeds. However, it is possible to reduce infestation, or at least slow its progress, through proper grazing management on lands surrounding the affected area. Improving health in adjacent areas creates a natural barrier to the spread of weeds. Properly designed grazing strategies have also noticeably improved areas presently dominated by exotic annuals. Areas where annual grasses are still a minor problem have also benefited from improved grazing management. Improvement is evidenced by increased vigor and seed production in native vegetation, and such efforts are now being prioritized (Reisner et al. 2013).

Wetland and Riparian Alliance

Nationwide, riparian-wetland areas comprise less than nine percent of the land base (Prichard et al. 1993, 1994, 1998, 2003). However, these areas are the most productive and prized resource on BLM-administered lands. Riparian-wetland areas are essential to restoring and maintaining natural hydrologic function (particularly groundwater recharge and flood control) and the physical, chemical, and biological health of the nation's water supply.

There is disproportionately heavy use of riparian-wetland areas by numerous wildlife species, more so than any other habitat types. Riparian-wetland areas are also highly prized for their recreational value (e.g., hunting, fishing, photo taking, hiking, and wildlife viewing), economic value (e.g., livestock grazing), and for nature education. These habitats are highly valued by Native Americans for food gathering and other traditional economic activities.

When viewed from high elevations, riparian zones usually appear as thin green ribbons in canyon bottoms. Green strips in many mountain drainages are less than 15 feet wide (including stream width); even the largest streams in the management area are only 10 to 40 feet wide. However, portions of some rivers exceed 100 feet in width. The riparian vegetation zone varies tremendously in width, according to water depth, volume, and flow rate and local topography, soils, and streambank (or nearby) modifications.

Riparian and wetland communities in this planning area are primarily found in or next to seeps and springs, seasonal or permanent meadows, creeks and rivers, natural lakes or playas, and human-made irrigation canals and reservoirs.

Because of the proximity and abundance of water, riparian plants are usually quite different from those found in adjacent upland areas; they also thrive in or tolerate wet or saturated soil conditions that upland plants cannot.

The BLM's Riparian-Wetland Initiative for the 1990s (BLM 1991c) establishes national goals and objectives for protecting riparian-wetland resources on public lands. The initiative's chief goals were to restore and maintain riparian-wetland areas so that at least 75 percent were in PFC by 1997 and to achieve an advanced condition of ecological stability (except where resource management objectives, such as PFC, required an earlier stage of succession to provide greater habitat diversity for wildlife, fish, and watershed protection). The strategy of this initiative requires holistic watershed-based management. The condition of the entire watershed is an essential component for determining whether a riparian-wetland area is functioning properly.

Riparian Scrub/Herbaceous Association

Riparian zones and riparian plant communities in this association occupy areas next to streams, lakes, and other natural sources of open water, as well as reservoirs; this water exerts a predominant influence on the native vegetation and the associated biotic community (USDA NRCS 1997). The riparian association, riparian communities, and ecological sites all describe plants that grow in the riparian zone. Certain species require the environmental conditions that prevail in this zone, whereas other species tolerate these conditions but are frequently found outside the riparian zone.

Riparian ecosystems are distinctly different from surrounding lands and vegetation because of the strong influence exerted by free water in the soil (USDA NRCS 1997). Riparian and all plant communities are classified according to recognizable, repeatable, and clearly defined assemblages of riparian plant species. The following plant communities are commonly found in California and Nevada.

<u>Willow Scrub Community</u>

This is an open to moderately dense deciduous community of tall shrubs (less than 8 feet) or trees (less than 30 feet). The dominant genus is willow, mixed with wet meadow plants and scattered low shrubs (3 feet or less). Associated species may include narrow-leaf willow, arroyo willow, red willow, Scouler's willow, Lemmon's willow, shining willow, interior rose, sedges, rushes, columbine, mountain alder, American dogwood, quaking aspen, and black cottonwood. This community occupies flats or gentle slopes in springs, meadows, and wet drainages throughout the region. Willows grow in riparian and wetland associations on periodically saturated soils. Healthy willow communities sprout vigorously following fire. Willows also sprout well from cuttings, and are used extensively for revegetation. However, close association with open water and palatability make willows especially vulnerable to overgrazing by livestock, wild horses, and burros. Repeated streambank

trampling by livestock causes soil erosion and gullying, which lowers the water table and converts riparian habitats to upland shrub communities. Similar effects can result from improper road placement (through or alongside riparian habitats) and excessive motor vehicle traffic.

Seasonally Dry Meadow Community

This community occupies areas with remnant meadow soils that are wet in spring but usually dry by early summer. It is primarily composed of perennial, grass-like plants, but also may contain scattered 3- to 6-foot shrubs. When in poor condition, it may contain numerous annual weeds or bare ground. The dominant plants are usually Baltic rush and various sedges. Associated species are silver sagebrush, rubber rabbitbrush, squirreltail, annual beardgrass, clustered field sedge, mat muhly, beardless wildrye, inland saltgrass, meadow barley, fine-branched popcornflower, and tanseyleaf evening primrose. This community occupies flats or gentle slopes at elevations of 4,000 to 6,000 feet.

Wet Meadow or Seep Community

This community occupies seeps, springs, or meadows that are wet most of the year. It supports a dense community of primarily riparian grass-like plants and sometimes a few scattered 3- to 6-foot shrubs. Rushes and sedges are the dominant plants. Associated species include willow, golden currant, interior rose, Nebraska sedge, Baltic rush, common spikerush, short-awn foxtail, meadow barley, spike redtop, thingrass, western blue flag, small-flowered camas, hoary nettle, and common monkeyflower. This community grows on flats or gentle slopes at elevations of 4,000 to 8,000 feet.

Noxious Weeds and Invasive Plants

Noxious weeds and invasive plants are recognized as a very serious threat to the biodiversity of native rangelands, second only to habitat loss and fragmentation (Pimm and Gilpin 1989; Scott and Wilcove 1998). These plants alter basic ecosystem functions, such as nutrient cycling, hydrology, and wildland fire frequency; they overwhelm native plants and animals and sometimes hybridize with native species. All natural plant communities are susceptible to noxious weed invasion. The presence, abundance, and influence of noxious weed infestations in a particular ecosystem is highly dynamic, responding to changes in local environmental conditions from a range of human and natural causes. Introduction, proliferation, and spread of noxious weeds and invasive plants—and priorities for their control—can change in as little as two years, as new infestations are located, known infestations are successfully treated (or increase in size and severity), and management priorities change.

Trends in noxious weed infestation are assessed according to the number and severity of infestations, and their net or gross size in acres. A sustained reduction in any of these factors is considered a positive trend. The ultimate goal of the noxious weed program is elimination (or effective control) of noxious weeds on BLM-administered and National Forest System lands. Effects

of change on the noxious weed problem are difficult to predict because of the complexity of ecosystem processes and the diversity of management activities. However, there is an undisputed consensus that, in the absence of continued inventory, a coordinated weed-treatment program, and yearly treatment evaluation, the problem would rapidly worsen. Certain weeds have already become so widespread that infestations are now considered too difficult, time-consuming, and costly to treat.

Aggressive fire suppression and overgrazing have led to encroachment and degradation of sagebrush communities by certain native shrubs, particularly western juniper. Fire can be used to control invasive species or to approximate historic fire regimes. Nonetheless, land managers must be cautious when using fire for these purposes; if not used correctly, fire may favor proliferation of other fire-tolerant invasive species or exotic weeds, resulting in further degradation of already compromised ecosystems. Natural fire conditions in sagebrush ecosystems did not occur in the presence of numerous exotic plants, and its use may not be feasible if fire-tolerant exotics are present (Brooks and Pyke 2001).

Exotic annual grasses especially benefit from fire, and the proliferation of these grasses results in a frequent reoccurrence of fire (i.e., an unnaturally shortened fire-return interval), to the point where native species cannot persist and sagebrush communities are converted to exotic annual grasslands. Type-conversion of this kind severely reduces biodiversity and is devastating for wildlife, including carnivores. Therefore, effective wildlife management depends on the control of invasive and exotic plants and use of appropriate, site-specific fire regimes (Brooks and Pyke 2001).

Cheatgrass, especially, is widespread in low-elevation juniper woodlands. However, cooler, mesic woodlands appear less susceptible to invasion and dominance by this and other exotic annuals. A better understanding of factors that influence woodland susceptibility to invasive and exotic species is required. Whisenant (1990) reviewed the effects of cheatgrass infestation on fire frequency in shrub-steppe communities and found that it tends to exert dominance on disturbed soils. Because it forms a continuous fuel load, its presence leads to more frequent fires. Frequent fire shrinks native plant cover, encourages proliferation of cheatgrass, and reduces biodiversity, making establishment easier on relatively undisturbed soils.

The BLM and Forest Service use an integrated pest management approach to prevent the introduction and establishment of noxious weeds and to control existing infestations. This includes education and preventive measures, as well as physical, biological, chemical, and cultural treatments. In 2007, the BLM released the Vegetation Treatments Using Herbicides on Bureau of Land Management Land in 17 Western States Programmatic Environmental Impact Statement and Record of Decision (BLM 2007a). The ROD identified prevention measures and

standard operating procedures for the BLM to follow to protect and enhance natural resources that could be affected by future vegetation treatments. Prevention measures are designed to minimize invasive weed establishment as part of activity planning.

In **Table 3-11** the known acreage values of cheatgrass, by jurisdictional boundaries, are presented.

Table 3-11
Acres of Cheatgrass Potential in Greater Sage-Grouse Habitat

Surface Management Agency	Management Zone	Acres in PPH	Acres in PGH	Total
BLM	III	1,149,800	1,574,600	2,724,400
	IV	1,175,000	681,200	1,856,200
	V	1,557,400	515,800	2,073,200
Forest Service	III	16,900	30,100	47,000
	IV	23,500	20,000	43,500
	V	0	0	0
Other	III	336,600	563,600	900,200
	IV	489,900	470,600	960,500
	V	594,200	146,800	741,000

Sources: Manier 2013; USGS 2014

Conifer Encroachment

Pinyon /juniper woodlands are complex, not only in terms of species composition and appearance, but also because the management area contains woodlands that vary greatly in successional stage (from early to aged). The developmental stage greatly affects fuel loads, wildlife habitats, and management activities involving other natural resources. Treatment of invasive pinyon /juniper, including methods, cost, and response to treatment, also largely depends on developmental stage.

Studies show that the expansion of pinyon/juniper has more than tripled in the areas dominated by pinyon /juniper woodlands in the last 150 years. Although pinyon/juniper woodlands have increased dramatically in the last 150 years, they currently occupy far less than they are capable of under current climatic conditions (Miller and Tausch 2001). These changes have generally coincided with the introduction of heavy livestock grazing, tree use by the mining industry, and fire suppression that followed settlement of the region.

Unfortunately, pinyon/juniper has the potential to replace existing shrubland and grassland communities. An increase in tree dominance results in a loss of understory. This further reduces the fuel and further decreases the fire frequency. Altered disturbance regimes and climate change have resulted in major changes in plant community compositions. Since the 1860s, many bunchgrass and sagebrush-bunchgrass communities, which dominated the

Intermountain West, have shifted to pinyon/juniper woodland or introduced annual-dominated communities (West 1984; Miller et al. 1994).

Studies conclude that, barring some major environmental change or management action, continued forage reduction and decreased fire frequency will continue until trees dominate most of the sites favorable to their survival. This continued tree dominance then jeopardizes the historic woodland sites because under the right conditions, a crown fire could result in a stand replacement wildland fire, with catastrophic consequences because of continuous tree canopy. Studies further show that in pinyon/juniper communities that are overstocked, the ability of the understory to respond after a fire is dramatically reduced and potentially opens the site to invasion by exotics. Once these communities become mature tree-dominated woodlands, treatment becomes difficult and expensive (Miller and Tausch 2001).

Biological Crusts

Biological soil crusts are made up of tiny living plants and bacteria that grow together on the soil surface. They help keep the soil from washing or blowing away, fix nitrogen from the atmosphere into the soil, help establish vascular[3] plants, and promote the health of plant communities. Intense disturbance results in bare soil. Severely, newly, or frequently disturbed soils are generally dominated by large filamentous cyanobacteria. When disturbance is less severe or less frequent or some time has elapsed since the disturbance, crusts are generally in some mid-successional state, with some lichens and mosses present. If disturbance continues, crusts will stay in early successional stages (i.e. cyanobacteria only; USDI 2001).

Biological soil crusts are found throughout the planning area but are not uniformly distributed. Some of the same characteristics that influence sagebrush species distribution also influence biological crust development. Crusts tend to be lacking in sagebrush types that occur on seasonally flooded soils as they create oxygen-free conditions that are not well tolerated by lichens. Heavily saline soils also lack lichen cover, although moss is sometimes present if the salt concentration is not too great. Mountain, subalpine, and xeric big sagebrush types support higher biological crust cover unless soil surfaces are greatly disturbed or the current vegetation is in an early successional stage (USDI 2001). Northern Great Basin recovery rates based on USDI (2001), for elevations of near 3,280 feet and average precipitation amount of 14 inches range from 20 years for the gelatinous lichens, 25 years for early colonizers, 60 years for mid-successional, and 125 years for late successional crusts.

[3]Flowering plants

3.4 RIPARIAN AREAS AND WETLANDS

Riparian areas and wetlands are critical to the long-term viability of GRSG populations. Riparian habitats provide important sources of food and cover for GRSGs, particularly during the late summer brood-rearing period (see **Section 3.2**, Greater Sage-Grouse and Greater Sage-Grouse Habitat). This function is especially important in the more arid portions of the GRSG range, including much of the planning area.

Riparian areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence. Typical riparian areas are lands along perennially and intermittently flowing rivers, streams, and shores of lakes and reservoirs with stable water levels. Excluded are ephemeral streams or washes that do not exhibit vegetation dependent on free water in the soil.

Wetlands are areas that are inundated or saturated by surface 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, swamps, lakeshores, sloughs, bogs, wet meadows, estuaries, and some riparian areas. For a description of riparian and wetland vegetation community types characteristic of the planning area, refer to **Section 3.3**, Vegetation.

Riparian and wetland areas next to surface waters are the most productive and important ecosystems in the planning area. These areas represent an estimated 1,817,800 acres (3 percent) of the planning area, according to information derived from the National Wetlands Inventory (USFWS 2013b). Although they are limited in extent, riparian habitats play an integral role in restoring and maintaining the chemical, physical, and biological integrity of water resources (Fitch and Ambrose 2003).

Healthy riparian and wetland areas have the potential for multi-canopy vegetation layers with trees, shrubs, grasses, forbs, sedges, and rushes. They are valuable habitat for a wide variety of wildlife species. Healthy systems also filter and purify water, reduce sediment loads, enhance soil stability, provide micro-climatic moderation, and contribute to groundwater recharge and base flow (Prichard et al. 1998).

Generally, riparian areas and wetlands are stratified into lotic (flowing water or riverine) systems and lentic (standing water) systems, which may include a variety of wetland types. In the planning area, lentic riparian habitats typically include seeps, springs, aspen stands, and both wet and dry meadows.

Current Conditions

Although detailed information on the condition and trend of riparian and wetland areas is not available for the planning area as a whole, some data are available for portions of the Battle Mountain, Elko, and Winnemucca BLM Districts in Nevada, the Alturas, Eagle Lake, and Surprise BLM Field Offices in

California, and the Humboldt-Toiyabe National Forest (**Table 3-12**). Collectively, these seven management areas encompass approximately 17,721,700acres of PPH and PGH, which represents approximately 82 percent of the total PPH and PGH in the planning area).

Table 3-12
Lotic and Lentic Riparian Areas Meeting Riparian Goals

Management Unit	Percent Meeting Goals[1]	Data Set	Assessment Method[2]
Lotic Riparian Areas			
Elko District	60	558 miles (2000 to 2012)	1
Winnemucca District	55	891 miles (1993 to 2012)	2, 3
Battle Mountain	47	752 miles (1994 to 2012)	2, 3
Alturas Field Office	81	51.5 miles (1995 to 2012)	2, 3
Eagle Lake Field Office	90	109 miles (1995 to 2012)	2, 3
Lentic Riparian Areas			
Elko District	30	2,237 assessments (1996 to 2012)	4, 5
Winnemucca District	38	2,103 acres (1993 to 2012)	4, 5
Battle Mountain	27	2,213 assessments (1994 to 2012)	4, 5
Alturas Field Office	95	737 acres (1995 to 2012)	4, 5
Eagle Lake Field Office	71	146 acres (1995 to 2012)	4, 5
Surprise Field Office	14	398 assessments (1993 to 2012)	4, 5
Lotic and Lentic Riparian Areas Combined			
Humboldt-Toiyabe National Forest	21	553 assessments (1990 to 2012)	6

[1]Goals are defined here as PFC or functional-at-risk with an upward trend (most BLM district data); good to excellent riparian habitat condition (Elko District data); or high ecological condition (Forest Service data).
[2]1=Stream Survey (Elko District, BLM 2002d); 2=Lotic Functioning Condition Assessment (Prichard et al. 1993); 3=Lotic Functioning Condition Assessment (Prichard et al. 1998); 4=Lentic Functioning Condition Assessment (Prichard et al. 1994); 5=Lentic Functioning Condition Assessment (Prichard et al. 1999, Revised 2003); 6=Forest Service Ecological Scorecard System.

Much of the information presented in **Table 3-12** is based on PFC assessments, as the BLM uses this technique to determine whether riparian areas are meeting rangeland health standards. Riparian areas are considered to be in PFC when adequate vegetation, landform, or debris is present to dissipate energy, improve water quality and reduce erosion, filter sediment and aid floodplain development, capture and store water, and provide for greater biodiversity (Prichard et al. 1998, 1999 [revised 2003]). Riparian areas that are functioning at risk lack one or more soil, water, or vegetation attributes, making them susceptible to degradation. Nonfunctional riparian areas are clearly not providing adequate vegetation, landform, or debris to dissipate energy, filter sediment, capture and store water, and provide for greater biodiversity.

Some of the data in **Table 3-12** are from stream surveys (Elko District, BLM 2002d) or from a scorecard system used by the Forest Service to determine

ecological condition based on riparian community types and attributes, such as frequency, cover, root depths, and soil characteristics. High ecological condition indicates that the site is functioning in physical and biological capability of the ecosystem. Moderate ecological condition indicates the site has one or more disturbances to the biological and physical features that limit the capability of the site. Low ecological condition indicates that the site has crossed a biological or physical threshold where site disturbance has resulted in the loss of the ability to sustain the ecosystem.

Condition of riparian habitats varies throughout the planning area. In many portions of California, a high percentage of both lotic and lentic riparian habitats are functioning properly or functioning-at-risk with an upward trend. For some portions of California and most of Nevada, riparian management goals have not been met for a most assessed lentic riparian habitats (or for both lentic and lotic areas for National Forest System lands).

On BLM-administered lands in Nevada, results are more positive for lotic riparian habitats in comparison to lentic riparian habitats. This is likely the result of management strategies that have been focused on priority stream habitats in the last 15 to 20 years. In addition, lentic areas are characteristically small, widely scattered, and typically less resilient to grazing impacts than stream systems. Consequently, these areas tend to be disproportionally impacted by grazing animals, including livestock and wild horses.

For remaining management units in the planning area, including the BLM Ely and Carson City Districts, information on condition and trend of riparian areas has not been summarized. However, available information generally indicates many of these areas are not functioning properly.

Where riparian habitats in the planning area are not meeting goals, grazing by livestock and wild horse and burros is often identified as the primary cause. Overgrazing riparian vegetation makes streambanks more vulnerable to destabilizing effects of livestock trampling and the erosive force of water, exposes soils to drying out by wind and sunlight, reduces water storage capacity of the riparian area, reduces shade and thereby increases stream water temperature, encourages invasion of undesirable plants, speeds up runoff, and reduces filtration of sediment necessary for building streambanks, wet meadows, and floodplains (Chaney et al. 1993).

Where riparian habitats are meeting goals, this is often the result of protective fencing or implementation of prescriptive livestock grazing practices to reduce frequency and duration of hot season use on riparian areas. Many of these efforts have been undertaken in cooperation with the livestock industry as well as other agencies and entities and have included both public and private lands.

Besides grazing impacts from livestock and wild horses and burros, riparian areas and wetlands in the planning area are impacted by a range of land uses that

have occurred and continue to occur throughout the western United States. These can include recreation, water diversions, mining, roads, agricultural encroachment, channelization, flood control, urbanization, and railroads (Meehan 1991; Williams et al. 1997; Sada et al. 2001; Prichard et al. 1998). Impacts include accelerated erosion, concentration of stream energy, loss of floodplain access, reduced water supplies, sediment loading, and degradation of water quality. These all affect functionality and condition of riparian ecosystems.

Although identified as the number one threat to the GRSGs by the USFWS, impacts on riparian areas from wildland fire are highly variable, depending on a host of factors, including elevation, precipitation, time frames, habitat conditions, grazing impacts, and fuel moisture levels. Especially during periods of drought or in areas of low average annual precipitation, wildland fires can completely destroy riparian communities, resulting in loss of hydrologic function or in plant community shifts from mesic species to invasive weed species. Riparian areas in the planning area, in general, are inherently resilient to the impacts of fire due to the persistence of soil moisture.

However, habitat conditions (often tied to livestock grazing practices) can also determine riparian response to fire. In an analysis of 81 streams on BLM-administered and National Forest System lands in northern Nevada, Dalldorf et al. (2013) found that the occurrence of wildland fires between 1999 and 2001 did not play an influential role in the response of selected stream survey attributes when coupled with livestock grazing attributes.

Climate change also has the potential to negatively impact lotic and lentic riparian habitats in the planning area. Increases in water and air temperatures and decreases in precipitation rates predicted as a result of climate change can fuel expansions of invasive species, lead to increased stream temperatures, and create higher potential for floods and erosion (Karl et al. 2009).

3.5 FISH AND WILDLIFE AND SPECIAL STATUS SPECIES

This section describes the existing conditions of special status and non-special status fish and wildlife resources, including aquatic and terrestrial animal species and their habitats, in the planning area. Fish and wildlife resources include big game, upland game, waterfowl, raptors, migratory birds, small mammals, reptiles, amphibians, and fish. NDOW, CDFW, and USFWS have primary responsibilities for managing fish and wildlife species in the planning area. The BLM and Forest Service are responsible for land management. Therefore, on BLM-administered and National Forest System lands in the decision area, the agencies are directly responsible for managing habitat for fish and wildlife species and indirectly responsible for the health of fish and wildlife populations that are supported by these habitats.

The ESA mandates the protection of species listed as threatened or endangered of extinction and the habitats on which they depend. Section 7 of the ESA clarifies the responsibility of federal agencies to use their authority to carry out

programs for the conservation of listed species. In addition, federal agencies must consult with USFWS to insure that any action authorized, funded, or carried out by the agency is "…not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species."

3.5.1 Conditions on BLM-Administered Lands

In the planning area, the major ecoregions are the Great Basin and Modoc Plateau and the westernmost edge of the Sierra Nevada. Sagebrush generally occurs throughout the Great Basin and Modoc Plateau and is most common in valleys and mountain ranges north of the Mojave Desert. Sagebrush does occur in the ecotone between the Mojave Desert and the Great Basin ecoregions, mostly in mid-elevation drainages and old burn scars of blackbrush shrublands and higher on mountain ranges.

Because sagebrush is a dominant vegetation type in the planning area, a high number of species have evolved specifically to thrive in sagebrush habitat. Sagebrush types are generally found in a mosaic with other habitat types but can occur as large monotypic expanses.

Sagebrush habitats generally occur between 4,500 and 10,000 feet and are widespread throughout valley, foothill, and mountain environments (NDOW 2012b). Annual precipitation ranges from 8 to 30 inches, mostly in the form of snow. Temperatures range from minus 30 degrees to 110 degrees Fahrenheit (NDOW 2012b). Sagebrush overstory structure can range from less than 6 inches on exposed rocky slopes up to 9 feet in drainages where basin big sagebrush has extended its roots into the water table. Sagebrush canopy, however, is generally between 2 and 3 feet high. Crown cover varies from 1 to 70 percent but commonly is between 20 and 40 percent (NDOW 2012b).

There are 27 recognized species and distinct subspecies of sagebrush in the planning area. Dominant species are basin big sagebrush, mountain big sagebrush, Wyoming big sagebrush, low sagebrush, and black sagebrush (Cronquist et al. 1994). Co-dominant plant species are bitterbrush, snowberry, rabbitbrush, snakeweed, white sage, spiny hopsage, bluebunch wheatgrass, bluegrass, needle and thread, Idaho fescue, Indian ricegrass, Great Basin wildrye, Indian paintbrush, lupine, buckwheat, globemallow, and penstemon.

The altitudinal distribution of sagebrush generally follows a pattern of basin big sagebrush in the valley floors or lower alluvial fans, Wyoming big sagebrush at mid-elevations, and mountain big sagebrush above 6,500 feet.

Low and black sagebrush are both low-growing shrubs that rarely exceed heights of 15 inches, primarily on shallow or poorly drained soils with a root-restricting layer, interspersed throughout the greater sagebrush expanse in many elevation bands.

Commonly occurring trees in the planning area are Utah juniper, western juniper, mountain mahogany, and pinyon pine. Aspen communities are dispersed throughout the planning area. Conifer forests dominate the higher elevations.

The planning area has a diverse aquatic environment of wetland, spring, meadow, seep, vernal pool, stream/river, and riparian communities, all providing invaluable water sources across the arid cool desert landscape.

The planning area is an outstanding region for wildlife, providing habitat for characteristic megafauna such as mountain lion, mule deer, elk, black bear, and pronghorn antelope, as well as an abundance of birds, such as hawks, peregrines, golden eagles, pinyon jay, burrowing and other owls, and various shorebirds and waterfowl. The area boasts at least eight sagebrush-dependent species: pygmy rabbit, Great Basin pocket mouse, sagebrush vole, sagebrush lizard, sage thrasher, Brewer's sparrow, sage sparrow, and GRSGs. The varied aquatic habitats and natural barriers have resulted in the evolution of several unique communities of endemic fish and invertebrates.[4]

Sagebrush range in good condition supports an abundant understory of protein rich bunchgrasses and forbs. The presence of this understory is critical to the needs of other wildlife species, including the sagebrush vole. The various shrew species that live in sagebrush are invertivores,[5] but they depend on the productivity of the herbaceous component for the abundant production of their prey items, as well as for cover.

Much of the planning area has been substantially altered or degraded since the nineteenth century by a combination of change agents. Despite being in one of the least-developed regions of the country, the Great Basin and Modoc Plateau are one the most threatened ecosystems in the country (TNC 2001). Major change agents that negatively affect terrestrial wildlife in the planning area, including GRSGs, are increases in both the frequency and intensity of wildland fire, invasive annual grasses, the expansion of native pinyon and juniper, development, and livestock and wild ungulate grazing that exceeds land health standards. The aggregate effects of these change agents have altered the planning area's sagebrush, riparian, and forest habitats (Miller et al. 1994; Schaeffer et al. 2003).

For example, much of the basin big sagebrush and Wyoming big sagebrush range in Nevada lacks understory of native bunchgrasses and forbs that were historically present. Shrub cover has increased from what are generally regarded as the conditions before Euro-American contact. Nonnative annual grasses, most notably cheatgrass, have invaded big sagebrush range, bringing with them an accelerated fire interval for which sagebrush regeneration cannot

[4]Animals without backbones, for example, snails
[5]Feeding on invertebrates

compensate. Low and black sagebrush are being similarly invaded by cheatgrass throughout the state and by medusahead in northern Nevada; the latter is an aggressive exotic grass that can tolerate the shallow clay soils of these ecological sites and can cause a similar negative impact through altered fire regime. It is threatening the low sagebrush landscape. Overall, shrubland with high species diversity is being converted over time to annual grassland with drastically reduced wildlife value is occurring (NDOW 2012b).

Pinyon/juniper expansion into shrubland has thrived due to range overgrazing in the nineteenth century and continuing in the first half of the twentieth century (Young and Sparks 2002) and fire suppression after the 1920s (Blackburn and Tueller 1970; Pyne 2004). Many true woodlands within a few miles of mines were harvested or thinned during the historic mining era of the late nineteenth century; however, many woodlands have repopulated the soils that supported them and continue to aggressively contribute to the expansion of trees into sagebrush range.

Pinyon/juniper expansion into sagebrush range drastically alters range structure and creates conditions difficult to restore to pre-encroachment conditions. Pinyon/juniper expansion is also generally facilitated by regional warming (Grayson 1993; Tausch and Nowak 1999). Currently, there is considerable discussion in Nevada concerning the need to manipulate the balance between woodland expansion and healthy sagebrush communities in light of the recent efforts to conserve GRSGs and the habitat needs of pinyon/juniper-dependent species, such as pinyon jay, which are currently experiencing a 4 to 6 percent decline in population per year (GBBO 2010).

New road development, existing road improvement, and urban, suburban, and industrial development are also contributing to depletion and fragmentation. Increased human population in several areas of the sub-region has exerted increased pressure on the landscape, and thus sagebrush community integrity will continue to be challenged over time.

Loss of habitat reduces living space for wildlife. Where sagebrush habitat has been depleted of its understory, it lacks the ability to provide nesting and escape cover and sources of food to plant- and seed-eating animals. Lack of nesting and escape cover, coupled with increasing human infrastructure (e.g., roads and utility ROWs), creates travel lanes for mammalian predators and perch sites for avian predators (Knight et al. 1995) and serves to fragment the landscape into smaller and smaller patches. This interaction may increase the success of predators at the expense of species such as ground-nesting birds. Predation pressure may be reaching effect levels on a suite of sagebrush residents, including GRSGs. Increased human activity on the land can leave in its path a footprint of habitat degradation in the form of a broken-down shrub layer, loss of species diversity, and increased soil erosion that reduces site restoration capability.

The US Breeding Bird Survey documented a population decline of 50 percent or greater for Brewer's sparrow between 1966 and 1999. The Partners in Flight North American Landbird Conservation Plan has identified Brewer's sparrow as a Watch List Species in need of management action in the Intermountain Bird Conservation Region due to the significant population decline (Rich et al. 2004). Loggerhead shrike continues to decline significantly across its range in North America, and the sage thrasher continues to exhibit significant declines in neighboring states, although it is showing signs of stabilizing in Nevada and throughout the Great Basin.

Declining populations for most fish and wildlife species are attributable to habitat loss and fragmentation as the primary cause. **Table 3-13** through **Table 3-15**, under Current Condition, below, list species federally recognized as threatened or endangered and those recognized by the Forest Service and BLM as sensitive.

The BLM designates as sensitive all federally designated candidate species, proposed species, and delisted species in the first five years following their delisting. Additional species may be designated as sensitive if they are native species found on BLM-administered land for which the BLM has the capability to significantly affect the conservation status of the species through management and one of the following:

- 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
- The species depends on ecological refugia[6] or specialized or unique habitat 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.

The BLM coordinates the potential listing of species as sensitive in consultation with their respective state wildlife agencies and the Nevada Natural Heritage Program.

The following species accounts are a selection of Forest Service indicator species or are considered strongly dependent on a sagebrush-dominated ecosystem for their persistence. Alternatives for various land management scenarios affecting the sagebrush ecosystem are likely to positively or negatively impact these species.

[6]Areas where species can survive unfavorable conditions

3.5.2 Conditions on National Forest System Lands

The National Forest System lands in the Humboldt-Toiyabe National Forest and in the project area provide a diversity of terrestrial and aquatic habitats, similar to what is described above for BLM-administered lands. For management purposes, the Forest Service categorizes species into four main group: Federally listed threatened and endangered species, designated by the USFWS under the ESA; sensitive species, designated by the Regional Forester with each Forest Service region; management indicator species, designated for each forest unit in the individual LUPs during the planning process; and other wildlife species, which are those that are not included in the special status species categories (federally listed threatened or endangered or sensitive). They include mammals (e.g., deer and elk), birds (e.g., raptors and migratory birds), fish, amphibians, insects, and other species.

3.5.3 Species Accounts

Mule Deer

Mule deer occur in a diversity of habitat types throughout the sub-region but occur in highest densities in montane shrub-dominated communities. They are often associated with successional vegetation. They are often found on open or "bared off" south-facing slopes in winter. Mule deer browse on a wide variety of woody plants and graze on grasses and forbs. Throughout the year, most activity occurs at dawn and dusk, though nocturnal and daytime activity is common.

Mule deer are a secondary successional species (taking advantage of plant species that are often the result of some type of disturbance). They have a high degree of selectivity, not only for the plant species they choose to eat, but also for the specific parts of the plant and the time of year that a particular plant may be eaten. Browse species include sagebrush, bitterbrush, serviceberry, snowbrush, and snowberry. When deer are feeding on browse, they prefer the most tender parts, the new shoots and tips or leaders (the most nutritious, most easily bitten off, most flavorful, and most easily digested part of the browse).

Seasonally, home range size is extremely variable and may be 74 to 593 acres or more and is directly correlated with the availability of food, water, and cover. In mountainous regions, mule deer tend to migrate up to 120 miles, from high summer range to lower winter range. In the intermountain west, deer often migrate in response to snowfall patterns. They exhibit high fidelity to individual seasonal ranges (Kucera 1992).

Mule deer populations were estimated at all-time highs in the late 1980s. Habitat loss and degradation are the primary concerns for this species. Invasive weeds, increase in number and frequency of large-scale fires, pinyon/juniper encroachment, shrubland decadence, urban development and expansion, and

drought all contribute to habitat degradation and loss. Decreases in quality of summer range and loss of critical wintering habitat in particular have been the biggest challenges to the species.

Pygmy Rabbit

This species is found primarily on big sagebrush-dominated plains and alluvial fans where plants occur in tall dense clumps (Green and Flinders 1980). Deep, crumbly, loamy-type soils are required for burrow excavation. They may occasionally use burrows excavated by other species (e.g., yellow-bellied marmot) and, therefore, may occur in areas that support shallower, more compact soils as long as sufficient shrub cover is available (USFWS 2010b).

Dense stands of sagebrush growing next to permanent and intermittent streams, along fence rows, and in ditches may be avenues of dispersal (Green and Flinders 1980). Cover and height of woody vegetation appear to be critical habitat features (Green and Flinders 1980); however, Larrucea and Brussard (2008) found that pygmy rabbits occupied clusters of sagebrush that were taller than the sagebrush shrubs in the surrounding area (i.e., sagebrush islands that range from 4.7 to 46 inches in height).

Big sagebrush is the primary food and may comprise up to 99 percent of food taken in winter and 51 percent in summer. Wheatgrass and bluegrass were highly preferred foods in the summer, while forbs were eaten only occasionally (Green and Flinders 1980). This is the only native rabbit species in the sub-region to excavate its own burrows (Weiss and Verts 1984; Janson 1946).

Dispersal abilities are limited; this species is reluctant to cross open areas, such as roads or areas cleared of sagebrush (Weiss and Verts 1984). The size of pygmy rabbit home ranges fluctuates with the seasons; they tend to have smaller home ranges during winter and larger home ranges during spring and summer. Individuals generally remain near their burrows during the winter. Annual home ranges in southeastern Oregon and northwestern Nevada differed between the sexes and ranged from 1.2 to 25.8 acres for males and 0.27 to 18.7 acres for females. Male home ranges tend to be larger than females during the spring and summer, as males travel farther between a number of females. In the southeastern Oregon and northwestern Nevada study, home ranges for males ranged from 0.27 to 18.5 acres and from 0.15 to 17.5 acres for females during the breeding season. Juvenile dispersal in Nevada and Oregon was reported greater than 0.3 mile, with a maximum long-distance movement of 5.3 miles recorded for a juvenile female (Weiss and Verts 1984).

Livestock grazing at inappropriate levels can be detrimental to sagebrush habitat. Recent studies show that grazing is compatible with pygmy rabbits if grazing occurs at levels that leave sagebrush plants intact and soils not overly compacted. Fire was found to be the strongest predictor of loss of pygmy rabbits in Nevada and California. Cheatgrass invasion is detrimental to pygmy rabbits. Shrub cover is necessary for protection during dispersal, and cheatgrass

monocultures may provide a barrier to dispersal. Pinyon/juniper encroachment decreases understory species and, in turn, decreases suitable pygmy rabbit habitat. Climate change has been attributed to forcing pygmy rabbits to higher elevations; extant historical pygmy rabbit sites averaged 515 feet higher than extirpated sites. With local downward shift effect accounted for, overall upward elevation shift of extant sites was 722 feet; the researchers attributed this to climate (USFWS 2010b).

Sage Thrasher

In the northern Great Basin, the sage thrasher breeds and forages in tall sagebrush/bunchgrass, juniper/sagebrush/bunchgrass, mountain mahogany/shrub, and aspen/sagebrush/bunchgrass communities (Maser et al. 1984). The species is positively correlated with shrub cover, shrub height, bare ground, and horizontal patchiness and negatively correlated with spiny hopsage, budsage, and grass cover (Rotenberry and Wiens 1980; Wiens and Rotenberry 1981). The species usually nests within 3 feet of the ground in the forks of shrubs (almost always sagebrush) and sometimes nests on the ground (Harrison 1978; Reynolds 1981; Rich 1980).

In winter, the sage thrasher uses arid and semiarid scrub, brush, and thickets. The species feeds on a wide variety of insects, including grasshoppers, beetles, weevils, ants, and bees, as well as fruits and berries. The Great Basin Bird Observatory (GBBO 2012) analysis of bird population responses to projected effects of climate change indicates sage thrasher is expected to be most affected by projected losses in mountain sagebrush/mid-closed, big sagebrush/mid-open, and salt desert shrub/late covers, and is expected to gain some birds in salt desert shrub/annual, Wyoming big sagebrush/late, and greasewood/shrub/annual covers, for a total projected statewide population loss of 21 percent.

Loss, degradation, or fragmentation of high-quality sagebrush shrubland suitable for sage thrasher is attributed to fire, invasive plants, expansion of pinyon/juniper woodland into sagebrush, heavy livestock grazing, and heavy OHV use (GBBO 2010).

Sage Sparrow

Strongly associated with sagebrush for breeding, sage sparrows are also found in saltbush brushland, shadscale, antelope brush, rabbitbrush, mesquite, and chaparral (AOU 1998; Green and Smith 1981; Martin and Carlson 1998; Paige and Ritter 1998; Reynolds 1981). The species prefers semi-open habitats with shrubs 3 to 7 feet tall (Martin and Carlson 1998).

Sage sparrows nest on the ground or in shrubs, up to about 3 feet above the ground (Terres 1980). In the Great Basin, the species usually nests in living sagebrush, where cover is sparse but shrubs are clumped, and avoids the southwestern side of the plant (Petersen and Best 1985). Placement may be related to density of vegetative cover over the nest, as sage sparrows will nest higher in a taller shrub (Rich 1980).

The species migrates to and winters in arid plains with sparse bushes, grasslands, and open situations with scattered brush, mesquite, and riparian scrub, preferring to feed near woody cover (Martin and Carlson 1998; Meents et al. 1982; Repasky and Schluter 1994).

The GBBO analysis of bird population responses to projected effects of climate change indicates sage sparrow populations are projected to be most affected by reductions in mountain sagebrush/mid-closed and salt desert/mid-late covers; however, their population is expected to increase in salt desert/shrub/annual covers, for a projected statewide population reduction of 20 percent (GBBO 2012).

Sage sparrow is negatively affected by many factors that fragment its habitat or alter its basic structure, including fire, cheatgrass invasion, heavy livestock use, nest predation, expansion of pinyon/juniper woodland into shrubland, heavy OHV use (GBBO 2010), urban and suburban development, and road and power line ROWs.

Pinyon Jay

The pinyon jay is found in pinyon/juniper woodland and less frequently in pine; in nonbreeding season, it also inhabits scrub oak and sagebrush (AOU 1983). The species nests in shrubs or trees (e.g., pine, oak, juniper) about 5 to 30 feet above the ground, when and where adequate numbers of pine seeds are available. The species eats pinyon and other pine seeds, berries, small seeds, and grain, as well as beetles, grasshoppers, caterpillars, and ants. Pinyon jay may also eat bird eggs and hatchlings.

The species lives in loose flocks of multiple breeding pairs and their offspring from previous nesting seasons and communally stores large numbers of seeds. The flock has an established home range but may wander to other areas in search of food. During nesting season, flocks of yearlings may form. A GBBO radio-telemetry study found that foraging pinyon jays appeared to favor transitional areas where pinyon/juniper woodland is interspersed with sagebrush (GBBO 2012).

During the daytime, jays were usually found in 2,600 feet of woodland edge and always within 1.2 miles of the edge. Roosting and nesting jays went deeper, but usually no more than 1.8 miles into the woodland interior to denser tree stands. Jays were nearly always found in areas with diverse woodland canopy closure and age structure; they were not observed in large contiguous areas of mature, dense woodland. Although very large flocks have been reported elsewhere, telemetry studies most often observed smaller sub-flocks (fewer than 30 birds) that periodically joined other sub-flocks to form flocks of 50 to 100 birds. Sub-flock home ranges were less than 5,000 acres in all cases.

The GBBO analysis of bird population responses to projected effects of climate change indicates pinyon jay populations are projected to experience losses from

habitat change in mountain sagebrush/mid-closed, big sagebrush/shrub/annual, and pinyon/juniper, and they are expected to gain in Wyoming big sagebrush/late, pinyon/juniper/late, and mountain sagebrush/late-open, for an overall projected population decline of 19 percent (GBBO 2012).

Preliminary data suggest that pinyon jay declines may be at least partly related to substantial increases in the acreage of closed-canopy mature (or aged) woodland with a poor shrub understory, coupled with a corresponding loss of mixed-age woodland mosaics with openings and a complex shrubland edge. These landscape-scale changes are largely the result of altered fire conditions, although grazing pressure and invasive plants may be contributing factors.

3.5.4 Federal Endangered, Threatened, Proposed, and Candidate Species

Current Conditions

Table 3-13 shows federally listed, proposed, and candidate species in the planning area. There are also several species of BLM and Forest Service sensitive species in the planning area. **Table 3-14** lists BLM and Forest Service sensitive species in the planning area.

Table 3-13
Federal Endangered, Threatened, Proposed, and Candidate Species

Species	Federal Status	Designated Critical Habitat	Designated Critical Habitat in Planning Area
Amphibians			
Columbia spotted frog (*Rana luteiventris*)	Candidate	No	N/A
Oregon spotted frog (*R. pretiosa)*	Proposed threatened	Yes	No
Birds			
Greater Sage-Grouse *(Centrocercus urophasianus)*	Candidate	No	N/A
Yellow-billed cuckoo *(Coccyzus americanus)*	Threatened	Yes	No
Mammals			
Gray wolf (*Canis Lupus*)	Endangered	No	N/A
Fishes			
Cui-ui *(Chasmistes cujus)*	Endangered	No	N/A
Lahontan cutthroat trout *(Oncorhynchus clarkii henshawi)*	Threatened	No	N/A
Lost River sucker (*Deltistes luxatus*)	Endangered	Yes	No
Modoc sucker (*Catostomus microps*)	Endangered	Yes	No

Table 3-13
Federal Endangered, Threatened, Proposed, and Candidate Species

Species	Federal Status	Designated Critical Habitat	Designated Critical Habitat in Planning Area
Shortnose sucker (*Chasmistes brevirostris*)	Endangered	Yes	No
Warner sucker *(Catostomus warnerensis)*	Threatened	No	N/A
Bull trout (*Salvelinus confluentus*)	Threatened	Yes	Yes
Clover Valley speckled dace *(Rhinichthys osculus oligoporus)*	Endangered	No	N/A
Desert dace *(Eremichthys acros)*	Threatened	Yes	Yes
Hiko White River springfish (*Crenichthys baileyi grandis*)	Endangered	Yes	No
Independence Valley speckled dace (*Rhinichthys osculus lethoporus*)	Endangered	No	N/A
Pahrump poolfish *(Empetrichthys latos)*	Endangered	No	N/A
Railroad Valley springfish *(Crenichythys nevadae)*	Threatened	Yes	No
Warm Spring pupfish *(Cyprinodon nevadensis pectoralis)*	Endangered	No	N/A
White River spinedace *(Lepidomeda albivallis)*	Endangered	Yes	Yes
White River springfish *(Crenichythys baileyi baileyi)*	Endangered	Yes	No
Big Spring spinedace *(Lepidomeda millispinis pratensis)*	Threatened	Yes	Yes
Plants			
Geene's tuctoria *(Tuctoria greenei)*	Endangered	Yes	No
Slender Orcutt grass *(Orcuttia tenuis)*	Threatened	Yes	Yes
Webber ivesia *(Ivesia webberi)*	Threatened	Yes	No
Churchill Narrows buckwheat *(Eriogonum diatomsaceum)*	Candidate	No	N/A
Goose Creek milkvetch *(Astragalus anserinus)*	Endangered	No	N/A
Gentner's fritillary *(Fritillaria gentneri)*	Endangered	No	N/A
Insects			
Carson wandering skipper *(Pseudocopaeodes eunus obscurus)*	Endangered	No	N/A

Table 3-13
Federal Endangered, Threatened, Proposed, and Candidate Species

Species	Federal Status	Designated Critical Habitat	Designated Critical Habitat in Planning Area
Crustaceans			
Vernal pool fairy shrimp *(Branchinecta lynchi)*	Threatened	Yes	No

Sources: USFWS December 18, 2013; BLM June 2014; Forest Service June 2014

Table 3-14
BLM and Forest Service Sensitive Species

Common Name	Scientific Name	BLM	Forest Service
Mammals			
Silver-haired bat	*Lasionycteris noctivagans*	✓	
Western red bat	*Lasiurus blossevillii*	✓	
Hoary bat	*L. cinereus*	✓	
Dark kangaroo mouse	*Microdipodops megacephalus*	✓	
Pale kangaroo mouse	*M. pallidus*	✓	
Western small-footed myotis	*Myotis ciliolabrum*	✓	
Long-eared myotis	*M. evotis*	✓	
Little brown myotis	*M. lucifugus*	✓	
Fringed myotis	*M. thysanodes*	✓	
Long-legged myotis	*M. volans*	✓	
Yuma myotis	*M. yumanensis*	✓	
Big free-tailed bat	*Nyctinomops macrotis*	✓	
Pika	*Ochotona princeps*	✓	
Western pipistrelle	*Parastrellus hesperus*	✓	
Preble's shrew	*Sorex preblei*	✓	
Spotted bat	*Euderma maculatum*	✓	✓
Fish Spring pocket gopher	*Thomomys* sp.	✓	
San Antonio pocket gopher	*Thomomys* sp.	✓	
Pallid bat	*Antrozous pallidus*	✓	
Pygmy rabbit	*Brachylagus idahoensis*	✓	✓
Townsend's big-eared bat	*Corynorhinus townsendii*	✓	
Townsend's western big-eared bat	*C. t. townsendii*		✓
Big brown bat	*Eptesicus fuscus*	✓	
California bighorn sheep	*Ovis canadensis californiana*		✓
Rocky Mountain bighorn sheep	*O. c. canadensis*		✓
Birds			
Greater sandhill crane	*Grus canadensis*	✓	
Northern goshawk	*Accipiter gentilis*	✓	✓
Greater Sage-Grouse	*Centrocercus urophasianus*	✓	✓
Peregrine falcon	*Falco peregrinus anatum*	✓	✓
Bald eagle	*Haliaeetus leucocephalus*	✓	✓

Table 3-14
BLM and Forest Service Sensitive Species

Common Name	Scientific Name	BLM	Forest Service
Mountain quail	*Oreortyx pictus*		✓
Flammulated owl	*Otus flammeolus*		✓
Golden eagle	*Aquila chrysaetos*	✓	
Western burrowing owl	*Athene cunicularia*	✓	
Ferruginous hawk	*Buteo regalis*	✓	
Swainson's hawk	*B. swainsoni*	✓	
Western snowy plover	*Charadrius nivosus*	✓	
Pinyon jay	*Gymnorhinus cyanocephalus*	✓	
Loggerhead shrike	*Lanius ludovicianus*	✓	
Juniper titmouse	*Baeolophus ridgwayi*	✓	
Bank swallow	*Riparia riparia*	✓	
Sage thrasher	*Oreoscoptes montanus*	✓	
Brewer's sparrow	*Spizella breweri*	✓	
Reptiles and Amphibians			
Yosemite toad	*Bufo canorus*		✓
Sierra Nevada yellow-legged frog	*Rana sierrae*		✓
Northern sagebrush lizard	*Sceloporus graciosus graciosus*	✓	
Fish			
Bonneville cutthroat trout	*Oncorhynchus clarki utah*	✓	✓
Meadow Valley wash desert sucker	*Catostomus clarkii* ssp. 2	✓	
Wall Canyon sucker	*Catostomus murivallis*	✓	
Cui-ui	*Chasmistes cujus*	✓	
White River springfish	*Crenichthys baileyi baileyi*	✓	
Desert dace	*Eremichthys acros*	✓	
Independence Valley tui chub	*Gila bicolor isolata*	✓	
Newark Valley tui chub	*G. b. newarkensis*	✓	
Hot Creek Valley tui chub	*G. b.* ssp. 5	✓	
Railroad Valley tui chub	*G. b.* ssp. 7	✓	
Northern leatherside chub	*Lepidomeda copei*	✓	
Inland Columbia Basin redband trout	*Oncorhynchus mykiss gairdneri*	✓	
Relict dace	*Relictus solitarius*	✓	
Moapa speckled dace	*Rhinichthys osculus moapae*	✓	
Monitor Valley speckled dace	*R. o.* spp. 5	✓	
Meadow Valley speckled dace	*R. o.* ssp. 11	✓	
White River speckled dace	*R. o.* ssp. 7	✓	
Oasis Valley speckled dace	*R. o.* ssp. 6	✓	
Pahranagat speckled dace	*R. o. velifer*	✓	
Bull trout	*Salvelinus confluentus*	✓	
Plants			
Meadow pussytoes	*Antennaria arcuata*		✓
Eastwood milkweed	*Asclepias eastwoodiana*		✓
Broad-pod freckled milkvetch	*Astragalus lentiginosus* var. *latus*		✓

Table 3-14
BLM and Forest Service Sensitive Species

Common Name	Scientific Name	BLM	Forest Service
Lamoille Canyon milkvetch	*A. robbinsii* var. *occidentalis*		✓
Toquima milkvetch	*A. toquimanus*		✓
Currant milkvetch	*A. uncialis*		✓
Grouse Creek rockcress	*Arabis falcatoria*		✓
Ophir rockcress	*A. ophira*		✓
Upswept moonwort	*Botrychium ascendens*		✓
Dainty moonwort	*B. crenulatum*		✓
Slender moonwort	*B. lineare*		✓
Moosewort	*B. tunux*		✓
Goodrich biscuitroot	*Cymopterus goodrichii*		✓
Arid draba	*Draba arida*		✓
Serpentine draba	*D. oreibata* var. *serpentina*		✓
Pennell draba	*D. pennellii*		✓
Nevada willowherb	*Epilobium nevadense*		✓
Snake Mountain erigeron	*Erigeron cavernensis*		✓
Sunflower Flat buckwheat	*Eriogonum douglasii* var. *elkoense*		✓
Toiyabe buckwheat	*E. esmeraldense* var. *toiyabense*		✓
Lewis's buckwheat	*E. lewisii*		✓
Basin jamesia	*Jamesia tetrapetala*		✓
Grimes lathyrus	*Lathyrus grimesii*		✓
Maguire lewisia	*Lewisia maguirei*		✓
Elegant penstemon	*Penstemon concinnus*		✓
Mt. Moriah penstemon	*P. moriahensis*		✓
Bashful penstemon	*P. pudicus*		✓
Rhizome beardtongue	*P. rhizomatosus*		✓
Inconspicuous phacelia	*Phacelia inconspicua*		✓
Small-flower phacelia	*P. minutissima*		✓
Whitebark pine	*Pinus albicaulis*		✓
Marsh's bluegrass	*Poa abbreviata* ssp. *marshii*		✓
Williams combleaf	*Polyctenium williamsii*		✓
Sagebrush cinquefoil	*Potentilla johnstonii*		✓
Nevada primrose	*Primula nevadensis*		✓
Nachlinger silene	*Silene nachlingerae*		✓
Railroad Valley globemallow	*Sphaeralcea caespitosa* var. *williamsiae*		✓
Alpine goldenweed	*Tonestas lyalli*		✓
Charleston ground daisy	*Townsendia jonesii* var. *tumulosa*		✓
Currant Summit clover	*Trifolium andinum* var. *podocephalum*		
Leiberg's clover	*T. leibergii*		
Rollins clover	*T. macilentum* var. *rollinsii*		✓

Sources: BLM 2011d; Forest Service 2011c

3.5.5 Management Indicator Species (Forest Service)

The NFMA directs the Forest Service to select appropriate species of plants, invertebrates, and vertebrates as management indicator species to manage for

maintenance and improvement of important habitats in the forest. 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 those 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 and thereby habitats. A Forest Service-specific Biological Evaluation and Wildlife Specialists Report is in **Appendix Q** of this document.

3.6 WILD HORSES AND BURROS

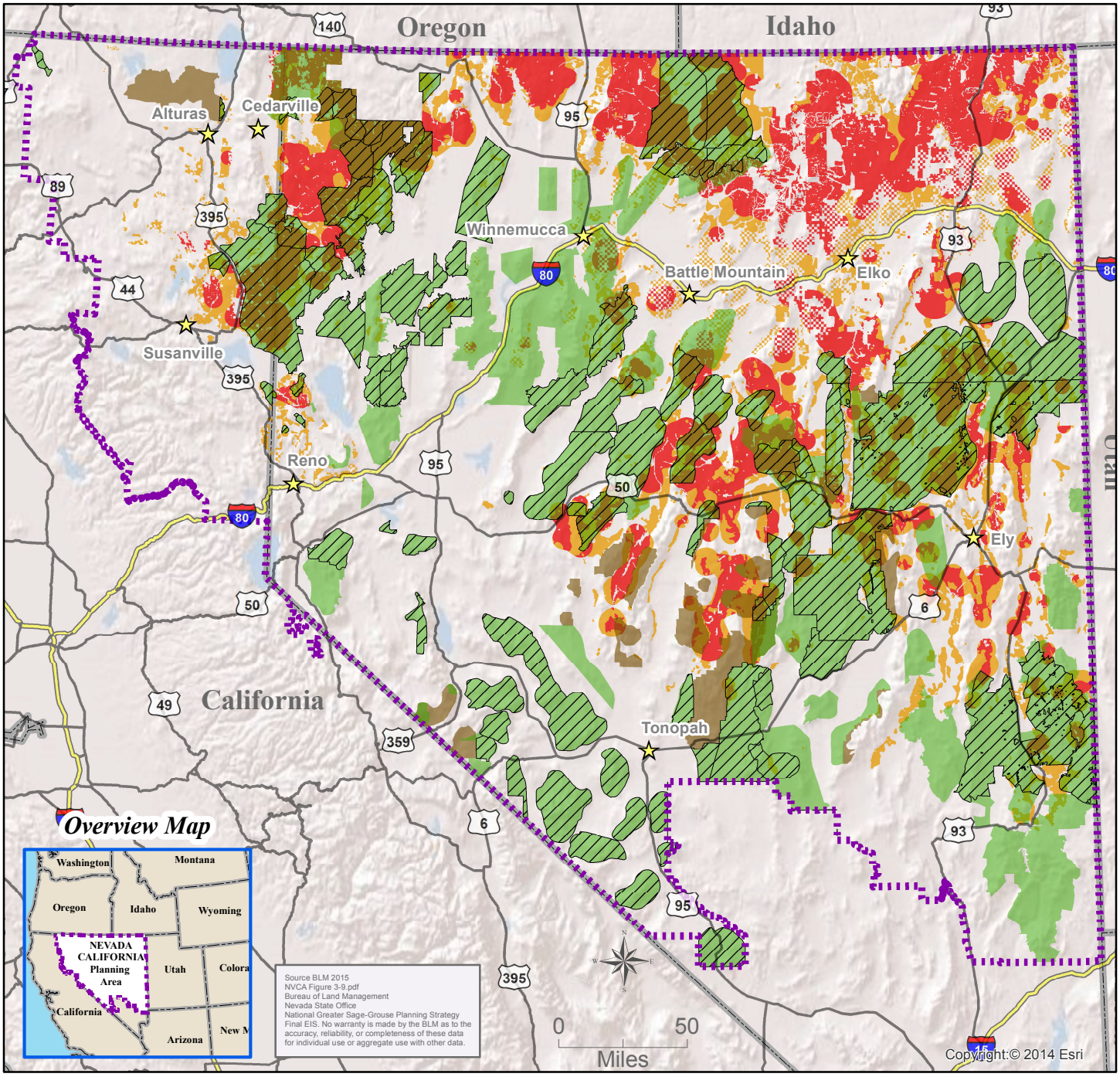
The BLM and Forest Service protect, manage, and control wild horses and burros, in accordance with the Wild Free-Roaming Horses and Burros Act of 1971 (PL 92-195, as amended by Congress in 1976, 1978, 1996, and 2004). The act mandates the BLM and Forest Service to "prevent the range from deterioration associated with overpopulation" and "remove excess horses in order to preserve and maintain a thriving natural ecological balance and multiple use relationships in that area." FLPMA directs the BLM and Forest Service to manage wild horses and burros as one of numerous multiple uses and resources, including mining, recreation, domestic grazing, and fish and wildlife. Wild horse and burro management is governed by 43 CFR, Part 4700 (BLM) and 36 CFR, Part 222, Subpart B (Forest Service).

One of the BLM's and Forest Service's top priorities is to ensure the health of the public lands so that the species depending on them, including the nation's wild horses and burros, can thrive. BLM and Forest Service policies and regulations also direct that wild horses and burros are to be managed as self-sustaining populations of healthy animals at minimal feasible levels.

Following passage of the act, BLM HAs and HMAs and Forest Service wild horse and burro territories (WHBTs) were identified in the planning area (see **Figure 3-9**). Herd areas and territories are locations where wild horse and burro populations were found when the act was passed; HMAs and WHBTs are areas in these identified herd areas, in their entirety or part, where it was established and affirmed through LUPs that sufficient forage, water, cover, and space existed to support the long-term management of healthy wild horse or burro populations.

Since the passage of the act in 1971, management knowledge regarding wild horse and burro population levels has increased. For example, it has been determined that wild horses are capable of increasing their numbers by 18 percent to 25 percent annually, resulting in the doubling of wild horse populations about every 4 years (Wolfe et al. 1989; Garrott et al. 1991). This

Herd Areas, Herd Management Areas
and USFS Wild Horse and Burro Territories



Legend

- Herd Management Areas
- Herd Areas
- USFS Wild Horse and Burro Territories
- Preliminary Priority Habitat (PPH)
- Preliminary General Habitat (PGH)
- City / Town
- Interstate
- US Route
- States
- Planning Area

has resulted in the BLM shifting program emphasis beyond just establishing an AML and conducting wild horse and burro gathers to include a variety of management actions that further facilitate the achievement and maintenance of viable and stable wild horse and burro populations and a "thriving natural ecological balance."

Management actions resulting from shifting program emphasis include increasing population growth suppression, adjusting sex ratios, and collecting genetic baseline data to support genetic health assessments. The Forest Service has been a cooperating agency to these additional management efforts.

Wild horses and burros are a long-lived species with survival rates estimated between 80 and 97 percent (Wolfe 1980; Eberhardt et al. 1982; Garrott and Taylor 1990). Wild horse and burro numbers appear to be limited principally by water availability and winter forage. Predation and disease have not substantially regulated wild horse and burro population levels in or outside the planning area; throughout the HMAs few predators exist to control wild horse and burro populations. Some mountain lion predation occurs but does not appear to be substantial. Coyotes are not prone to prey on wild horses and burros unless they are young or extremely weak.

Being a non-self-regulating species, there will be a steady increase in wild horse and burro numbers for the foreseeable future, which will continue to exceed the carrying capacity of the range. Animal movement and distribution are controlled by fencing and the distribution of watering sources.

3.6.1 Current Conditions

In the planning area, there are 15,989,900 acres of wild horse and burro herd areas, HMAs, and WHBTs in PPH, and PGH. **Table 3-15** displays data compiled in a baseline environmental report produced by the USGS for the BLM (Manier 2013; USGS 2014).

Table 3-15
Acres of Wild Horse and Burro Areas and Territories in Greater Sage-Grouse Habitat

Surface Management Agency	Management Zone	Acres in PPH	Acres in PGH	Total
BLM	III	2,930,800	3,048,400	5,979,200
	IV	1,107,600	312,200	1,419,800
	V	2,478,600	656,200	3,134,800
Forest Service	III	136,800	255,900	392,700
	IV	0	0	**0**
	V	0	0	**0**

Sources: Manier 2013; USGS 2014

There are 168 HAs and territories in the planning area that overlap 6,653,800 acres of PPH and 4,272,700 acres of PGH. These identified HAs, in their

entirety or part, were the basis for current identified HMAs, as established and affirmed through LUPs.

The BLM manages 64 HMAs and the Forest Service manages 11 WHBTs in the planning area, which overlap both PPH and PGH. Wild horse and burro populations in HMAs and WHBTs are managed to achieve and maintain established AMLs and corresponding forage allocations (measured in animal unit months [AUMs]).

The AML is defined as the maximum number of wild horses or burros that can be sustained in a designated HMA or WHBT that achieves and maintains a thriving natural ecological balance. The AML for each HMA and WHBT, in most cases, is expressed as a range with an upper and lower limit. The AUM allocation for wild horses and burros in HMAs and WHBTs is based on the upper limit of the AML range.

Initial AMLs and the boundaries of each HMA and WHBT were established through previous LUPs to ensure that public land resources, including wild horse habitat, are maintained in satisfactory, healthy condition and that unacceptable impacts on these resources are minimized. The AML ranges are based on best available science and rangeland monitoring studies. HMA and WHBT acreages by habitat type, along with current AMLs, are shown in **Table 3-16**.

Table 3-16
Herd Management Areas and Forest Service Territories in GRSG Habitat

HMA or WHBT	BLM Field Office or Forest Service Ranger District	Acres[1]			AML[2]	Estimated Population[3]
		Total[5]	PPH	PGH		
BLM California						
Bitner	Surprise	53,700	49,900	3,600	15-20	40
Buckhorn	Surprise	76,300	59,600	6,800	59-85	247
Carter Reservoir	Surprise	23,400	500	13,300	25-35	95
Coppersmith	Surprise	73,100	37,900	1,600	50-75	108
Fort Sage[4]	Eagle Lake	15,600	300	3,500	55-65	67
Fox Hog	Surprise	127,100	112,100	13,400	120-220	288
High Rock	Surprise	94,700	94,700	0	78-120	142
Massacre Lakes	Surprise	39,900	32,600	5,300	25-35	-186
New Ravendale	Eagle Lake	32,200	8,000	24,000	10-25	64
Nut Mountain	Surprise	40,200	40,000	0	30-55	65
Round Mountain	Eagle Lake		0	7,200	0	0
Twin Peaks	Eagle Lake	756,300	416,800	125,500	448-758 H 72-116 B	1,783 H 386 B
Wall Canyon	Surprise	41,200	41,100	0	15-25	37
BLM Nevada						
Antelope	Schell	327,300	73,200	108,000	155-324	496
Antelope Valley	Wells	504,100	49,900	72,000	150-259	950

Table 3-16
Herd Management Areas and Forest Service Territories in GRSG Habitat

HMA or WHBT	BLM Field Office or Forest Service Ranger District	Acres[1]			AML[2]	Estimated Population[3]
		Total[5]	PPH	PGH		
Augusta Mountains	Humboldt	177,600	9,500	13,200	185-308	557
Bald Mountain	Mount Lewis	139,900	22,000	26,500	129-215	283
Black Rock Range East	Black Rock	93,400	55,400	22,900	56-93	83
Black Rock Range West	Black Rock	93,200	53,700	10,600	56-93	273
Buffalo Hills	Black Rock	131,900	61,600	17,600	188-314	413
Calico Mountains	Black Rock	160,800	7,100	99,000	200-333	340
Callaghan	Mount Lewis	156,200	99,400	47,600	134-237	433
Clan Alpine	Stillwater	302,200	9,900	10,100	619-979	869
Desatoya	Stillwater	161,700	74,400	66,400	127-180	250
Diamond	Mount Lewis	165,600	23,700	52,100	151	251
Diamond Hills North	Tuscarora	71,600	12,800	7,100	37	115
Diamond Hills South	Egan	19,300	1,600	10,600	10-22	217
Dogskin Mountains	Sierra Front	6,500	0	0	10-15	37
Eagle	Schell	660,300	65,100	138,400	100-210	1,042
Fish Creek	Mount Lewis	252,800	29,800	44,400	107-180	305
Flanigan	Sierra Front	17,100	6,600	8,100	80-125	170
Fort Sage[4]	Sierra Front	2,000	200	2,900	36	115
Fox-Lake Range	Humboldt	177,700	0	3,100	122-204	488
Goshute	Wells	267,300	0	10,400	74-123	628
Granite Peak	Sierra Front	4,000	0	2,200	11-18	26
Granite Range	Black Rock	103,800	34,800	33,700	155-258	198
Hickison	Mount Lewis	57,300	12,600	9,500	45 B	134 B
Jackson Mountains	Humboldt	283,800	0	13,800	130-217	425
Little Fish Lake	Tonopah	28,700	24,500	1,700	39	60
Little Humboldt	Tuscarora	17,200	17,200	0	32-80	24
Little Owyhee	Humboldt	457,800	216,800	37,800	194-298	806
Maverick-Medicine	Tuscarora	323,500	58,600	88,700	166-276	916
McGee Mountain	Black Rock	41,200	100	24.300	25-41	72
New Pass-Ravenswood	Mount Lewis	285,900	12,600	17,400	545-566	692
North Monitor	Mount Lewis	11,500	1,600	3,900	8	61
Owyhee	Tuscarora	339,100	209,800	59,500	139-231	203
Pancake	Egan	849,600	113,300	119,400	240-493	1,3333
Reveille	Tonopah	105,500	0	11,000	83-138	93
Roberts Mountain	Mount Lewis	100,000	84,600	12,600	150	443
Rock Creek	Tuscarora	121,400	30,100	57,900	150-250	381
Rocky Hills	Mount Lewis	84,000	25,800	18,700	86-143	131

Table 3-16
Herd Management Areas and Forest Service Territories in GRSG Habitat

HMA or WHBT	BLM Field Office or Forest Service Ranger District	Acres[1]			AML[2]	Estimated Population[3]
		Total[5]	PPH	PGH		
Sand Springs West	Tonopah	152,300	0	1,000	34-56	190
Seven Mile	Mount Lewis	97,600	25,200	13,000	30-50	221
Seven Troughs	Humboldt	148,900	2,500	13,600	94-156 H 28-46 B	439 H 118 B
Shawave Mountains	Humboldt	107,100	0	500	44-73	320 H, 73 B
Silver King	Schell	575,500	14,700	45,400	60-128	713
Snowstorm Mountains	Humboldt	117,100	76,900	24,200	90-140	589
South Shoshone	Mount Lewis	133,100	53,200	22,500	60-100	403
Spruce-Pequop	Wells	240,700	9,800	4,600	48-82	592
Stone Cabin	Tonopah	406,300	7,100	16,500	219-364	455
Tobin Range	Humboldt	198,200	41,100	39,100	22-42	58
Triple B	Egan	1,232,400	316,700	273,500	250-518	1,328
Warm Springs Canyon	Black Rock	91,700	85,700	4,300	105-175 H 14-24 B	205 H 55 B
Whistler Mountain	Mount Lewis	43,200	9,300	16,500	24	20
Forest Service						
Butler Basin	Austin	53,500	5,200	18,100	60-100	440
Cherry Spring	Ruby Mountains	23,000	200	500	40-68	53
Dobbin Summit	Austin	48,600	7,300	40,400	1-3	0
Hickison Burro	Austin	16,600	700	4,600	16-45 B	130 B
Kelly Creek	Austin	20,800	200	1,900	8-16	26
Little Fish Lake	Tonopah	84,800	35,300	7,600	81-93	658
Monitor	Tonopah	338,900	5,600	33,500	51-90	402
Monte Cristo	Ely	93,500	5,200	27,900	72-96	194
Quinn	Tonopah	32,000	0	900	inactive	0
Seven Mile	Tonopah	5,700	100	500	1-3	42
Shoshone	Tonopah	85,300	3,000	20,000	inactive	
Stone Cabin	Tonopah	1,500	700	0	1-3	0
Tierney	Tonopah	77,100	5,600	30,400	inactive	0
Toiyabe	Tonopah	87,800	8,300	9,600	inactive	0
Toquima	Tonopah	143,500	22,100	49,800	15-30	221

Source: BLM and Forest Service GIS 2015
Notes:
H = Wild Horse
B = Wild Burro
[1]Rounded to nearest hundred acres
[2]AML and population number refers to wild horses, unless noted.
[3]Estimated population as of February 2015
[4]Fort Sage HMA lies in both California and Nevada, each with separate established AML.
[5]Due to GIS mapping accuracy, only HMAs/WHBTs with greater than 40 acres of GRSG habitat are listed.

The HMAs, WHBTs, and associated wild horse and burro populations in the planning area are managed in the established AML and management objectives identified in the LUP, HMA plan, or territory management plan. The AML, objectives, and management actions may be modified in future multiple-use decisions for the grazing allotments contained in an HMA or WHBT.

The estimated population size of wild horses and burros in each HMA/WHBT is based on aerial population inventories, which occur on average every two to three years. WHBTs in HMA/WHBT complexes are generally inventoried on the same schedule under cooperative agreement between BLM and Forest Service. These population inventories provide information pertaining to population numbers, foaling rates, distribution, and herd health.

Population estimates in the planning area (February 2015) show a total estimated population of over 25,789 wild horses and burros. Population estimates indicate that the number of horses and burros substantially exceeds the aggregated AML of 11,872 wild horses and burros. Wild horse and burro populations at the end of 2014 were exceeding the AML in 55 of 64 HMAs and 8 of 11 WHBTs.

As stated in the 2013 National Academy of Sciences' (NAS) report "Using Science to Improve the BLM Wild Horse and Burro Program: A Way Forward," it is the committee's judgment that the reported annual population statistics are probably substantial underestimates of the actual number of horses occupying public lands, inasmuch as most of the individual HMA population estimates are based on the assumption that all animals are detected and counted in population surveys—that is, perfect detection.

A large body of scientific literature focused on inventory techniques for horses and many other large mammals clearly refutes that assumption and shows estimates of the proportion of animals missed on surveys ranging from 10 to 50 percent, depending on terrain ruggedness and tree cover (Caughley 1974a; Siniff et al. 1982; Pollock and Kendall 1987; Garrott et al. 1991a; Walter and Hone 2003; Lubow and Ransom 2009). The committee went on to state that a reasonable approximation of the average proportion of horses undetected in surveys throughout western rangelands may be 20 to 30 percent. An earlier National Research Council committee and the Government Accountability Office also concluded that reported statistics were underestimates.

Various factors, including drought conditions, historic grazing, wildland fires, and uncontrolled wild horse and burro population growth, may adversely affect habitat and, in some instances, herd health. As the populations of wild horses and burros continue to increase they tend to spread outside the boundaries of the HMA/WHBT in search of sufficient water and forage resources and space, which increases the habitat needs and impacts in those areas.

Wild horses and burros also compete with wildlife species for various habitat components, especially when populations exceed AML, they expand beyond the boundaries of the HMA/WHBT, or when habitat resources become limited (e.g., reduced water flows, low forage production, or dry conditions).

Although determined by population monitoring, it is generally necessary to gather excess wild horses and burros on a three- to four-year schedule to ensure that numbers remain in the AML. Unfortunately, this has not been consistently possible because of insufficient funding and holding space; therefore, AMLs are frequently exceeded.

Following gathers, some animals are selected for return to the HMA or WHBT; excess horses or burros are placed in the adoption program and in long-term holding and are also made available for sale. Wild horses and burros that establish home ranges outside of HMA, WHBT, or herd area boundaries are removed during gathers. Wild horses and burros are removed from private lands at the request of the landowner after reasonable efforts to keep the animals off private lands have failed.

Trends

Current conditions in the planning area show that wild horse and burro populations continue to grow; most are exceeding AMLs and continue to expand into areas outside of established boundaries, impacting private and public lands and GRSG habitat. Wild horses and burros will continue to be removed to maintain AMLs and rangeland health. Implementing population growth suppression (PGS) will continue to be a priority management tool to help maintain and achieve AMLs.

3.7 WILDLAND FIRE AND 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. Control of fires and other land use practices during the last century has changed plant communities by altering the frequency, size, and severity of wildland fires.

The Federal Wildland Fire Management Policy was developed by the Secretaries of the DOI and the USDA in 1995 in response to dramatic increases in the frequency, size, and catastrophic nature of wildfires in the United States.

The 2001 review and update of the policy consisted of findings, guiding principles, policy statements, and implementation actions and replaced 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 policy provides nine guiding principles fundamental to the success of the federal wildfire management program and the implementation of review recommendations. The Guidance for Implementation of Federal Wildland Fire Management Policy (Forest Service 2009d) is the most recent guiding principle for these documents. These umbrella principles compel each agency to review its policies to ensure compatibility.

The management of BLM-administered and National Forest System lands includes the control of wildland fires, the use of fire through prescribed burning, and the use of fire through the management of wildland fires in order to meet land management goals.

Wildland fire management on BLM-administered and National Forest System lands is guided by a fire management plan (FMP) that considers the three elements mentioned and includes firefighter and public safety and cost effectiveness. Wildland fires occur from natural causes, such as lightning, or are human caused. Prescribed fire is used for beneficial purposes (such as reducing hazardous fuel accumulation or restoring ecosystem health) in a controlled manner under a specific prescription and planned effort.

Wildfires can be managed for multiple objectives, either by a full suppression response or to achieve land management objectives or combinations of both. The response to a wildfire 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 in vegetation communities (e.g., big sagebrush/grassland); rejuvenate fire-dependent vegetation communities (e.g., aspen); maintain or increase vegetation productivity, nutrient content, and palatability; and maintain or improve wildlife habitat, rangeland, and watershed condition. Fire is also considered a management tool for timber slash disposal, seedbed preparation, hazardous fuel reduction, disease or insect control, grazing management, thinning, or species manipulation in support of forest management objectives.

Management activities use collaborative planning, fuels project prioritization and selection, and community assistance actions to help mitigate wildfire risks to communities and their values; to protect and enhance threatened and endangered species and their habitat; and to ensure that fuels reduction treatments and projects conform to and support FMP and LUP objectives.

The actions that the BLM and Forest Service undertake will be with the appropriate level of NEPA analysis and documentation. BLM and Forest Service staff must also determine whether such actions may affect cultural resources and endangered or threatened species or their habitats. If the agency review reveals the potential for impacts, the agency will follow proper consultation

procedures; ensure the appropriate use of Fire Regime Condition Class, LANDFIRE (USGS 2006a), or other local data to describe existing vegetative condition; and ensure priority is given to planning those activities, projects, treatments, and community assistance actions that best meet DOI and USDA priorities.

All fuels reduction activities include the following guiding principles:

- Employee and public safety is the first priority in every fuels reduction and community assistance activity.
- The role of wildland fire as an essential ecological process and natural change agent will be identified and incorporated into the land use planning process and the fire management program.
- Education and outreach on wildland fire risk mitigation will be developed and targeted toward the public, with emphasis on communities with high risk.
- Fire program managers will work with line managers, resource specialists, and cooperators to identify treatment areas, develop plans, and implement fuels treatments and conduct community assistance activities.
- The fuels reduction and community assistance program will comply with applicable national, state, and local laws and regulations and departmental and BLM manuals, policy, and direction.
- Education plans and marketing strategies will be developed to increase awareness of, and the need for, prescribed fire and other fuels treatments with internal and external audiences.
- Fuels reduction treatments are monitored to determine whether short- and long-term (beyond three years) objectives are being met (effectiveness monitoring).
- Effectiveness of treatments is reported when intersected by a wildland fire.
- Community assistance grant funding provided through assistance agreements and contracts to cooperating entities will be open to all eligible recipients.

Current Condition

Wildfire management in the planning area is directed by an interagency effort between the BLM, Forest Service, and other federal, state, and local agencies. Wildfire can result in the loss of seasonal habitats and a food source for GRSGs. It has contributed to converting sagebrush communities into marginal or nonhabitat cheatgrass or medusahead grasslands, and has been identified as a primary threat to GRSGs and their habitat (USFWS 2010a). Current direction for fire management in GRSG habitat on BLM-administered lands is provided in

WO IM-2014-114—Sage-Grouse Habitat and Wildland Fire Management. Correlating direction of 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.

In sagebrush ecosystems, fire has been identified as one of the primary factors linked to loss of sagebrush-steppe habitat. Wildland fire has been increasing the loss of habitat due to an increase in its frequency. This has been facilitated by the incursion of nonnative annual grasses, primarily cheatgrass, into the sagebrush ecosystems (Miller and Eddleman 2000; Brooks et al. 2004). In areas where cheatgrass invasion has occurred, fuel profiles have changed, resulting in increased surface fire intensities, shorter fire return intervals, and larger fire sizes (Knapp 1996; Epanchin-Niell et al. 2009; Rowland et al. 2010; Baker 2011; Condon et al. 2011). Without sufficient rehabilitation efforts, these larger burned areas are prone to even more cheatgrass invasion. This interaction of annual grasses and fire is apparent by the increase in the average decadal acres burned in GRSG habitat.

In addition, suppression actions and some grazing practices in the late nineteenth and early twentieth centuries have facilitated the expansion of native conifers into GRSG habitat by decreasing the fire return interval (Miller and Rose 1999; Miller et al. 2011). **Table 3-17** and **Figure 3-10** display the extent of pinyon /juniper interface in GRSG habitat.

Table 3-17
Acres of Sagebrush and Pinyon-Juniper Interface in GRSG Habitat

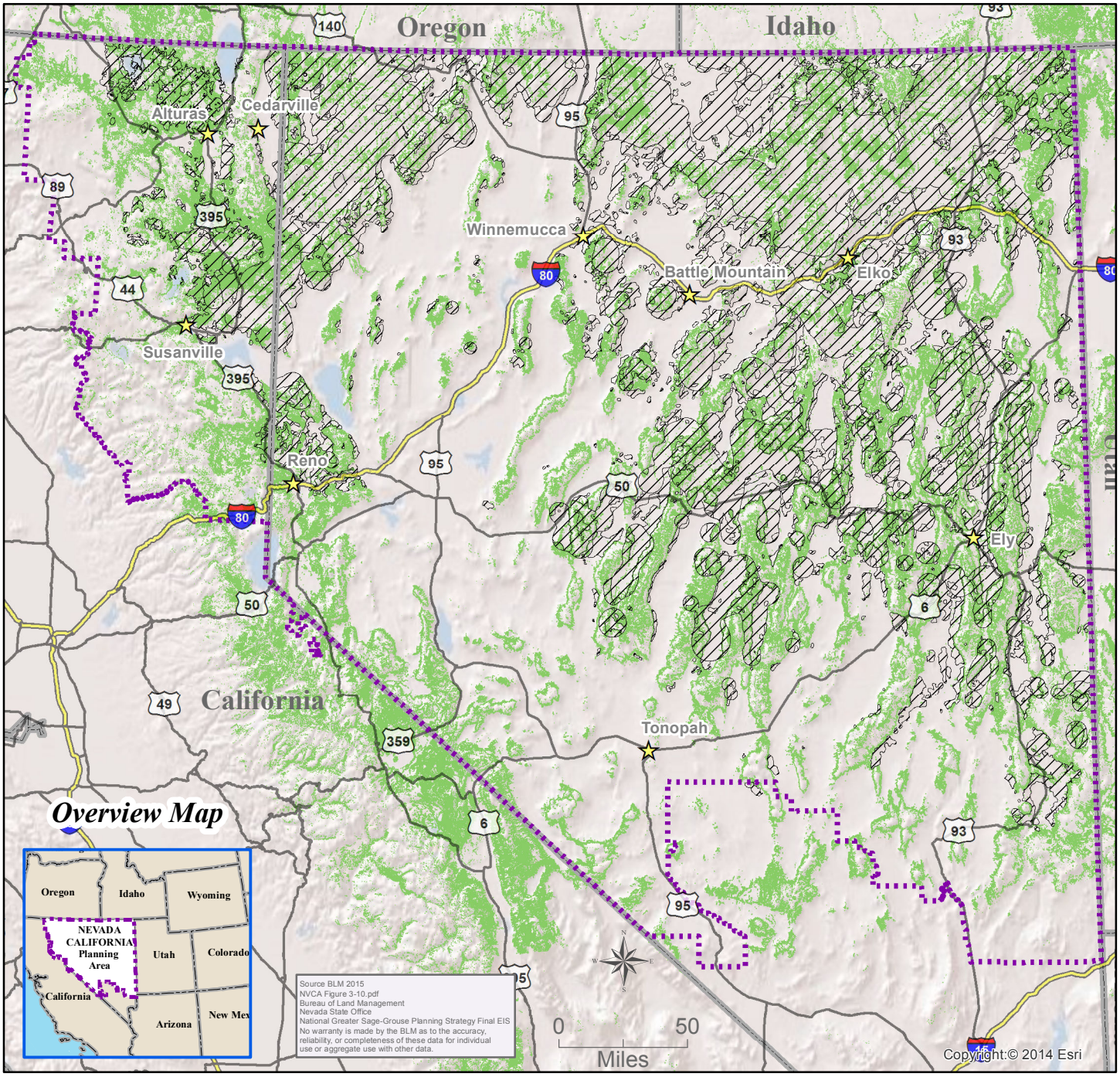
Surface Management Agency	Management Zone	Acres in PPH	Acres in PGH	Total
BLM	III	310,400	286,300	596,700
	IV	263,900	65,700	329,600
	V	302,500	105,900	408,400
Forest Service	III	43,600	119,900	163,500
	IV	82,300	34,100	116,400
	V	0	0	0
Other	III	44,100	35,200	79,300
	IV	92,400	32,200	124,600
	V	73,600	41,000	114,600

Source: Manier et al 2013, USGS 2014

Fire Regime

Fire regime is a general classification of the role fire would play across the landscape in the absence of modern human intervention, but including the influence of aboriginal burning (Agee 1993; Brown 1995). The natural or historical fire regimes are classified by number of years between fires (frequency) and the severity of the fire on the dominant overstory vegetation.

Areas with Sagebrush and Pinyon-Juniper Conifer Interface



Legend

- City/Town
- Interstate
- US Route
- States
- Planning Area
- Preliminary Priority and General Habitat
- Sagebrush/Pinyon Juniper Interface

National and state BLM fire policy requires that current and desired resource conditions related to fire management be described in terms of three condition classes and five fire regimes (**Table 3-18** and **Table 3-19**).

Table 3-18
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
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: Hann et al. 2008

Table 3-19
Fire Regime Condition Classes

Fire Regime Condition Classes	Attributes
Condition Class 1	• Fire regimes are in or near a 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 in a historical range.
Condition Class 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, and landscape patterns. • Vegetation attributes have been moderately altered from their historical range.
Condition Class 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, and landscape patterns. • Vegetation attributes have been significantly altered from their historical range.

Source: Hann et al. 2008

The Fire Regime Condition Classification System measures the degree to which vegetation departs from reference conditions, or how the current vegetation differs from a particular reference condition. Departures from reference condition could be a result of changes to key ecosystem components such as vegetation characteristics, fuel composition, fire frequency, fire severity, and pattern, as well as other associated disturbances such as insects and disease mortality. The classification system is used to categorize existing ecosystem conditions and to determine priority areas for treatment, as mandated by national direction (Hann and Bunnell 2001). 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., death from insects and diseases, grazing, and drought).

Vegetative condition class quantifies the amount that current vegetation has departed from the simulated historical vegetation reference conditions. Three condition classes describe low departure, moderate departure, and high departure. 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 (USGS 2006b) is based on departure of current vegetation conditions from reference vegetation conditions only, whereas the Interagency Fire Regime Condition Class Guidebook approach includes departure of current fire regimes from those of the reference period.

In the planning area, there are two major changes in fire regimes. The first occurred when nonnative annual grasses (e.g., cheatgrass) were introduced to the region in the late nineteenth century. These annual grasses have spread rapidly into areas of low to mid elevation. These warm and dry sites have low resilience to disturbances. Effective precipitation limits site productivity. The level of a site's resilience will further decrease if the site productivity, herbaceous perennial species, and ecological conditions all decrease.

Resistance to annual grasses decreases as soil temperature increases, but establishment and growth are highly dependent on precipitation. The largest number of acres burned typically follows a year or two after warm and wet winters and springs promote the growth of annual grasses, increasing fine fuel loads.

The second major change in fire regimes has occurred from conifer encroachment in the mid to high elevations, with a reduction of grass, forbs, and shrub species. The increase in trees or woody fuel, and a decrease in fine fuel loads are decreasing fire frequency. Extreme burning conditions (high winds,

high temperatures, and low relative humidity) in high density (Phase III) stands are resulting in large and severe fires that result in significant losses of above- and below-ground organic matter and have detrimental ecosystem effects (Miller et al. 2013).

Table 3-20 and **Table 3-21** summarize the current fire regime classification of all lands in GRSG habitat in the planning area. Approximately 28 percent of the vegetation in GRSG habitat is Condition Class III—highly departed and 70 percent is Condition Class II—moderately departed.

Table 3-20
Fire Regime Groups in PPH and PGH (Acres)

Fire Regime	I	II	III	IV	V
PPH—BLM	39,490	21,288	3,937,121	6,484,328	806,379
PGH—BLM	28,981	10,319	1,342,977	2,415,454	600,523
PPH—Forest Service	20,237	14,680	393,007	693,884	33,311
PGH—Forest Service	5,208	2,092	186,280	291,643	42,169
PPH—Other[1]	25,612	3,982	1,016,606	1,729,375	225,535
PGH—Other[1]	17,535	982	240,848	554,261	141,062

Sources: LANDFIRE Fire Regime Groups Layer (USGS 2006a); BLM and Forest Service GIS 2015
[1]Other represents tribal, other federal agencies, state, and private lands

Table 3-21
Condition Classes in PPH and PGH (Acres)

Population Area	Condition Class I	Condition Class II	Condition Class III
PPH—BLM	2,738,714	6,112,877	2,466,204
PGH—BLM	709,390	2,747,367	954,754
PPH—Forest Service	439,012	625,637	119,476
PGH—Forest Service	126,557	360,075	52,572
PPH—Other[1]	745,562	1,420,459	792,305
PGH—Other[1]	101,020	548,300	301,679

Source: LANDFIRE Vegetation Condition Class Layer (USGS 2006b), BLM and Forest Service GIS 2015
[1]Other represents tribal, other federal agencies, state, and private lands.

Fuels Treatments

The primary purpose of hazardous fuels management is to reduce the extent, intensity, and severity of wildland fire if it encounters a treatment area during the lifespan of the treatments. To be effective, fuels treatments must reduce fireline intensities under the conditions most likely to result in harm. That is, they have to work across a range of weather conditions likely to occur during a wildland fire.

Depending on the ecosystem, reduced extent, intensity, and severity can have beneficial ecological effects. For example, wildland fires burning less intensely may mimic historical fire effects more closely, helping to restore or enhance native, fire-adapted vegetation. In addition, less severe fires damage or kill fewer economically valuable trees and less soil erosion occurs following fires.

Strategically placed fuel treatments can have broader landscape effects that extend beyond the perimeter of the area physically treated, either through affecting fire behavior directly or by facilitating ecologically sensitive containment strategies. Such treatments can affect the spatial distribution of fires, leading to more desirable vegetation composition and structure. This increases the resistance to invasive species (e.g., cheatgrass) and can help preserve structure that is limited on the landscape (i.e., sagebrush).

Reduced intensity also means that suppression efforts are more likely to be effective and can be conducted more safely in areas where wildland fires are unwanted or threaten communities. Fuel treatments near homes and communities also are an effective, proactive way of reducing the likelihood of structure ignition and enhancing the safety of firefighters and the public. The three primary means of managing fuels are prescribed fire, managing wildland fire for ecological purposes and resource objectives, and non-fire treatments involving mechanical, biological, or chemical methods. Treatments can occur in isolation or in combination, depending on management objectives and resource constraints. (The Science Analysis of The National Cohesive Wildland Fire Management Strategy 2015)

Prescribed fires and other fuels treatments have also occurred throughout the planning area as a management tool for fuels and to help meet resource management goals for other land and resource uses such as vegetation and range management. **Table 3-22** lists the amount of BLM treatments by type and how many acres were treated, while **Table 3-23** lists the amount of Forest Service treatments by type and how many acres were treated.

Table 3-22
BLM Fuels Treatments (2008-2014)

Treatment Type	Number of Treatments	Acres Treated
Prescribed fire	72	11,940
Mechanical	351	98,459
Chemical	48	18,642
Total	**471**	**129,041**

Sources: National Fire Planning Operations Reporting System. Data included 2008 to 2014; BLM and Forest Service GIS 2015
Note: A 1-mile buffer was used on the coordinates of the treatments.

Table 3-23
Forest Service Fuels Treatments (2008-2012)

Activity	Treatments	Acres
Prescribed fire treatments	2,038	129,862
Mechanical treatments (not including pre-commercial or commercial thinning activities)	1,656	100,711
Total	**3,694**	**230,573**

Source: Forest Service 2013b

Fire Occurrence

Between 1992 and 2014, over 6.8 million acres of GRSG habitat in the planning area were affected by wildfire (see **Table 3-24**).

Wildland fire has historically occurred in the planning area and tends to occur between late April and September. Of the fires in PPH and PGH in the planning area, the vast majority of the fires are caused by lightning and the vast majority of acres burned are the result of lightning. **Table 3-25** lists the number of fires by size class that have occurred in the GRSG habitat in the planning area over the past 22 years. This table illustrates that most fires are suppressed at a small size, and only a few spread large. However, these rare but large fires consume most of the acres burned. **Table 3-26** lists the percent of human- and lightning-caused fires and acreage burned by agency and habitat type.

Table 3-24
Acres of Wildland Fire in Greater Sage-Grouse Habitat

Surface Management Agency	Management Zone	Acres in PPH	Acres in PGH	Acres in OHMA	Total
BLM	III	297,815	372,217	739,585	1,409,617
	IV	1,101,630	709,891	506,367	2,317,888
	V	654,933	318,884	305,298	1,279,115
Forest Service	III	3,996	4,991	4,713	13,700
	IV	107,319	102,542	53,839	263,700
	V	0	0	3,073	3,073
Other	III	0	0	0	482,900
	IV	0	0	0	920,500
	V	0	0	0	182,000

Sources: Short 2013; BLM and Forest Service GIS 2015; USGS 2014

Table 3-25
Fire Occurrence Starts (1992 to 2014)

Population Areas	A: 0 to 0.25 Acres	B: 0.26 to 9.9 Acres	C: 10 to 99 Acres	D: 100 to 299 Acres	E: 300 to 999 Acres	F: 1,000 to 4,999 Acres	Proposed Plan: 5,000+ Acres
PPH—BLM	631	344	153	64	59	60	44
PGH—BLM	1133	484	139	47	56	42	34
OHMA—BLM	1079	416	152	66	39	53	31
PPH—Forest Service	47	44	16	6	6	2	1
PGH—Forest Service	76	35	9	3	4	7	3
OHMA—Forest Service	71	26	13	1	6	1	2

Source: Short 2013, BLM GIS WFMI 2015

Table 3-26
Causes of Fires (1992—2014)

	PPH—BLM	PGH—BLM	OHMA—BLM	PPH—Forest Service	PGH—Forest Service	OHMA—Forest Service	Total
Total starts	1,355	1,935	1,836	122	137	120	5,505
Total acres	2,054,378	1,400,987	1,551,248	111,315	107,533	61,625	5,287,086
Human acres	52,308	59,478	50,406	12,810	66,733	36,430	278,165
Natural acres	1,310,679	742,439	547,339	44,917	12,631	8,964	2,666,969
Unknown acres	691,391	599,070	953,503	53,588	28,169	16,231	2,341,952
Human percent	3	4	3	12	62	59	5
Natural percent	64	53	35	40	12	15	50
Unknown percent	34	43	61	48	26	26	45

Sources: Source: Short 2013, BLM GIS WFMI 2015

Trends

Recent scientific research has shown a trend toward increased large fire frequency, longer wildland fire durations, and longer wildland fire seasons since the mid-1980s (Westerling et al. 2006). This may involve both climate change and previous land use effects in California. The spread of cheatgrass and other annual grasses will continue to serve as a catalyst for large fire growth in the planning area. Climate change may also alter the range of invasive plants, potentially expanding this threat into more GRSG habitat.

In the absence of vegetation management, there is an increased potential for further loss of biological diversity in the advent of future high-severity, large fires that damage or eliminate components of the ecosystem (Martin and Sapsis 1991). "No treatment" or "passive management" can perpetuate the potential for high-severity fire (Stephens et al. 2009), thereby increasing the loss of habitat.

Where fuels cannot be managed to match historical levels, adjustments must be made in human communities to accommodate a new normal in fire occurrence and extent. For forested systems, this likely means a progressive transition from historical FRG I or III to a new FRG IV and less frequent, higher-intensity fires.

Higher-intensity fires lead to higher suppression difficulty, increased risks to firefighter and public safety, and more severe social or ecological damage. Changes in rangeland and shrubland systems also can lead to increased, more continuous fire extent, often with greatly increased rates of spread, which also increase suppression difficulty and risk to firefighters. Additionally, changes in fire frequency can lead to an undesirable mix of new species that move into these systems (e.g., invasive grasses, such as cheatgrass, or encroachment by woody species, such as juniper; D'Antonio and Vitousek 1992; Brooks et al. 2004; Miller et al. 2013; Chambers et al. 2014)

Figure 3-11 shows those areas of the sub-region with the highest fire potential; **Table 3-27** shows the acreage with a high probability for wildfire in GRSG habitat in the planning area.

Table 3-27
Acres with High Probability of Wildland Fire in GRSG Habitat

Surface Management Agency	Management Zone	Acres[1] in PPH	Acres[1] in PGH	Acres in OHMA	Total
BLM	III	2,611,900	2,547,300	2,518,400	7,677,600
	IV	2,815,900	1,025,000	669,000	4,509,900
	V	1,304,000	603,800	374,600	2,282,400
Forest Service	III	102,400	102,900	141,400	346,700
	IV	478,600	193,200	176,500	848,300
	V	0	0	0	0
Other	III	474,700	588,400	509,100	1,572,200
	IV	1,060,800	664,600	297,400	2,022,800
	V	445,400	286,000	123,100	854,500

Sources: Finney et. al. 2010; USGS 2014
[1]Derived from Forest Service FSim burn data

3.8 LIVESTOCK GRAZING

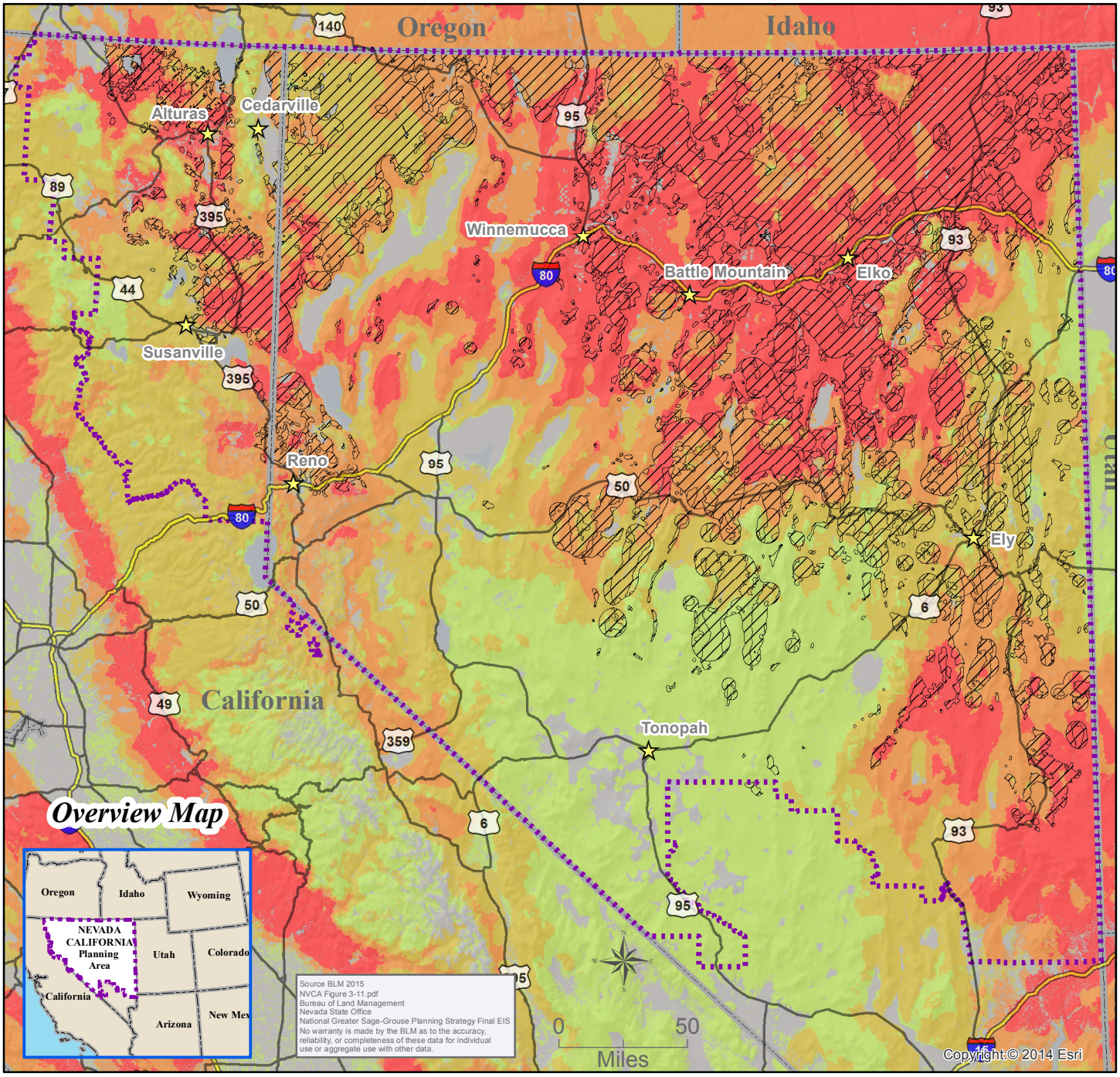
BLM

The primary laws that govern grazing on public lands are the Taylor Grazing Act of 1934, the FLPMA, and the Public Rangelands Improvement Act of 1978. The BLM manages grazing lands under 43 CFR, Part 4100, and its own manuals and handbooks, including the Nevada Rangeland Monitoring Handbook (BLM 2006). In addition, the BLM must meet or ensure progress is being made toward meeting its Standards and Guidelines for Livestock Grazing Administration (**Appendix R**) for each allotment.

Four fundamentals of rangeland health are listed in 43 CFR, Part 4180.1. They combine the basic precepts of physical function and biological health with elements of law relating to water quality and plant and animal populations and communities. The fundamentals provide the basis for developing and implementing the standards for land health.

Standards and guidelines (SandGs) establish conditions needed to sustain public land health for soils, riparian systems, upland vegetation, wildlife habitat, threatened and endangered species, and water quality. Guidelines are livestock grazing management tools, methods, strategies, and techniques designed to maintain or achieve healthy public lands, as defined by the standards. The SandGs have been implemented through land health assessments, determination documents, environmental assessments, permit renewals, and other permit changes. These standards not only pertain to impacts associated with livestock

Areas with High Fire Probability



Legend

Burn Probability

- Very High
- High
- Moderate
- Low
- Zero

- City/Town
- Interstate
- US Route
- Planning Area
- States
- Preliminary Priority and General Habitat

grazing but also to other rangeland impacts from such activities as recreation, development, wildlife grazing, and wild horse management. Sustainable livestock grazing and desired rangeland condition requires the collective management of forage, water, soil, and livestock by the BLM and the livestock owners and operators. Four resource advisory council SandGs apply to the Nevada and Northeastern California decision area **(Appendix R):**

- Mojave-Southern Great Basin
- Northeastern Great Basin
- Sierra Front-Northwestern Great Basin
- Northeastern California and Northwestern Nevada

Forest Service

The primary laws that govern grazing on lands administered by the Forest Service are the Organic Administration Act of 1897, Granger-Thye Act of 1950, Multiple Sustained Yield Act of 1960, FLPMA, Forest Rangeland Renewable Resources and Planning Act of 1974, NFMA, and Public Rangelands Improvement Act of 1978. The Forest Service manages livestock grazing under direction in 36 CFR, Part 222, Forest Service Manual 2200, and Forest Service Handbook 2209. In addition, LUPs identify the suitability of land on National Forest System units to produce forage for grazing animals and establish programmatic direction for grazing activities, including goals, objectives, desired conditions, standards and guidelines (**Appendix R**), and monitoring requirements.

Although an area may be deemed suitable for use by livestock in a LUP, a project-level analysis evaluating the site-specific impacts of the grazing activity, in conformance with NEPA, is required in order to authorize livestock grazing on specific allotments.

Current Condition

Cattle are the primary grazers on BLM-administered lands of the planning area, in identified or potential GRSG habitat; secondary grazers are sheep and some domestic horses. The season of use in the planning area varies from seasonal to year-long.

Range improvements are present on public lands in the planning area. Structural range improvements are fences and water developments, along with vegetation treatments, such as seedings and invasive weed control. Fences are typically three- to four-strand barbed wire, although other types of approved fences are present.

Water developments are reservoirs, developed springs, and wells. Developed springs and wells commonly include pipeline systems that distribute water to one or more metal, fiberglass, or rubber-tire tanks. Reservoirs and developed

springs are typically located in drainages and depressions, while wells and their associated delivery tanks are typically located on uplands. Noxious and invasive weeds are controlled through integrated weed management measures over the planning area, which is described in the Vegetation Section.

Active grazing use, management actions, and long-term rangeland health in each allotment are monitored and evaluated. Adjustments are made by agreement or decision, in accordance with legislation, regulations, and policy, to ensure that public land resource values are maintained or improved to meet LUP goals and objectives.

The primary management objectives for livestock grazing have been to improve rangeland health, to improve riparian functioning condition, and to restore native plant communities. The BLM is improving rangeland health by controlling animal numbers and season-of-use and by resting severely damaged rangeland (principally caused by wildland fires). Livestock grazing is monitored on an ongoing basis to ensure that BLM land health standards are being achieved. Where progress is lacking or inadequate, grazing practices are altered or other conditions are corrected to achieve compliance. As elsewhere, forage production and availability are subject to substantial yearly fluctuations. Droughts in particular necessitate use restrictions on annual grazing permits. Factors of human and natural origin that interfere with land health restoration and threaten efforts to achieve the desired future condition are as follows:

- Pinyon/juniper encroachment in low sagebrush, big sagebrush, and oak woodland plant communities
- Sheet erosion and pedestal formation (formed where individual plants or plant clumps retain soil while the intervening spaces are eroded)
- Competition from invasive weeds
- Decline in watercourse health and hydrologic function
- Decline in riparian vegetation, health, and function
- Soil trampling by feeding and traveling livestock, particularly along streambanks and in riparian areas, and erosion from roads and trails (especially near watercourses and riparian areas)
- Forage shrub decline due to drought
- Proliferation of exotic weeds, which are already established in most pastures (management actions, including altered grazing practices, would increase the extent and health of native perennial species, but they are not likely to restore complete dominance)

Current Livestock Management

Present management involves adhering to permit stipulations, particularly regarding livestock numbers and season-of-use restrictions. Grazing pressure is controlled with fencing, herding, and strategic placement of water. Many allotments are managed with a combination of rest and deferred grazing. This can include early-on and early-off grazing, delayed turnout, or a modified annual season-of-use. Annual adjustments are made according to forage availability and the prevalence of drought or above-average precipitation. Livestock are trucked or driven overland to and from allotments and between pastures.

The BLM and its grazing permittees are striving to maintain or improve rangeland health so that forage production is sustainable and ranching remains a viable occupation. Despite some inherent difficulties, local ranchers have begun to employ new grazing strategies that are beginning to show improvements in rangeland health. These changes have increased the extent and health of sensitive riparian and upland vegetation. Techniques include shorter grazing seasons, modified spring and summer grazing use, and intensive management of riparian areas and livestock pastures. Livestock exclosures and riparian pastures (riparian areas fenced out to promote riparian function) have been created to protect streams and riparian habitats. Improved fencing, frequent herding and moving, and season-of-use adjustments have been used to protect sensitive areas and to improve rangeland condition. Leaving greater amounts of residual vegetation has enhanced hydrologic function and watershed condition by slowing runoff, increasing infiltration, reducing erosion, and improving seedling establishment and ground cover.

BLM rangeland health information is separated into the Northeast California District and Nevada BLM sections. The Northeast California District had access to more detailed information, while the Nevada BLM information is more general. As an example, the data sets used for rangeland health assessments are different, so the category definitions are also different.

BLM California

Rangeland Health Assessments

Rangeland health assessments are used to compare the current condition of grazing allotments to rangeland health standards. Some factors of major importance to rangeland health are current and historic grazing practices, juniper encroachment, and proliferation of noxious weeds. Once evaluated, allotments are placed in one of four condition categories.

Northeastern California BLM currently permits approximately 181,500 AUMs on allotments in GRSG habitat (**Table 3-28**).

BLM Nevada

Nevada BLM currently permits approximately 1,790,000 AUMs on allotments in GRSG habitat (**Table 3-29**).

Table 3-28
Northeastern California BLM Allotments in GRSG

North-eastern California District	Category 1		Category 2		Category 3		Category 4	
	Number of Allot-ments	Acres	Number of Allot-ments	Acres	Number of Allot-ments	Acres	Number of Allot-ments	Acres
Total	22	676,594	68	1,629,199	53	359,458	11	108,301

Source: BLM 2008a, 2008b, 2008c
Category 1—Areas where one or more standards have not been met, nor has significant progress been made toward meeting the standards, and livestock grazing is a significant factor.
Category 2—Areas where all standards have been met or significant progress has been made toward meeting the standards.
Category 3—Areas where one or more of the standards is not known or the cause of the failure to meet the standards is not known.
Category 4—Areas where one or more standards have not been met, nor has significant progress been made toward meeting the standards due to causes other than (or in addition to) livestock grazing. (Allotments where livestock grazing is the primary cause for failure are also included in Category 1.)

Table 3-29
Nevada BLM Allotments in GRSG

Category 1		Category 2		Category 3		Category 4		Category 5	
Num-ber of Allot-ments	Allot-ment Acres*	Num-ber of Allot-ments	Allot-ment Acres*	Num-ber of Allot-ments	Allot-ment Acres*	Num-ber of Allot-ments	Allot-ment Acres*	Num-ber of Allot-ments	Allot-ment Acres*
46	3,050,942	38	4,068,776	34	2,961,503	74	2,932,151	376	20,453,855

Source: BLM 2012, and BLM and Forest Service GIS 2015
Category 1—Information indicates standards met
Category 2—Determination signed, livestock a causal factor
Category 3—Determination not signed but information indicates possible grazing conflict
Category 4—One or more standards not achieved; livestock not a cause
Category 5—Determination not complete
*Acres represent the total allotment acreage with GRSG habitat acreage present in allotment perimeters.

Forest Service

The Humboldt-Toiyabe National Forest manages 225 grazing allotments in the planning area. Of these, 212 allotments, or about 95 percent, contain GRSG habitat totaling about 1,792,696acres. Livestock are permitted on National Forest System lands under term grazing permits, which cannot be leased in whole or part. A term grazing permit authorizes the number, kind, and class of livestock and the period of use and grazing allotment on which livestock are permitted to graze. Mostly cattle and sheep graze on the Humboldt-Toiyabe National Forest from early June to late September.

All allotments on the Humboldt-Toiyabe National Forest are managed under allotment management plans or annual operation instructions that implement livestock grazing S&G of the Humboldt or Toiyabe Forest LUPs, including forage utilization standards. Structural range improvements help distribute livestock across the allotments and include fences, cattle guards, corrals, pipelines, water troughs, wells, reservoirs, and ponds.

Planning Area

Table 3-30, **Table 3-31**, and **Table 3-32** list the current conditions affecting livestock grazing in the planning area. **Figure 3-12** shows BLM-administered and National Forest System lands available for grazing and the relationship of PGH and PPH to existing grazing allotments.

Current use patterns vary based on local and regional plans, conditions, and grazing allotments. Pastures on BLM-administered and National Forest System lands (management units) represent the typical planning, leasing, and evaluation units used in grazing management across GRSG range. Based on field office records of grazing allotments, allotments "not meeting wildlife land health standards due to livestock grazing" influence GRSG habitats throughout MZ IV and western portions of MZ III, although BLM-administered lands not meeting wildlife land health standards due to livestock can be found throughout the range of GRSGs.

Table 3-30
Acres of Grazing Allotments in GRSG

Surface Management Agency	Management Zone	Acres in PPH	Acres in PGH	Total
BLM	III	3,604,200	3,657,100	7,261,300
	IV	2,802,600	1,010,300	3,812,900
	V	2,235,000	811,000	3,046,000
Forest Service	III	1,600	3,700	5,300
	IV	7,200	2,400	9,600
	V	0	0	0
Other	III	392,200	432,400	824,600
	IV	927,000	487,100	1,414,100
	V	202,600	166,900	369,500

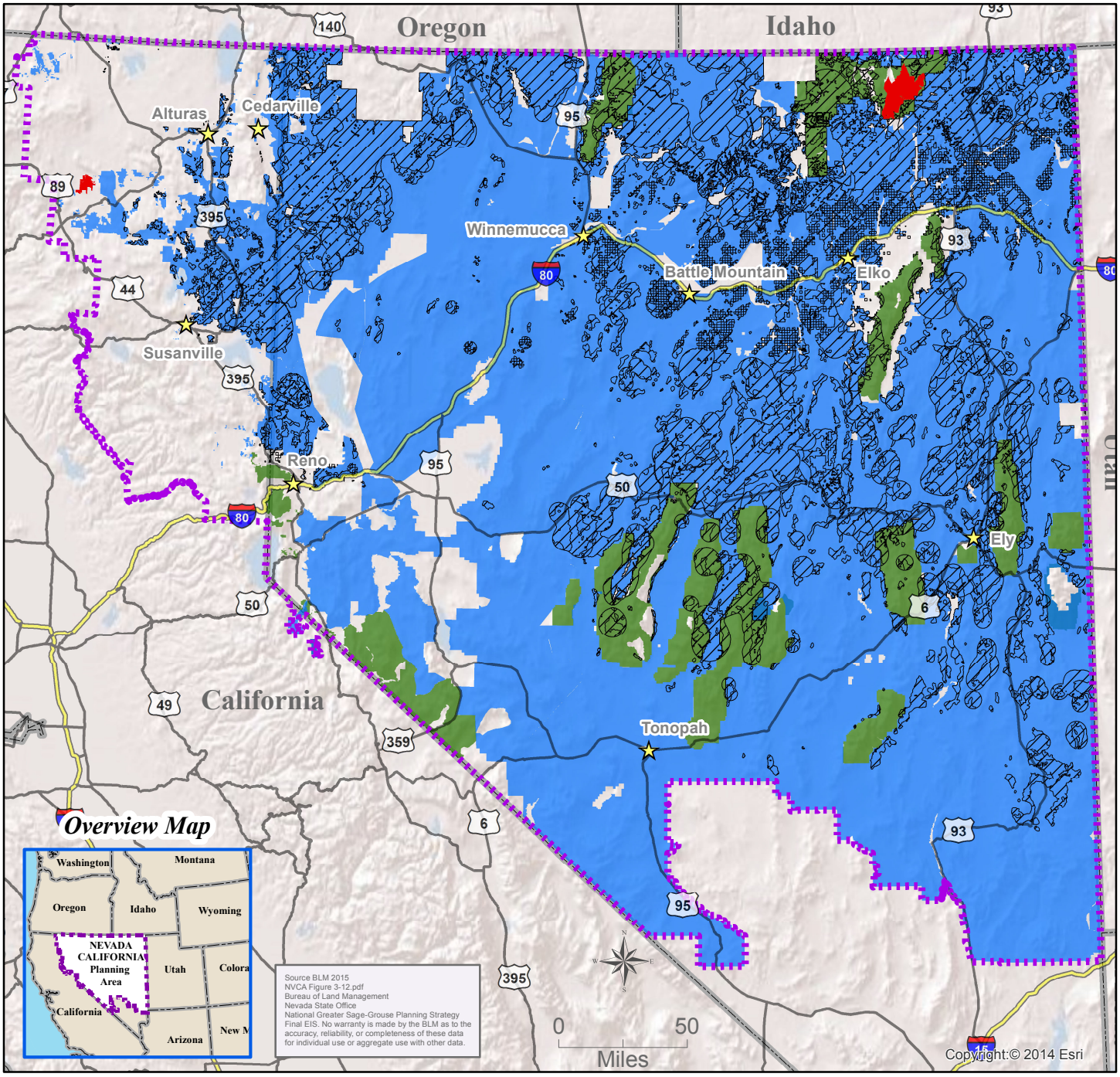
Source: Manier et al. 2013

Table 3-31
Acres of Allotments Not Meeting Land Health Standards in GRSG Habitat

Surface Management Agency	Management Zone	Acres in PPH	Acres in PGH	Total
BLM	III	630,200	601,300	1,231,500
	IV	455,600	225,300	680,900
	V	323,800	122,200	446,000
Forest Service	III	200	100	300
	IV	40	0	40
	V	0	0	0
Other	III	27,900	36,700	64,600
	IV	78,200	21,300	99,500
	V	11,400	7,000	18,400

Sources: Manier et al. 2013; Forest Service 2014
[1]Includes only allotments not meeting land health standards with grazing as the cause.
*The Forest Service does not use the land health concept.

Existing Lands Available for Livestock Grazing



Legend

- Livestock Grazing Unavailable
- Preliminary Priority and General Habitat
- BLM Available Grazing Allotments
- Forest Service Available Grazing Allotments
- City / Town
- Interstate
- US Routes
- States
- Planning Area

Table 3-32
Miles of Fences in GRSG

Surface Management Agency	Management Zone	Acres in PPH	Acres in PGH	Total
BLM	III	2,200	1,600	3,800
	IV	2,000	600	2,600
	V	1,400	500	1,900
Forest Service	III	500	300	800
	IV	500	200	700
	V	0	0	0
Other	III	400	400	800
	IV	1,100	400	1,500
	V	300	200	500

Source: BLM and Forest Service 2015
[1]Derived from a dataset that identifies pasture and allotment borders on BLM-administered and National Forest System lands as potential fences.

Importantly, assessments for some lands were not available (some federal and all state, private, and tribal lands), and conditions have changed since the data were gathered (assembled in 2008 using available data), so regional scale comparisons may be misleading. Contemporary local data should supersede this information in most cases.

Approximately 2.8 million acres (17 percent) of BLM-administered GRSG range did not meet land health standards (Manier et al. 2013).

3.9 RECREATION

Conditions on BLM-Administered Lands

Recreation management is guided by BLM regulations and policies, federal and state laws, current and emerging trends in public demand for recreational activities and opportunities, and an area's physical and natural surroundings.

Current management direction is based on objectives in LUPs and LUP amendments, activity-level plans, and recreation management guidance, including Manual 8320 (BLM 2011e). The intent of the BLM's recreation-focused laws, policy, and guidelines is to meet public demand for outdoor land- and water-based recreation opportunities, while preventing or minimizing adverse impacts on the natural and cultural resources on BLM-administered lands.

Recreation Management Areas

Recreation planning guidance and the definitions for recreation management areas (i.e., SRMAs and extensive recreation management areas [ERMAs]) have changed since most LUPs in the planning area were written.

Special Recreation Management Areas

Current BLM guidance identifies SRMAs as administrative units where the existing or proposed recreation opportunities and recreation setting characteristics are recognized for their unique value, importance, or distinctiveness, especially as compared to other areas used for recreation.

SRMAs are managed to protect and enhance a targeted set of activities, experiences, benefits, and desired recreation setting characteristics. They may be subdivided into recreation management zones to further delineate specific recreation opportunities. In SRMAs, recreation and visitor service management is recognized as the predominant land use planning focus, where specific recreation opportunities and recreation setting characteristics are managed and protected on a long-term basis.

SRMAs and recreation management zones must have measurable outcome-focused objectives. Supporting management actions and allowable use decisions are required to sustain or enhance recreation objectives, protect the desired recreation setting characteristics, and constrain uses, including incompatible recreation activities, that are detrimental to meeting recreation or other critical resource objectives (e.g., cultural or threatened and endangered species).

There are seven SRMAs in the planning area. The largest single SRMA is the Black Rock High Rock Canyon National Conservation Area (NCA), encompassing 1,205,040 acres. The Loneliest Highway SRMA that follows US Highway 50 in the Ely District is 675,123 acres. The Egan Crest SRMA, also in the Ely District, is 53,445 acres. There are four SRMAs in the Elko District: Wilson Reservoir with 5,440 acres, South Fork Owyhee River with 3,500 acres, Zunino/Jiggs Reservoir with 800 acres, and the Fort Sage SRMA in the Eagle Lake Field Office with 22,000 acres.

Extensive Recreation Management Areas

Current BLM guidance defines ERMAs as administrative units that require specific management consideration in order to address recreation use, demand, or recreation and visitor service program investments. ERMAs are managed to support and sustain the principal recreation activities and the associated qualities and conditions of the ERMA. Management of ERMAs is commensurate with the management of other resources and resource uses. Supporting management actions and allowable use decisions must facilitate the visitors' ability to participate in outdoor recreation activities and protect the associated qualities and conditions. Incompatible uses, including some recreation, may be restricted or constrained to achieve interdisciplinary objectives.

Planning guidance in place when most LUPs in the planning area were written directed that all BLM-administered land not designated as an SRMA should be designated as an ERMA. However, under current recreation guidance (BLM Manual 8320—Planning for Recreation and Visitor Services [BLM 2011e]), what were formerly ERMAs would now be considered undesignated (i.e., neither an

ERMA nor an SRMA). As such, there are no areas in the planning area designated as ERMAs.

BLM-Administered Lands not Designated as Recreation Management Areas

As described above, current recreation guidance (BLM 2011e), directs that what were formerly ERMAs would now be considered undesignated; approximately 36,062,995 acres in the planning area are undesignated. These BLM-administered lands are managed to meet basic recreation and visitor services and resource stewardship needs. Recreation is not emphasized but may occur. The recreation and visitor services are managed to allow recreation uses that are not in conflict with the primary uses of these lands. Management actions and allowable use decisions may still be necessary to address basic recreation and visitor services and resource stewardship needs.

Forest Service

The Multiple Use Sustained Yield Act of 1960 (16 USC, Section 528, Public Law 86-517) directs the Forest Service to manage recreation as a resource on par with timber, water, and wildlife resources. As the science of outdoor recreation management has evolved, managers have placed more emphasis on providing for experience opportunities rather than specific recreation activities. Accordingly, a primary objective of Forest Service recreation management is to provide and secure an environment for visitors to achieve desired experiences while balancing other social, economic, and environmental factors.

The recreation opportunity spectrum (ROS) is a widely used planning and management tool used to delineate and define outdoor recreation settings and related experience opportunities. The ROS arrays recreation settings on a spectrum from primitive to urban. A given ROS 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 ROS classes described in the LUPs: primitive, semiprimitive nonmotorized, semiprimitive motorized, roaded natural, rural, and urban. For each of these classes, the LUPs also describe 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 ROS classes are used: motorized and nonmotorized.

Table 3-33 summarizes the various ROS classes in the planning area and in PPH and PGH.

Table 3-33
Recreation Opportunity Spectrum Classes

Surface Management Agency	Management Zone	Acres in PPH	Acres in PGH
BLM	Primitive	0	0
	Rural	0	0
	Roaded natural	200	300
	Semiprimitive motorized	400	100
	Semiprimitive nonmotorized	100	100
	Urban	0	0
Forest Service	Primitive	15,700	33,600
	Rural	9,500	600
	Roaded natural	164,000	190,400
	Semiprimitive motorized	288,600	122,000
	Semiprimitive nonmotorized	334,500	536,900
	Urban	200	0
Other	Primitive	700	700
	Rural	2,800	0
	Roaded natural	13,900	8,400
	Semiprimitive motorized	27,400	9,000
	Semiprimitive nonmotorized	22,300	11,100
	Urban	0	0

Source: BLM and Forest Service GIS 2015

3.10 COMPREHENSIVE TRAVEL AND TRANSPORTATION MANAGEMENT

Travel and Transportation Management on BLM-Administered Lands

Travel and transportation are integral parts of virtually every activity that occurs on BLM-administered lands. The BLM has taken a holistic approach to comprehensive travel and transportation management (CTTM). It is an interdisciplinary approach to travel and transportation planning and management that addresses resource uses and associated access to public lands and waters, including motorized, nonmotorized, mechanical, and animal-powered modes of travel.

Travel and transportation management planning means providing clear and specific direction that addresses public and administrative access needs on the proper levels of land and water for all modes of travel. The CTTM process addresses variability among landscapes, users' interests, equipment options, and cultural and biological resource constraints. The primary goal of CTTM is to develop a systematic network of routes with appropriately designated uses that provide opportunities for a diverse set of activities to occur on public lands, such as recreation, energy development, grazing, and wildlife management. Travel management objectives serve as the foundation for appropriate travel and access prescriptions.

There is considerable overlap between travel management and all other uses on BLM-administered lands. For example, many people visit BLM-administered lands for recreation. For these visitors, a route system may serve as either a means to reach a destination where the activity occurs (e.g., a road to a trailhead or parking area) or as the focus of the recreation activity itself (e.g., a four-wheel driving, hiking, or horseback riding trail).

To reduce the duplication of narrative between travel management and the other sections of this document, this section addresses only public travel and access (i.e., OHV management area designations, route designations, types of travel, and seasonal area limitations). The interrelated recreation components, such as OHV use, are addressed under **Section 3.9**, Recreation.

Modes of Travel

Visitors to public lands use roads and trails for a variety of activities involving various modes of travel. Motorized travel in the planning area ranges from standard passenger vehicles driving on maintained roads to OHVs operating on primitive roads and trails. OHV is synonymous with off-road vehicle, as defined in 43 CFR, Part 8340.0-5(a):

> "Off-road vehicle means any motorized vehicle capable of, or designed for, travel on or immediately over land, water, or other natural terrain, excluding: 1) Any nonamphibious registered motorboat; 2) Any military, fire, emergency, or law enforcement vehicle while being used for emergency purposes; 3) Any vehicle whose use is expressly authorized by the authorized officer or otherwise officially approved; 4) Vehicles in official use; and 5) Any combat or combat-support vehicle when used in times of national defense emergencies."

OHVs commonly used in the planning area include off-road motorcycles, all-terrain vehicles, utility terrain vehicles, jeeps, specialized 4-by-4 trucks, and snowmobiles. Other modes of travel include mountain biking, cross-country skiing, snowshoeing, horseback riding, pack animal driving, hiking, boating, hang-gliding, paragliding, ballooning, and wheelchairs. The type and amount of use and the location of roads and trails influence physical, social, and administrative recreation setting and the overall quality of the recreation experience.

Travel Designations

Executive Order 11644 and 43 CFR, Part 8340, both require the BLM to designate all BLM-administered lands nationally as open, closed, or limited for OHV use.

Open

Areas designated as open are those where all types of vehicle use are permitted at all times anywhere in the area. Use is subject to any operating regulations and vehicle standards established in other parts of the CFR.

Limited

Areas designated as limited are those restricted at certain times, in certain areas, or to certain vehicular use. These restrictions may be of any type, but can generally be accommodated in the following categories: numbers of vehicles, types of vehicles, time or season of vehicle use, permitted or licensed use only, use on existing roads and trails, and use on designated roads and trails.

Closed

Areas designated as closed are where cross-county motorized vehicle use is prohibited. OHVs may be allowed in closed areas for certain reasons, but only with the approval of the authorized officer.

Federal Regulations

Route designation criteria are described in 43 CFR, Part 8342.1, and state:

> The authorized officer shall designate all public lands as open, limited, or closed to off-road vehicles. All designations shall be based on the protection of the resources of the public lands, the promotion of the safety of all the users of the public lands, and the minimization of conflicts among various uses of the public lands; and in accordance with the following criteria:
>
> (a) Areas and trails shall be located to minimize damage to soil, watershed, vegetation, air, or other resources of the public lands, and to prevent impairment of wilderness suitability.
>
> (b) Areas and trails shall be located to minimize harassment of wildlife or significant disruption of wildlife habitats. Special attention will be given to protect endangered or threatened species and their habitats.
>
> (c) Areas and trails shall be located to minimize conflicts between off-road vehicle use and other existing or proposed recreational uses of the same or neighboring public lands, and to ensure the compatibility of such uses with existing conditions in populated areas, taking into account noise and other factors.
>
> (d) Areas and trails shall not be located in officially designated wilderness areas or primitive areas. Areas and trails shall be located in natural areas only if the authorized officer determines that off-road vehicle use in such locations will not adversely affect their natural, esthetic, scenic, or other values for which such areas are established.

National Guidance

On a national level and in response to increasing demand for motorized and mechanized recreation trails on public lands, the BLM first developed an OHV strategy and then a mountain bike strategy. These strategies emphasize that the BLM should be proactive in seeking travel management solutions that conserve natural resources, while providing for ample recreation opportunities.

The BLM released the current version of the Land Use Planning Handbook (H-1601-1, BLM 2005a) in March 2005. Guidance on determining open, limited, and closed OHV area designations during the planning process was incorporated into the Comprehensive Trails and Travel Management Section (Appendix C, Section II D).

Additional CTTM guidance continued to be developed and culminated with the release of the Travel and Transportation Management Manual (1626, BLM 2011f) in July 2011. Current policy states that open areas will be limited to a size that can be effectively managed and geographically identifiable and that expansive open areas allowing cross-country travel will not be designated in LUP revisions or new travel management plans.

The Travel and Transportation Handbook (H-8342, BLM 2012m) was released in March 2012. It provides detailed guidance using the designation criteria in 43 CFR, Part 8342.1 for area and route selection. It includes guidance for developing other implementation plans, including sign plans, education and outreach plans, law enforcement plans, and maintenance plans.

Travel Management on National Forest System Lands

The Forest Service published its Travel Management Rule in 2005 (Forest Service 2005). It required each National Forest to designate roads, trails, and areas open or closed to motor vehicles. Designations were made in accordance with criteria described in Executive Order 11644 and included the type of vehicle and, if appropriate, time of year for motor vehicle use. A given route, for example, could be designated for use by motorcycles, ATVs, or street-legal vehicles. Once designation was complete, the rule prohibited motor vehicle use off the designated system.

In addition to the CFR, the Forest Service developed CTTM planning guidance, including the Travel Management Manual, FSM 7700 (Forest Service 2009e), and the Travel Planning Handbook, FSH 7709.55 (Forest Service 2009f).

Federal Regulations

The criteria for Forest Service route designation are found in 36 CFR, Part 212.55(a), General criteria for designation of National Forest System roads, National Forest System trails, and areas on National Forest System lands and state:

> In designating National Forest System roads, National Forest System trails, and areas on National Forest System lands for motor vehicle use, the responsible official shall consider effects on National Forest System natural and cultural resources, public safety, provision of recreational opportunities, access needs, conflicts among uses of National Forest System lands, the need for maintenance and administration of roads, trails, and areas that would arise if the uses under consideration are

designated; and the availability of resources for that maintenance and administration.

(b) Specific criteria for designation of trails and areas. In addition to the criteria in paragraph (a) of this section, in designating National Forest System trails and areas on National Forest System lands, the responsible official shall consider effects on the following, with the objective of minimizing:

(1) Damage to soil, watershed, vegetation, and other forest resources;

(2) Harassment of wildlife and significant disruption of wildlife habitats;

(3) Conflicts between motor vehicle use and existing or proposed recreational uses of National Forest System lands or neighboring Federal lands;

(4) Conflicts among different classes of motor vehicle uses of National Forest System lands or neighboring Federal lands. In addition, the responsible official shall consider:

(5) Compatibility of motor vehicle use with existing conditions in populated areas, taking into account sound, emissions, and other factors.

Current Condition

Travel planning is complete for all National Forest System lands in the planning area. National Forest System lands with a designated route system are considered the same as the limited designation on BLM-administered lands. Current closed areas in the planning area are generally designated wilderness and some ACECs.

Current acreage for open, closed, and limited OHV area designations for the planning area are listed in **Table 3-34**. Most acres in both PPH and PGH have an open OHV area designation. Miles of roads, including interstate and state highways, secondary roads, and local roads are listed in **Table 3-35** and **Table 3-36**. This does not include two-track primitive roads; inventory data for two-track primitive roads is incomplete at this time. Miles and acres of railroads are shown in **Table 3-37** and **Table 3-38**.

Table 3-34
Travel Area Designations on BLM and Forest Service Lands[1]

	PPH (Acres)	PGH (Acres)	Total
Open	6,939,500	5,205,900	12,145,400
Closed	230,800	290,800	521,600
Limited	2,382,200	1,454,100	3,836,300
Total	9,552,500	6,950,800	16,503,300

Source: BLM and Forest Service GIS 2015
[1]Acres rounded to nearest 100 acres

Table 3-35
Miles of Roads in GRSG Habitat

Surface Management Agency	Management Zone	Miles in PPH	Miles in PGH	Total
BLM	III	8,200	8,400	16,600
	IV	4,100	1,500	5,600
	V	3,900	1,400	5,300
Forest Service	III	500	800	1,300
	IV	700	200	900
	V	0	0	0
Other	III	1,700	1,900	3,600
	IV	2,300	600	2,900
	V	1,800	400	2,200

Source: BLM and Forest Service GIS 2015

Table 3-36
Acres of Roads in GRSG Habitat

Surface Management Agency	Management Zone	Acres[1] in PPH	Acres[1] in PGH	Total
BLM	III	10,300	22,600	32,900
	IV	3,300	1,600	4,900
	V	1,700	1,800	3,500
Forest Service	III	600	3,700	4,300
	IV	1,000	100	1,100
	V	0	0	0
Other	III	4,900	15,600	20,500
	IV	3,900	4,500	8,400
	V	2,600	2,500	5,100

Source: BLM and Forest Service GIS 2015
[1]Assumes footprint of 240 feet for interstate highways, 84 feet for paved primary and secondary highways, and 41 feet for other roads, such as graded county roads. This does not include two-track primitive roads.

Table 3-37
Miles of Railroad in GRSG

Surface Management Agency	Management Zone	Miles in PPH	Miles in PGH	Total
BLM	III	40	30	70
	IV	10	10	20
	V	0	0	0

Table 3-37
Miles of Railroad in GRSG

Surface Management Agency	Management Zone	Miles in PPH	Miles in PGH	Total
Forest Service	III	0	0	0
	IV	0	0	0
	V	0	0	0
Other	III	40	100	140
	IV	10	30	40
	V	0	0	0

Source: BLM and Forest Service GIS 2015

Table 3-38
Acres of Railroad in GRSG

Surface Management Agency	Management Zone	Acres in PPH	Acres in PGH	Total
BLM	III	300	300	600
	IV	90	80	170
	V	0	0	0
Forest Service	III	0	0	0
	IV	0	0	0
	V	0	0	0
Other	III	300	600	900
	IV	40	200	240
	V	0	0	0

Source: BLM and Forest Service GIS 2015

3.11 LAND USE AND REALTY

The Lands and Realty Program secures and protects the American public's rights, title, value, and interests in its public lands and authorizes a variety of uses on those public lands in order to meet the needs of present and future generations. Lands and realty actions ensure that public lands are managed to benefit the public.

Lands and realty actions can be divided between land tenure adjustments and land use authorizations (LUAs). Land tenure adjustments focus primarily on land acquisition and disposal (including easement acquisition), while LUAs consist of ROWs, communication sites, and other leases and permits. Wind and solar renewable energy development are also authorized by ROW grants through the Lands and Realty Program but are addressed separately in this document. "ROW Avoidance" and "ROW Exclusion" areas are identified throughout this document. The term ROW would encompass all land use authorizations, such as ROWs, leases, permits, and Forest Service special use authorizations. See the definition of ROW avoidance and exclusion in Chapter 8.

Forest Service forest plan prescriptions are similar to BLM ROW exclusion and avoidance areas. Prescriptions can restrict or prohibit certain uses in a planning area. Also note that the Forest Service grants special use authorizations (granting ROWs, permits, easements, and leases), while the BLM grants ROWs on their respective agency-administered lands. Lastly, the Forest Service completes landownership adjustments (purchase, exchange, donation, and ROW acquisition), while the BLM conducts land tenure adjustments (disposals and acquisitions).

Potentially affecting the Lands and Realty Program are LUP decisions related to land designations and land classifications, as well as limitations or restrictions on land use authorizations, stipulations, or land tenure changes (acquisition or disposal of BLM or National Forest System lands) in the planning area.

Current Condition

The planning area, which is the geographical area for which land use and resource management plans are developed and maintained, includes acres in Siskiyou, Modoc, Lassen, Shasta, Plumas, Sierra, Nevada, and Alpine Counties in northeastern California. The planning area also includes 16 of the 17 counties in Nevada, Clark County being the exception in the southern part of the state. These lands are owned or administered by multiple federal, state, and local agencies, tribes, and private landowners.

Due to the configuration of landownerships and their proximity to each other, land tenure adjustments and evaluation of ROW applications is often complex. **Table 1-1** shows the acreage and overall percent ownership for each landowner in the planning area.

Table 3-39 through **Table 3-42** list data compiled in a baseline environmental report produced by the USGS and the BLM (Manier et al. 2013; USGS 2014). In each table, acreages and mileages are shown by surface management agency and whether they are in PPH and PGH. These tables were originally created through the BER report. The numbers and data in the tables have changed for this sub-regional effort due to the 2014 habitat mapping update.

Table 3-39
Number of Communication Towers in GRSG Habitat

Surface Ownership or Management Agency	Management Zone	Communication Towers in PPH	Communication Towers in PGH	Total
BLM	III	40	70	110
	IV	30	30	60
	V	20	30	50

Table 3-39
Number of Communication Towers in GRSG Habitat

Surface Ownership or Management Agency	Management Zone	Communication Towers in PPH	Communication Towers in PGH	Total
Forest Service	III	0	0	0
	IV	10	0	10
	V	0	0	0
Other	III	50	200	250
	IV	50	70	120
	V	10	20	30

Source: BLM and Forest Service GIS 2015

Table 3-40
Miles of Transmission Lines in GRSG Habitat

Surface Ownership or Management Agency	Management Zone	Miles in PPH	Miles in PGH	Total
BLM	III	100	160	260
	IV	100	40	140
	V	70	40	110
Forest Service	III	4	3	7
	IV	10	3	13
	V	0	0	0
Other	III	10	100	110
	IV	90	50	140
	V	20	20	40

Source: BLM and Forest Service GIS 2015

Table 3-41
Acres of Utility Corridors in GRSG Habitat

Surface Ownership or Management Agency	Management Zone	Acres in PPH	Acres in PGH	Total
BLM	III	33,000	74,400	107,400
	IV	25,100	9,700	34,800
	V	33,700	21,200	54,900
Forest Service	III	0	100	100
	IV	0	0	0
	V	0	0	0

Table 3-41
Acres of Utility Corridors in GRSG Habitat

Surface Ownership or Management Agency	Management Zone	Acres in PPH	Acres in PGH	Total
Other	III	9,700	30,400	40,100
	IV	10,700	11,300	22,000
	V	9,500	16,400	25,900

Source: BLM and Forest Service GIS 2015

Table 3-42
Acres of ROW Exclusion/Avoidance Areas in GRSG Habitat

	Acres in PPH	Acres in PGH	Total
BLM LUA Exclusion Areas	179,400	148,500	327,900
FS LUA Exclusion Areas	52,100	140,400	192,500
BLM LUA Avoidance Areas	918,800	341,900	1,260,700
FS LUA Avoidance Areas	60	0	60

Source: BLM and Forest Service GIS 2015

Conditions on BLM-Administered Lands

Land Tenure

Landownership (or land tenure) adjustment refers to those actions that result in the disposal or exchange of public land or the acquisition by the BLM of nonfederal lands or interests in land. The FLPMA requires that public land be retained in public ownership unless, as a result of land use planning, disposal of certain parcels is warranted.

The FLPMA also requires that lands disposed of through sale are specifically identified in the relevant LUP. California BLM has historically processed more land exchanges than land sales. However, in recent planning efforts, the California BLM has identified numerous parcels for disposals by sale. Since land sales take considerably less time to process, the BLM has been using sales to dispose of land that is difficult to manage. Since the mid-1990s, Nevada BLM also moved to completing land sales instead of land exchanges because of the reduced time and cost. Lands suitable for disposal must be identified in a LUP. Any lands to be disposed of that are not identified in the current LUP require a LUPA before disposal can occur.

Disposal

Disposal areas include tracts of land that are economically difficult to manage and parcels that could serve important public objectives, such as expansion of communities and economic development. These lands are usually disposed by land sales or with public or private partners that allow the surrounding lands to

be managed more effectively. Desert land entries is also a form of disposal of public lands for agriculture purposes.

The Ely RMP currently identifies 28,000 acres of public land for disposal in GRSG habitat, in accordance with the White Pine County Conservation, Recreation, and Development Act of December 20, 2006.

Land exchanges are generally initiated in direct response to public demand or by the BLM to improve management of the public lands. Lands need to be formally determined as suitable for exchange. In addition, lands considered for acquisition would be those lands that meet specific land management goals identified in the LUP. Nonfederal lands are considered for acquisition through exchange of suitable public land on a case-by-case basis, where the exchange is in the public interest and where acquisition of the nonfederal lands will contain higher resource or public values than the public lands being exchanged.

Acquisition

Acquisition of land and interests in land are important components of the BLM's land tenure adjustment strategy. Land and interest in lands are acquired for the following purposes in the public interest:

- To improve management of natural resources through consolidation of federal, state, and private lands
- To secure key property necessary to protect endangered species, promote biological diversity, increase recreational opportunities, and preserve archaeological and historical resources
- To implement specific acquisitions authorized or directed by acts of Congress and allow for expansion of communities and consolidation of non-Federal landownership.

Acquisition of other agency or private lands can be pursued to facilitate various resource management objectives. Acquisitions, including easements, can be completed through exchange, Land and Water Conservation Fund purchases, condemnation, or donations.

Withdrawals

Withdrawn lands are reserved and set aside from application of some, or all, of the public land and mining laws. This is done to provide for a specific designated use or to protect specific resource values, such as water power and reservoir sites, designated recreation areas, and Federal Reserve water rights (which may include a land withdrawal).

The segregation effects of withdrawals can vary in time and which agency is responsible for administrative jurisdiction. The withdrawal may be extended, modified, or eliminated through revocation or relinquishment.

Withdrawals are used to preserve sensitive environmental values, protect major federal investments in facilities, support national security, and provide for public health and safety. Withdrawals that are authorized in accordance with FLPMA are limited to a 20-year term, after which the holding agency must apply for the withdrawal to be extended. Terms established for legislative withdrawals are made at the discretion of Congress.

Land Use Authorizations

Land Use Authorizations (LUAs) are specific to lands and realty actions. They include those land uses authorized under 43 CFR, Parts 2800 and 2900. ROWs, permits and leases are generally authorized for long-term land uses (three years or more), and some ROWs (e.g., site testing) and permits (e.g., filming permits) are used to authorize short-term uses (less than three years). All LUA applications will be reviewed using the criteria of following existing corridors or infrastructure wherever practical and avoiding the proliferation of separate authorizations.

ROW Avoidance and Exclusion Areas

ROW exclusion and avoidance areas are established and designated in the governing LUP to protect or minimize development of specific lands. See **Table 3-42**.

Exclusion areas are closed to any ROW development, including leases and permits. Avoidance areas are open to ROW, lease, and permit development as long as the project meets the ROW avoidance stipulations in the governing LUP that identifies the criteria that must be met for the project to be authorized on or across those lands.

ROWs

The most common form of LUA to grant uses of BLM-administered lands by commercial, private, or governmental entities is the Title V FLPMA ROW. A ROW grant is an authorization to use a specific piece of public land for projects such as roads, pipelines, transmission lines, or communication sites. The ROW grant authorizes rights and privileges for a specific use of the land for a specific time.

The BLM's objective is to grant ROWs to any qualified individual, business, or government entity and to direct and control the use of ROWs on public lands in a manner that accomplishes the following:

- Protects the natural resources associated with public lands and adjacent lands, whether private or administered by a government entity
- Prevents unnecessary or undue degradation to public lands
- Promotes the use of ROWs in common, considering engineering and technological compatibility, national security, and area LUPs

- Coordinates, to the fullest extent possible, all BLM actions with local, state, Native American, and other federal agencies, interested individuals, and appropriate quasi-public entities (43 CFR, Part 2801.2)

Private individuals and groups, as well as various businesses and government entities, can hold these authorizations.

In the subregion there are specific ROW projects that are currently authorized, however, not fully constructed. Since these authorizations were granted before the completion of this Proposed LUPA/Final EIS, they have valid and existing rights. The Southwest Intertie transmission project (500 kV) is an example of a ROW that has been authorized but only partially constructed. It has been constructed from Las Vegas to Ely, Nevada, and is authorized to be constructed from Ely, Nevada, to Twin Falls, Idaho, in the future.

Communication Sites

Communication sites are normally situated on mountain and ridgetops and contain equipment for various public and private tenants, including phone companies, local utilities, and local, state, and other federal agencies.

Leases and Permits

Leases and permits may be authorized for use, occupancy, and development in accordance with Section 302 of FLPMA 43 CFR, Part 2920. These are generally used for activities that are not authorized as a ROW, such as commercial filming, small site uses, and Recreation and Public Purpose (R&PP) leases.

Corridors

Utility corridors are identified during the planning process with the intent of concentrating utility lines in manageable locations on BLM-administered lands. The corridors may contain power lines, fiber-optic communication cables, and gas pipelines; they may also hold other ROWs that may be pertinent to the operations, such as substations or regeneration stations.

Identifying corridors does not necessarily mandate that facilities be located in the corridor, especially if they are not compatible with other resource uses, values, and objectives in and near the corridors, or if the corridors are already at maximum capacity with existing structures.

There are numerous existing designated corridors in the sub-region. There are currently 1,322,800 acres of utility corridors in GRSG habitat, including 209,500 acres of utility corridors designated as part of the West-wide Energy Corridor Programmatic EIS (PEIS). The BLM completed the PEIS in response to Section 368 of the 2005 Energy Policy Act. West-wide energy corridors are commonly referred to as Section 368 Energy Corridors. (See **Table 3-41** for an overview of the number and acreages of utility corridors)

Conditions on National Forest System Lands

Humboldt-Toiyabe National Forest

Several aspects of public land management must be considered in the land and resource management planning process, including landownership adjustments (i.e., purchase, exchange, donation, and ROW acquisition) and special use authorizations (granting ROWs, permits, easements, and leases).

Landownership Adjustment

The landowner must be willing to engage in a land ownership adjustment and, if that is the case, the Forest Service must ensure that market value is obtained for lands or interests in lands to protect the public and the private property owner's interests. The Forest Service identifies parcels that meet the criteria for land adjustment.

Other parcels not currently identified are evaluated under the merits of each proposal. The objectives of the National Forest System landownership adjustment program are to achieve the optimum landownership pattern for the protection and management of resource uses, settle land title claims, and provide resource administrators with title information about the use of and resources on the land they administer.

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. Nonfederal lands are considered for acquisition through exchange of suitable National Forest System lands on a case-by-case basis.

One of the objectives in all land exchanges is keeping the surface and subsurface or mineral estate intact on both the disposed and acquired lands to benefit the future owners and their uses of their land.

Land purchase can be pursued to facilitate various resource management objectives. Lands considered for purchase would be those lands that meet specific land management goals identified in the Forest Plan. The Forest Service purchases land primarily through revenues generated from sale of BLM lands via the Southern Nevada Public Land Management Act. SNPLMA provides for the revenue from the sale of BLM lands to be made available to other federal agencies (e.g., the Forest Service) to buy environmentally sensitive lands, or interests in lands, in the State of Nevada. There is some priority to lands in Clark County, Nevada, but SNPLMA has been used to acquire lands across the state by all land management agencies. Other similarly legislated land acts in the State of Nevada are also in place to protect critical resource areas and provide increased public recreation opportunities.

Land donations, when determined to be in the public interest, are to consolidate National Forest System lands and protect critical resource areas. Acquisition of road and trail ROWs often provides legal public access to National Forest System lands that are otherwise inaccessible. Opportunities for landownership adjustments are equally distributed across the affected Ranger Districts on National Forest System lands.

The Forest Service acquires ROWs through exclusive easements that permit full multiuse of National Forest System lands served. This includes access for public users, with the least impact on private lands crossed, as long as it is economically and environmentally feasible and the private property owner is willing. The agency assists and cooperates with private landowners in acquiring needed ROWs to develop private land access along with National Forest System access. This is under the provision that such acquisition is needed and is compatible with National Forest System management objectives set out in forest plans.

Special Use Authorizations. SUAs authorize uses of public lands by individuals, companies, organized groups, other federal agencies and state or local levels of government in a manner that protects natural resource values and public health and safety. They authorize uses that contribute to the nation's infrastructure for generating and transmitting energy resources. This includes electric transmission facilities, oil and gas pipelines, hydropower facilities, and wind and solar facilities.

SUAs (granting ROWs, permits, easement, and leases) on National Forest System lands are necessary for all improvements such as roads, trails, telephone lines, power lines, pipelines, ditches, and fences over private or other lands not administered by the Forest Service.

To the extent possible, linear ROWs, such as roads and pipelines, are routed where impacts would be least disturbing to environmental resources, considering the point of origin, point of destination, and purpose and need of the project. Although established corridors exist, this does not preclude the location of transportation and transmission facilities in other areas if environmental analysis indicates that the facilities are compatible with other resource values and objectives. Further identification of corridors may not necessarily mandate that transportation and transmission facilities be located in these areas if they are not compatible with other resource uses, values, and objectives in and near the corridors or if the corridors are saturated.

SUAs are issued with surface reclamation stipulations and other mitigating measures. Restrictions and mitigating measures may be modified on a case-by-case basis, depending on impacts on resources. Areas closed to mineral leasing, having an NSO restriction, or otherwise identified as unsuitable for surface disturbance or occupancy are generally avoidance or exclusion areas for ROWs.

The 1986 amendment to FLPMA, known as the Ditch Bill, provides permanent easement for agricultural water systems in use before 1976. Water users had 10 years from passage of the bill to apply for easements for existing structures located on National Forest System lands. Currently, 23 easements have been issued under this law, with an estimated 7 additional applications being processed.

There are three summer home groups, with a total of 98 cabins, on the Humboldt-Toiyabe National Forest. In many areas, this use has existed since 1925. Permits for the recreation residences are issued for 20 years. The purpose was to encourage use of the national forests by allowing individuals to build cabins and occupy them for a portion of the year. Several thousand permits were issued nationwide. The current national policy is not to issue any additional permits but to continue to acknowledge the recreational values associated with the existing residences and to reissue existing permits when the current permit tenure expires. It is the intent of the Humboldt-Toiyabe National Forest to conduct the proper environmental analysis and reissue existing permits when the current permit tenure expires.

Table 3-43 lists the number of each type of special use permit on National Forest System land. This table is for illustrative purposes and is representative of the entire Forest; some uses may not be present in GRSG habitat.

Table 3-43
Number of Special Use Authorizations on the Humboldt-Toiyabe National Forest

Use	Number of Permits
Power lines	73
Road permits	103
Ditches	23
Communication permits	158
Transmission lines	121
Dams and reservoirs	15
Recreation residences	98
Clubs and cabins	4
Cultural use	3
Oil and gas pipelines	6
Monument	2
Ski area	2
Target range	2
Concession campground	5
Resorts	6
Group use	8
Filming	15
Telephone	59
Weather monitoring stations	9
Water monitoring	6
Wells of spring developments	10

Table 3-43
Number of Special Use Authorizations on the Humboldt-Toiyabe National Forest

Use	Number of Permits
Stream gauging stations	5
Stock water	2
Research/education	35
Outfitters and guides	63
Recreation events	18
Organization camps	5
Fences	8
Other improvements/permits	11
Warehouse/storage yard	6
Weir	4
Water treatment	1
Visitor center/museum	3
Military training	5
Hydroelectric project	1
Airport	1
Railroad	1
Water storage	17
Tramway	1
Debris/siltation impoundment	5
Disposal site	4
Total	**924**

Source: Forest Service 2013c

Trends on BLM-Administered Lands

Land Tenure Adjustments

Field offices in California and Nevada have been consolidating their lands to benefit the public and increase the economic viability of local communities. This includes acquiring lands to create a more contiguous land base and disposing of lands that are difficult to manage and serve no benefit to the public or the agency.

Land Use Authorizations

LUA applications are increasing in response to the accelerated interest for access, utility development, and other land uses on BLM-administered public lands.

Because of the large percentage of federal lands, compared with state, local government, or private lands, land tenure actions and LUAs are expected to continue well into the future.

Trends on National Forest System Lands

Humboldt-Toiyabe National Forest

As opportunities for land adjustments become available and there is a willing seller, these cases will be evaluated on a case-by-case basis, with consideration given for resource values and land adjustment priorities in the state given the limited funding available. Two land adjustments in GRSG habitat are being evaluated on the Mountain City Ranger District—the disposal of the Mountain City Administrative Site and the small tract sale at the Rizzi Ranch.

Special land use applications are increasing as more people make use of National Forest System lands. Recreational residence permits are anticipated as a flat trend because current national policy is not to issue any additional permits and to reissue existing permits when the current permit tenure expires.

3.12 RENEWABLE ENERGY RESOURCES

The BLM and the Forest Service are working with communities, state regulators, industry, and other federal agencies to build a clean energy future by providing sites for environmentally sound development of renewable energy facilities on public lands. Renewable energy on BLM-administered and National Forest System lands includes solar, wind, and biomass resources and siting of transmission facilities necessary to deliver renewable energy to the consumer. As demand has increased for clean and viable energy to power the nation, consideration of renewable energy sources available on public lands has come to the forefront of land management planning.

Renewable energy resources all have different requirements related to economic development; however, some issues are common to all renewable energy resources, including distance to existing power transmission facilities and compatibility with existing federal land use. Wind and solar resource facilities are permitted through the Lands and Realty Program with a ROW grant.

In cooperation with the National Renewable Energy Laboratory, the BLM assessed renewable energy resources on public lands in the western United States (BLM and DOE 2003). The BLM reviewed the potential for concentrated solar power, photovoltaics, wind, and biomass energy on BLM-administered, Bureau of Indian Affairs, and National Forest System lands in the western United States, except in Alaska. In December 2005, the BLM signed a ROD for the Wind Programmatic EIS (BLM 2005b), and in October 2012, it signed a ROD for Solar Energy Development in Six Southwestern States (BLM 2012h).

The BLM's renewable energy policy is directed by regulations, executive orders, and various instruction memorandums. Section 501(a)(4) of the FLPMA, 43 USC, Section 1761(a)(4); FSM 2701.1, para. 15, authorizes the Forest Service to issue SUAs 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 United States.

Consistent with Forest Service policies and procedures, the use and occupancy of National Forest System lands for renewable energy production, such as wind energy development, are appropriate and will help meet the energy needs of the United States. Permits for solar energy power facilities are issued only if non-National Forest System lands are not available and if adverse impacts can be minimized. 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.

For BLM-administered lands, solar and wind projects are authorized via the ROW process. Wind and solar renewable resource production are permitted by special use authorizations on National Forest System land. ROW applications are generally accepted and processed on a first-come, first-served basis. ROW regulations (43 CFR, Part 2804.23[c]) provide authority for offering public 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 CFR, Part 2804.23(c).

Although geothermal is a renewable energy source, it is managed as a leasable fluid mineral and therefore is discussed in **Section 3.13**, Mineral Resources.

Current Condition

California and Nevada are at the forefront for permitting renewable energy on public lands. The BLM has approved numerous renewable energy projects in the two states. It also has pending applications in the planning area. However, the lack of power transmission infrastructure continues to be a challenge in developing renewable energy sources. Pending renewable energy facilities in the planning area are described in **Chapter 5**, **Table 5-39**, Reasonably Foreseeable Future Actions.

Wind Energy

In the planning area, California and Nevada have more than 150 megawatts of developed wind capacity. In recent years, there has been new interest in wind-site testing, monitoring activities, and development on public lands in California and Nevada.

Since 2008, California and Nevada BLM have received 90 wind testing ROW applications for locations in the subregion. These ROWs have an authorized term of 3 years. At the end of the 3-year testing period, the applicant must either terminate the grant or file for development. Many of the applications that

were filed have either been withdrawn or terminated. At this time in the subregion, there are four pending utility-scale wind energy development ROW applications totaling 36,000 acres. These applications are in the planning process and have not been granted a ROW. There are five pending wind testing applications, totaling 18,000 acres, and 11 authorized wind testing ROW grants, totaling 108,000 acres (BLM 2015b).

There are 245,102 acres of wind energy ROWs in PPH and PGH (see **Table 3-44**); however, there is currently only one active industrial-scale wind energy generation facility in the planning area.

Table 3-44
Acres of Wind Energy ROWs in GRSG Habitat

Surface Ownership	Management Zone	Acres in PPH	Acres in PGH	Total
BLM	III	32,400	49,800	82,200
	IV	3,300	3,400	6,700
	V	75,700	67,700	143,400
Forest Service	III	0	200	200
	IV	0	2	2
	V	0	0	0
Other	III	2,600	2,700	5,300
	IV	2,200	1,500	3,700
	V	2,600	1,000	3,600

Source: BLM and Forest Service GIS 2015

Wind energy developments on National Forest System lands have not been proposed as of this time. The Forest Service has not identified avoidance, exclusion, or open areas for wind energy development because, to date, wind energy development on National Forest System lands has been minor.

Solar Energy

There are solar projects in California and Nevada, but there are no solar energy ROWs in the planning area (Manier et al. 2013). A programmatic solar EIS was completed in 2012 for six southwestern states, which included California and Nevada. This EIS established exclusion areas for Solar ROWs based on GRSG habitat, which encompasses most of the acres in the planning area. Solar energy zones were established with access to existing or planned transmission, incentives for development in those zones and a process through which to consider additional zones and solar projects. The SEZs took into consideration resource conflicts such as GRSG.

Biomass

Currently, there is no significant commercial energy economy for pinyon/juniper biomass in the planning area, other than for incidental use as a firewood fuel, for

heating of a school in White Pine County (BLM 2007d), and for a cogeneration biomass and geothermal plant in Lassen County.

Trends

In California and Nevada, greater pressure to develop renewable energy resources on public lands is expected as a result of public energy policy coming from individual states or the federal government. The development of more energy-efficient technologies for wind, biomass, and solar power will continue to grow because of increasing regulation of other energy sources, increased price of fossil fuels, and the increasing demand for energy products.

Although areas throughout California and Nevada have the potential to contribute wind-generated energy, future development is most likely to occur outside of the planning area. The potential on National Forest System lands for wind energy development is high in many locations, but the terrain and lack of accessibility to the grid makes it generally unsuitable for development.

An emerging market may exist in 5 to 10 years. At that time there may be field portable energy concentrating technology; longer-term and larger area land treatment contracts that provide a commercially reliable source of pinyon/juniper feedstock; an established adequate land treatment and biomass transportation service industry; a sustained pinyon/juniper biomass feedstock demand; and commercially viable stationary plant or field mobile bioenergy generation facilities.

The development of these resources can diversify and improve the area's energy reliability and will increase the demand for more ROWs and facility authorizations. The demand for renewable energy-related ROWs will likely increase nationally. The most likely trend for using solar, wind, and biomass energy resources will be to continue to develop more of these types of alternative sources; ways may be developed to make them more efficient to take the pressure off the fossil fuel resource and to be less dependent on nonrenewable energy sources.

3.13 MINERAL RESOURCES

The BLM administers all federally owned minerals that lie beneath both federal and non-federal lands. For this LUPA, 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-administered, National Forest System, private, and state surface are discussed in **Chapters 3** and **4** as being part of the decision area.

Leasable Minerals

Leasable minerals, as defined by the Mineral Leasing Act (February 1920) and 43 CFR, Parts 3000-3599 (1990), include leasable solid and leasable fluid minerals. Leasable fluid minerals are oil, natural gas (including methane, coal bed natural gas, and carbon dioxide), and geothermal resources. Leasable solid minerals

include coal, native asphalt, phosphate, sodium, potassium, and sulfur. The rights to explore for and produce these minerals on public land are acquired through leasing.

In addition to the Mineral Leasing Act, the Federal Onshore Oil and Gas Leasing Reform Act of 1987 regulates oil and gas leasing activities on National Forest System lands. This act expands the authority of the Secretary of Agriculture in the management of oil and gas resources on National Forest System lands. Without Forest Service approval, the BLM cannot issue leases for oil and gas on National Forest System lands. With the exception of geothermal activities on unleased lands, the BLM must approve all surface-disturbing activities on National Forest System lands before operations begin. The BLM and Forest Service reserve the right to require additional mitigation measures, in the form of COAs, at the time an APD or GDP is approved, if doing so is necessary for protection of other resources.

Fluid Leasable Minerals

Fluid leasable minerals are oil (including oil shale) and gas (including shale gas) and geothermal. 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. Geothermal is also governed by the Geothermal Steam Act of 1970, as amended. The rights to explore for and produce fluid minerals on public land may only be acquired through leasing.

Not all lands are open to fluid mineral leasing; the BLM will not issue leases for lands in the National Park System, National Recreation Areas, fish hatcheries or wildlife management areas administered by the DOI, Indian trust or restricted lands in or outside the boundaries of Indian reservations, Wilderness Areas, or Wilderness Study Areas administered by BLM, Forest Service, or other surface management agencies. In addition, leases are not issued if the BLM or Forest Service determines that issuing the lease would unnecessarily or unduly degrade public lands and resources.

Leases are issued through competitive and noncompetitive processes. Competitive leases are offered through a bid process in areas nominated by interested parties. Parcels that do not sell competitively are made available for over-the-counter purchase noncompetitively for the following two years. During the leasing process, the BLM may apply lease stipulations and notices. The Forest Service may also provide stipulations to be added to a lease as a condition of their consent to leasing. A lease stipulation is a provision that modifies standard lease rights. Stipulations are in addition to restrictions applied to field operations by federal regulations and become part of the lease, superseding any inconsistent provisions of the standard lease forms. The intent of a lease notice is to inform the lessee of a certain law or regulation that may impede their lease development.

Fluid Mineral Stipulations

During the leasing process, the Forest Service and BLM may apply stipulations to leases in order to protect other resource values or land uses (e.g., cultural resources and wildlife) by establishing authority for timing delays, site changes, or the denial of operations in the terms of the standard lease contract. There are three types of stipulations: no surface occupancy, controlled surface use, and timing limitations. These are defined as follows:

- No Surface Occupancy (NSO). On lands covered by the NSO stipulation, use or occupancy of the land surface for fluid mineral exploration or development is prohibited to protect identified resource values. Fluid minerals could be leased, but the leaseholder/operator would have to use off-site methods, such as directional drilling to access the mineral resource. NSO is the most restrictive type of stipulation.
- Controlled Surface Use (CSU). Under the CSU stipulations, use and occupancy is allowed (unless restricted by another stipulation), but identified resource values require special operational constraints that may modify the lease rights. While less restrictive than an NSO, a CSU stipulation allows the BLM or surface managing agency to require special operational constraints, to shift the surface-disturbing activity, or to require additional protective measures (e.g., special construction techniques for preventing erosion in sensitive soils) to protect the specified resource or value.
- Timing Limitations (TLs). A TL stipulation prohibits surface use during specified periods to protect identified resource values. This stipulation does not apply to the operation and maintenance of production facilities unless the findings of analysis demonstrate the continued need for such mitigation and that less stringent, project-specific mitigation measures would be insufficient.
- As required by WO IM 2010-117, each BLM state with an oil and gas program had to develop standard stipulations. Standard fluid mineral stipulations are conditions that can be included in revisions and amendments to LUPs and RMPs, so that stipulation language is uniform across the state.

Most but not all stipulations attached to leases at the time of sale have a provision, specified in the individual LUP, for granting exceptions, modifications, or waivers. An exception is a case-by-case exemption from a lease stipulation. The stipulation continues to apply to all other sites in the leasehold to which the restrictive criterion applies. A modification is a fundamental change to the provisions of a lease stipulation, either temporarily or for the term of the lease. A modification may, therefore, include an exemption from or alteration to a stipulated requirement. Depending on the specific modification, the stipulation may or may not apply to all other sites in the leasehold to which the restrictive

criteria applied. A waiver is a permanent exemption from a lease stipulation. The stipulation no longer applies anywhere in the leasehold.

In addition to the designations and stipulations described above, federal regulations give the BLM the authority to ensure that oil, gas, and geothermal activities are conducted in a manner that minimizes impacts on other resources and resource uses and protects human health and safety. These protections are accomplished through the BLM's inspection and enforcement program, as well as through the attachment of COAs to each APD and GDP approved. This is in conjunction with the NEPA process and during review of individual applications for permit to drill and of sundry notices submitted in conjunction with proposed changes in well pad design and operation. These COAs typically include BMPs and other required mitigation measures, including attachment of TLs up to 60 days in duration.

The federal fluid mineral regulations do not allow the BLM to attach new stipulations to a lease after its issuance, without the consent of the lessee. Similar, the BLM may not apply COAs and other post-leasing restrictions that result in a de facto application of a new lease stipulation. Thus, for example, the BLM cannot apply a project-specific COA that is equivalent to an NSO on the lease since such restriction would violate the valid existing property rights conveyed with the leasehold.

Table 3-45 shows current management applicable to actions on BLM-administered and National Forest System lands.

Current Conditions

Oil and Gas

There are two major oil producing basins in the planning area: Railroad Valley and Pine Valley. There is a potential for a third production area in the Elko District being explored and developed by Noble Energy. There is no commercial natural gas development being produced in the planning area. On BLM-administered and National Forest lands, 14,642,300 acres are open to oil and gas leasing standard stipulation. Acres closed to oil and gas leasing total 1,884,300 (BLM and Forest Service GIS 2015).

Ely District Office. The highest oil producing region in Nevada is Railroad Valley. It is an elongated valley trending north to south, approximately 80 miles long and up to 20 miles wide. The Grant Canyon No. 3 well in Railroad Valley was one of the most prolific onshore oil wells in the continental United States, flowing up to 4,300 barrels of oil per day (Nevada Bureau of Mines and Geology, undated). In addition to the high potential area of Railroad Valley, much of the Ely District Office is identified as moderate potential and low potential for petroleum. Recent interest has focused on and will likely continue to focus on the Chainman Shale and the Pilot Shale.

Table 3-45
Stipulations Related to GRSG Habitat

Stipulation Type	Elko District Office	Ely District Office	Winnemucca District Office	Battle Mountain District Office	Carson City District Office	Northern California Field Offices	Forest Service
Seasonal	Seasonal restrictions from disturbance in GRSG crucial winter habitat apply from November 1 to March 15. This stipulation does not apply to operating facilities.	No surface activity would be allowed in winter range for GRSGs from November 1 through March 31. **Exception:** An exception to this stipulation may be granted by the BLM Authorized Officer, in consultation with NDOW, if the operator submits a plan that demonstrates that impacts from the proposed action are minimal or can be adequately mitigated. **Modification:** The boundaries of the stipulated area may be modified if the BLM Authorized Officer, in consultation with NDOW, determines that portions of the area no longer contain GRSG winter habitat. The dates for the timing restriction may be modified if new	NV-WDO-WILD-02, TL (2002/2008) Timing limitations on known or potential GRSG habitat. Before entry on any lease areas, which include known or potential habitat, the lessee (operator) shall contact the appropriate BLM Field Office to discuss any proposed activities. During the times specified below, development or exploration activities must be avoided in known or potential nesting, brood-rearing, and winter habitat, and within 0.6 mile of known or potential habitat (PMUs). The times specified are in accordance with interim Nevada Guidelines or as determined by field office and wildlife personnel. Nesting habitat and brood-rearing habitats: April through August Winter habitats: October through March.	**Tonopah:** No surface use is allowed in GRSG winter habitat from February 15 to May 15. This stipulation does not apply to operations and maintenance of production facilities. **Mount Lewis:** Same as seasonal range.	Seasonal restriction on activities from March 1 to July 30 on GRSG habitat in the Pine Nut Mountains.	**Alturas:** NSO in ¼-mile of active GRSG leks. Seasonal restrictions from March 1 to June 15 in GRSG habitat. From March 1 to June 15, maintenance would not be permitted between 3:00 a.m. and 9:00 a.m.. Exhaust noise from pump jacks must be muffled so as not to exceed 75 decibels measured at 30 feet from the source of the noise. Exceptions to this requirement will be considered for areas of no or low GRSG strutting activity, or unoccupied habitat, including leks. Maintain 7-inch grass height in nesting habitat. Limit prescribed fire in nesting habitat. Prohibit sagebrush removal. **Eagle Lake**: Maintain 7-inch grass height in nesting habitat.	**Stipulation:** Controlled Surface Use **Objective:** To require that activities be located or designed to avoid or minimize the potential for adverse effects on GRSG summer habitat and to ensure that the viability of GRSG is not adversely affected. **Waiver:** None **Exception:** None **Modification:** A modification of the stipulation may be granted if new habitat studies or surveys show that a portion of the area does not contain summer habitat or the habitat is not occupied; the SLT would then apply.

Table 3-45
Stipulations Related to GRSG Habitat

Stipulation Type	Elko District Office	Ely District Office	Winnemucca District Office	Battle Mountain District Office	Carson City District Office	Northern California Field Offices	Forest Service
		information indicates the dates are not valid for the leasehold. **Waiver:** The stipulation may be waived if the BLM Authorized Officer, in consultation with NDOW, determines that the entire leasehold no longer contains winter range for GRSGs.				Limit prescribed fire in nesting habitat. Prohibit sagebrush removal. **Surprise:** Within 0.30 mile of leks, reduce human activity in early morning and late evening from March 1 to May 15. Maintain 7-inch grass height in nesting habitat. Limit prescribed fire in nesting habitat. Prohibit sagebrush removal.	
Brood-rearing	Seasonal protection from disturbance. Seasonal restrictions from disturbance on GRSG brood rearing areas apply in 0.5 mile or other appropriate distance, based on site-specific conditions	No Stipulation.	Timing limitations on known or potential GRSG habitat. Before entering any lease areas that include known or potential habitat, the lessee (operator) shall contact the appropriate BLM Field Office to discuss any proposed activities. During the times specified below, avoid all development or exploration in known or potential nesting, brood-rearing, and winter habitat, and in 0.6 mile of known or	**Tonopah:** No Stipulation. **Mount Lewis:** Same as seasonal range.	No Stipulation.	**Alturas:** Seasonal restrictions from March 1 to June 15 in GRSG habitat. From March 1 to June 15, maintenance would not be permitted between 3:00 a.m. and 9:00 a.m. Prohibit broadcast spraying in 3.75 miles of nesting and brood-rearing habitat. Prohibit insecticide use in brood-rearing habitats. **Eagle Lake:** Prohibit broadcast spraying in	**Stipulation:** Timing Limitation: March 15 to July 15 **Objective:** To protect occupied or potential habitat for nesting and early brood-rearing. **Waiver:** None. **Exception:** None. **Modification:** A modification of the stipulation/lease restriction may be granted if new habitat studies or surveys show that a portion

Table 3-45
Stipulations Related to GRSG Habitat

Stipulation Type	Elko District Office	Ely District Office	Winnemucca District Office	Battle Mountain District Office	Carson City District Office	Northern California Field Offices	Forest Service
	from May 15 to August 15, inclusive. This restriction does not apply to operating facilities.		potential habitat (PMUs). The times specified are per interim Nevada Guidelines or as determined by field office and wildlife personnel. Nesting habitat and brood-rearing habitats: April through August Winter habitats: October through March			3.75 miles of nesting and brood-rearing habitat. Prohibit insecticide use in brood-rearing habitats. **Surprise:** Prohibit broadcast spraying in 3.75 miles of nesting and brood-rearing habitat. Prohibit insecticide use in brood-rearing habitats.	of the area does not contain nesting/early brood-rearing habitat or the habitat is not occupied; the SLT would then apply.
GRSG Leks	Seasonal protection from disturbance. NSO is permitted in 0.5 mile, or other lesser, appropriate distance, based on site-specific conditions of GRSG leks.	No surface use would be allowed within 0.25 mile of a GRSG lek. **Exception:** An exception to this stipulation may be granted by the BLM Authorized Officer, in consultation with NDOW, if the operator submits a plan that demonstrates that impacts from the proposed action would not affect breeding activity nor degrade the integrity of the habitat associated	No surface occupancy within 2 miles of known leks at all times.	**Tonopah:** No surface use is allowed within 0.25 mile radius of a GRSG lek in all valleys throughout the BLM Battle Mountain Resource Area. This stipulation does not apply to operations and maintenance of production facilities. No surface activity is allowed with 2 miles of a GRSG lek from March 1 through May 15. This stipulation does not apply to operations and	Spring restrictions on GRSG strutting grounds north of Cold Springs in the Dixie and Edwards Creek Valley Area.	**Alturas:** Seasonal restrictions from March 1 to June 15 in GRSG habitat. From March 1 to June 15, maintenance would not be permitted between 3:00 a.m. and 9:00 a.m. Exhaust noise from pump jacks must be muffled so as not to exceed 75 decibels, measured at 30 feet from the source of noise. Exceptions to this requirement will be considered for areas of no or low GRSG strutting activity or unoccupied habitat,	**Stipulation:** No Surface occupancy—2-mile radius buffer around leks. **Objective:** To preclude disturbance to all leks. **Waiver:** None. **Exception:** None. **Modification:** A modification of the stipulation/lease restriction may be granted if field studies show that a lek has not been used in the last 5 years; the SLT would then apply.

Table 3-45
Stipulations Related to GRSG Habitat

Stipulation Type	Elko District Office	Ely District Office	Winnemucca District Office	Battle Mountain District Office	Carson City District Office	Northern California Field Offices	Forest Service
		with the GRSG lek. **Modification:** The boundaries of the stipulated area may be modified if the BLM Authorized Officer, in consultation with NDOW, determines that portions of the area can be occupied without adversely affecting the GRSG lek. **Waiver:** The stipulation may be waived if the BLM Authorized Officer, in consultation with NDOW, determines that the lek has been inactive for at least 5 consecutive years or the habitat has changed such that there is no likelihood the lek will become active.		maintenance of production facilities. **Mount Lewis:** Same as seasonal range.		including leks. Restrict OHV use within 2 miles of leks. Restrict aerial gunning of predators within 2 miles of leks. Limit prescribed fire in leks and nesting habitat. Prohibit transmission line within 2 miles of leks. No fences within 2 miles of leks. **Eagle Lake:** NSO restrictions on lands 0.25 to 0.60 mile from leks. Structures that could serve as raptor perches would not be allowed within 2 miles of active leks. Closed to exploration and development of leasable minerals within 0.25 mile of leks. Restrict OHV use within 2 miles of leks. Restrict aerial gunning of predators within 2 miles of leks. Limit prescribed fire in leks and nesting habitat.	

Table 3-45
Stipulations Related to GRSG Habitat

Stipulation Type	Elko District Office	Ely District Office	Winnemucca District Office	Battle Mountain District Office	Carson City District Office	Northern California Field Offices	Forest Service
						Prohibit transmission line within 2 miles of leks. No fences within 2 miles of leks. **Surprise:** Within 0.30 mile of leks, reduce human activity in early morning and late evening from March 1 to May 15. Restrict OHV use within 2 miles of leks. Restrict aerial gunning of predators within 2 miles of leks. Limit prescribed fire in leks and nesting habitat. Prohibit transmission line within 2 miles of leks. No fences within 2 miles of leks.	

Sources: BLM and Forest Service 2008; Forest Service 2007b

Battle Mountain District Office. A portion of the Railroad Valley, described above, lies in the Battle Mountain District Office; this portion is not identified as GRSG habitat. In addition to the high potential area of Railroad Valley, a small portion of the remaining area of the Battle Mountain District Office is identified as moderate and low potential for petroleum and contains GRSG habitat. Recent interest has focused on, and will likely continue to focus on, the Chainman Shale and the Pilot Shale.

Elko District Office. The second highest oil-producing region in Nevada is Pine Valley, which is in the Elko District Office. It is an elongated valley, trending north to south, approximately 30 miles long and 15 miles wide, in Eureka County. Production of oil in Pine Valley has been declining over recent years. Oil and gas operators have not indicated an interest in drilling new wells there. To the east and northeast of Pine Valley is an area identified as moderate potential for the presence of petroleum. Noble Energy has already drilled two exploration wells on private land 17 miles east of Elko, one on federal land 20 miles west of Jiggs, Nevada (Huntington Valley), and a third well in Marys River, 4 miles northwest of Wells, Nevada. Much of the moderate- to high-potential areas identified for petroleum in the Elko District Office are GRSG habitat.

In 2007, the Humboldt-Toiyabe National Forest issued a ROD that specified lands in the White Pine and Grant-Quinn Divisions that are available for oil and gas leases and the conditions controlling those leases (Forest Service 2007b). The decision makes available approximately 250,000 acres of National Forest System lands in the planning area for oil and gas leasing. This decision does not authorize specific lease activities in specific areas. A separate analysis compliant with the NEPA and a separate decision will be necessary to authorize those activities.

As shown on **Table 3-46** and **Table 3-47**, most of the planning area is open to oil and gas leasing. There are currently almost 8,000,000 acres of lands open to oil and gas leasing in PPH and approximately 4,800,000 acres open in PGH.

Table 3-46
Acres Open to Oil and Gas Leasing with Standard Stipulations in GRSG Habitat by MZ and Surface Management Agency

Surface Management Agency	Management Zone	Acres in PPH	Acres in PGH	Total
BLM	III	3,477,600	3,454,700	6,932,300
	IV	2,707,500	175,800	2,883,300
	V	1,540,600	672,100	2,212,700
Forest Service	III	261,800	568,900	830,700
	IV	0	0	0
	V	0	0	0

Table 3-46
Acres Open to Oil and Gas Leasing with Standard Stipulations in GRSG Habitat by MZ and Surface Management Agency

Surface Management Agency	Management Zone	Acres in PPH	Acres in PGH	Total
Other	III	200	0	200
	IV	0	0	0
	V	800	0	800

Source: BLM and Forest Service GIS 2015

Table 3-47
Acres Closed to Oil and Gas Leasing in GRSG Habitat by MZ and Surface Management Agency

Surface Management Agency	Management Zone	Acres in PPH	Acres in PGH	Total
BLM	III	78,100	148,900	227,000
	IV	133,900	16,700	150,600
	V	702,100	143,700	845,800
Forest Service	III	39,500	114,700	154,200
	IV	13,100	26,900	40,000
	V	0	0	0
Other	III	200	100	300
	IV	0	37	37
	V	6,600	800	7,400

Source: BLM and Forest Service GIS 2015

Oil and Gas Potential

Table 3-48 shows the number of acres of lands with low, moderate, and high oil and gas potential in GRSG habitat. These acres would be affected by placing major to moderate constraints (e.g. closures, NSO, TL, and CSU) over them. For more information on oil and gas potential, refer to **Appendix P**, RFD for Fluid Minerals.

Table 3-48
Acres of Oil and Gas Potential in GRSG Habitat

Potential	Acres in PPH	Acres in PGH	Acres in OHMA	Acres in SFA	*Total Acres
High	228,800	227,500	328,800	0	785,100
Moderate	1,008,300	1,356,800	785,500	0	3,150,600
Low	2,555,600	2,008,200	2,167,200	2,797,400	9,528,400

Source: BLM GIS 2015

Oil and Gas Trends on BLM-Administered and National Forest Lands

Swings in the natural gas market are the likely driver in the industry's interest for oil and gas leases and the resulting requests for leasing and for filing of APDs. As prices rise, more interest in oil and gas development is expected (BLM 2009a). With moderate to high potential in several areas in the planning area, drilling is expected to increase (**Figure 3-13**).

Geothermal Resources

Geothermal resources are significant in portions of the planning area. In recent years, industry has focused its exploration and use efforts in Nevada more so than in any other state. As a result several geothermal power plants have been constructed. Recently completed geothermal power plants in Nevada are the McGinness Hills I and II Geothermal Power Plants (each with a 48-megawatt capacity) and the Don A. Campbell Geothermal Power Plant (20-megawatt capacity) at the Wild Rose Geothermal Project Area. Additionally, the Don A. Campbell II Geothermal Power Plant (20-megawatt capacity) is under construction. There are five more geothermal power plants approved or pending approval in the planning area that have not been constructed. These plants have the potential to produce approximately 280 megawatts combined.

On BLM-administered and National Forest lands, 14,642,300 acres are open to geothermal leasing standard stipulation. Acres closed to geothermal leasing total 1,884,300 (BLM and Forest Service GIS 2015). **Figure 3-14** shows the lease areas and geothermal power plants with federal Interest in the planning area.

In 2012, the Humboldt-Toiyabe National Forest issued a ROD that identified approximately 4,000 acres on the Austin/Tonopah Ranger Districts and 3,500 acres in the Ely Ranger District that are available for geothermal leasing.

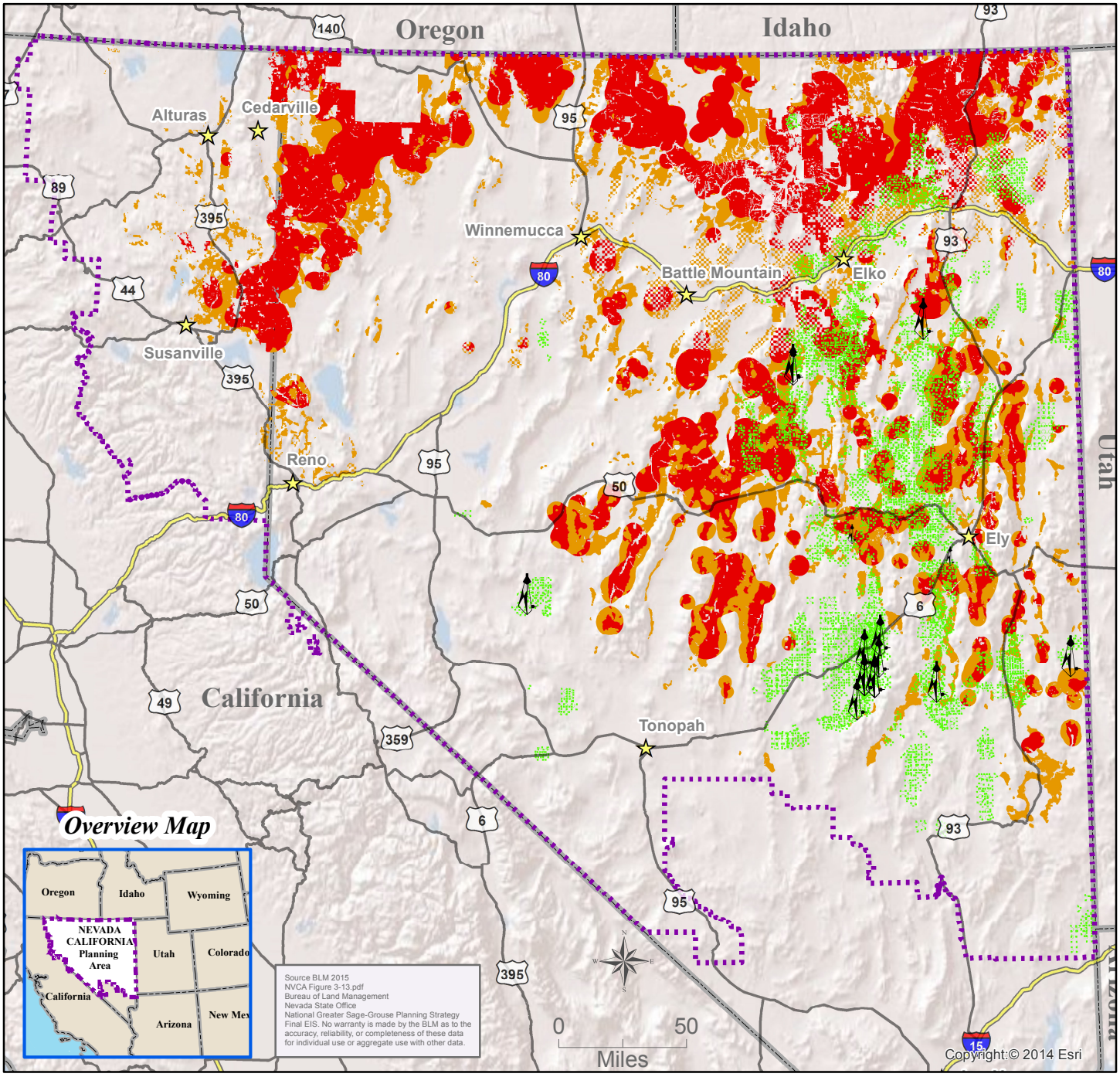
As shown by the data in **Table 3-49**, there are 9,697,800 acres open in PPH and 5,887,900 acres open in PGH.

Table 3-49
Acres Open to Geothermal Leasing in PPH and PGH by MZ and Surface Management Agency

Surface Management Agency	Management Zone	Acres in PPH	Acres in PGH	Total
BLM	III	3,477,600	3,454,700	6,932,300
	IV	3,917,600	1,016,200	4,933,800
	V	1,540,600	672,100	2,212,700
Forest Service	III	261,800	568,900	830,700
	IV	499,400	175,800	675,200
	V	0	0	0
Other	III	0	200	200
	IV	0	0	0
	V	800	0	800

Source: BLM and Forest Service GIS 2015

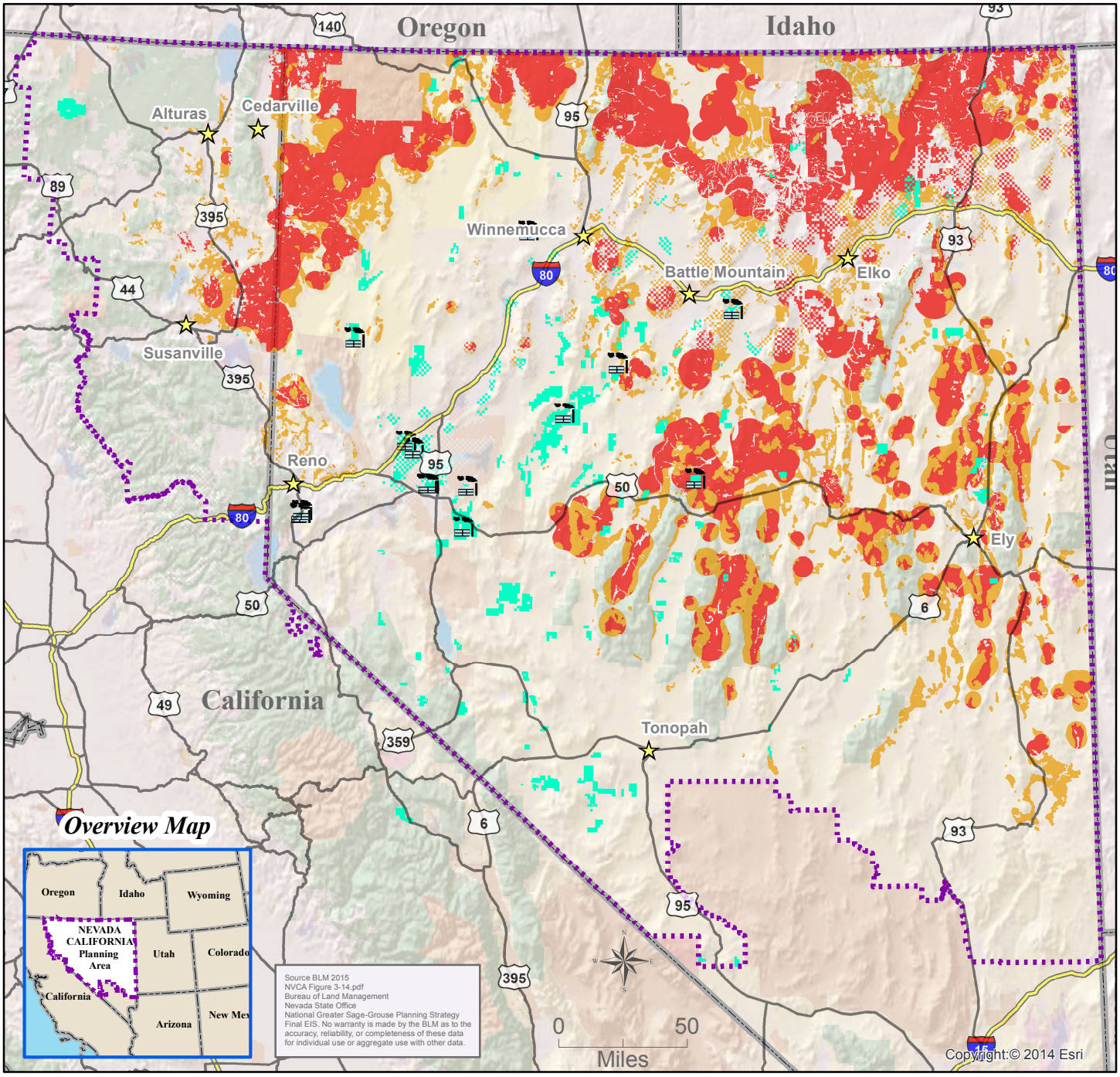
Existing Oil and Gas Leases and Wells



Legend

- Active Oil Wells
- Oil and Gas Leases
- Preliminary Priority Habitat (PPH)
- Preliminary General Habitat (PGH)
- City/Town
- Interstate
- US Route
- States
- Planning Area

Existing Geothermal Leases and
Geothermal Power Plants



Legend

- Geothermal Power Plants
- Geothermal Leases
- Preliminary Priority Habitat (PPH)
- Preliminary General Habitat (PGH)
- City/Town
- Interstate
- US Route
- States
- Planning Area

As shown by the data in **Table 3-50**, in GRSG habitat there are 33,600 acres of geothermal leases in PPH and 39,100 acres in PGH.

Table 3-50
Acres of Geothermal Leases in GRSG Habitat

Surface Management Agency	Management Zone	Acres in PPH	Acres in PGH	Total
BLM	III	12,800	13,400	26,200
	IV	19,100	22,100	41,200
	V	1,700	3,300	5,000
Forest Service	III	0	300	300
	IV	0	0	0
	V	0	0	0
Other	III	0	0	0
	IV	0	0	0
	V	0	0	0
Grand Total		**33,600**	**39,100**	

Source: BLM and Forest Service GIS 2015

Geothermal Trends on BLM-Administered and National Forest Lands

The decision area has significant geothermal potential. Based on USGS data, there is particularly high potential in northeastern portions of the planning area (Williams et al. 2008). However, the BLM has seen a decrease in geothermal leasing recently.

Table 3-51 shows the number of acres of suitable GRSG habitat in lands described as having geothermal potential in the decision area.

Table 3-51
Acres of Geothermal Potential in GRSG Habitat

Geothermal Potential in Nevada	Acres in PPH	Acres in PGH	Total Acres
High	371,300	334,200	705,500
Moderate	3,937,900	3,111,800	7,049,700
Low	4,890,000	3,145,300	8,035,300

Source: BLM and Forest Service GIS 2015

Solid (Nonenergy) Leasable Minerals

Solid leasable minerals are coal, sodium, potash, and phosphate. 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. The basic process starts with a prospecting permit under 43 CFR, Part 3500, that allows surface disturbance to

determine if a valuable mineral exists. If the permittee demonstrates the discovery of a valuable deposit of the leasable mineral for which the BLM issued the permit, the BLM may issue a preference right lease to that permittee without competition.

The rules for leasing coal (43 CFR, Part 3400) are significantly different from those of the other solid minerals but are not discussed further in this Proposed LUPA/Final EIS because there are no leasable coal deposits in the planning area.

Current Conditions

Identified solid leasable minerals in the planning area are potassium and sodium. On BLM-administered and National Forest lands, 14,642,300 acres are open to solid (nonenergy) leasable minerals. Acres closed to solid (nonenergy) leasable minerals total 1,884,300 (BLM and Forest Service GIS 2015). In the planning area there are 3,660 acres of approved solid leasable leases and prospecting permits. None of these permits are in PGH or PPH (BLM 2013b).

While solid leasable minerals are in the planning area, they are not a significant resource and there is no significant production of these minerals underway. However, several BLM districts have seen an increase in application submittals. There are 41 pending prospect permit applications (81,302 acres; BLM 2013b) in the planning area. Thirty of these pending permits are in the Battle Mountain District Office and total 58,908 acres. None of the pending permits are in PGH or PPH. There is one prospecting permit application (2,560 acres) pending for phosphate in the Elko District Office, which is in both PGH and PPH.

Ten pending prospecting permits for potassium are in the Winnemucca District Office (19,834 acres). Portions of these leases are also in PGH and PPH.

Trends on BLM-Administered and National Forest Lands

Since solid leasable minerals are not a significant resource in the planning area, and few pending and no approved prospect permit applications have portions that are in PGH or PPH, significant future activity affecting GRSG habitat is not anticipated.

Locatable Minerals

Locatable minerals include gold, silver, platinum, copper, lead, zinc, magnesium, nickel, tungsten, bentonite, uranium, vanadium, and uncommon varieties of mineral materials.

Mineral exploration and the development of locatable mineral deposits are nondiscretionary actions allowed under the General Mining Law of 1872 on all BLM-administered and National Forest System lands, unless they are withdrawn from mineral entry by Secretarial Public Land Order (PLO) or an act of Congress. Subject to valid existing rights, these areas are withdrawn from further location of mining claims or sites. Stipulations do not apply to locatable mineral development. However all operations under a BLM Plan or Forest

Service Plan of Operations are required to follow the performance standards in 43 CFR, Part 3809.420, or 36 CFR, Part 228.8. Regulations require the claimant to prevent unnecessary or undue degradation of the land. To restrict locatable mineral development, the BLM or Forest Service must petition the Secretary of the Interior for withdrawal actions, with subsequent validity exams for existing claims.

Locatable minerals acquired by staking a mining claim over the deposit and obtaining the necessary permits to explore or mine. In a mining claim, the surface lands remain open to the public for other multiple uses. Placer claims, which are for minerals found in geologic sediments rather than in veins, are also managed under the General Mining Law of 1872. Miners locate claims in order to develop the mineral values in a specified area.

Current Conditions

Mineral exploration and locatable mineral deposit development are allowed unless they are withdrawn from mineral entry by Secretarial PLO or an act of Congress. There are 2,846,600 acres withdrawn from further location of mining claims or sites in the planning area. The remaining 52,232,300 acres in the planning area are open to locatable mineral exploration and development (**Table 3-52**).

Table 3-52
Locatable Minerals

	Acres in Planning Area	Acres in PPH	Acres in PGH	Total Acres PPH and PGH
Withdrawn from locatable mineral entry	2,846,600	230,700	290,900	521,600
Open to locatable mineral exploration or development	52,232,300	9,342,600	6,662,400	16,005,000

Source: BLM and Forest Service GIS 2015

Gold, silver, and copper are the primary mineral resources in the planning area and are therefore the focus of discussion for this section.

In **Table 3-53**, acres are presented by surface management agency and their presence in PPH and PGH in the planning area.

Table 3-53
Acres Open to Locatable Mineral Exploration in GRSG Habitat

Surface Management Agency	Management Zone	Acres in PPH	Acres in PGH	Total
BLM	III	3,505,500	3,651,200	7,156,700
	IV	2,908,700	1,139,500	4,048,200
	V	2,162,000	1,122,200	3,284,200

Table 3-53
Acres Open to Locatable Mineral Exploration in GRSG Habitat

Surface Management Agency	Management Zone	Acres in PPH	Acres in PGH	Total
Forest Service	III	263,200	565,400	828,600
	IV	503,200	184,100	687,300
	V	0	0	0
Other	III	0	200	200
	IV	0	0	0
	V	1,400	300	1,700

Source: BLM and Forest Service GIS 2015

Conditions on BLM-Administered Lands

The BLM administers 45,359,000 acres of federal mineral estate in the planning area.

Mining claims for gold, silver, and copper are found throughout the planning area. The largest concentration of mining claims is in north-central Nevada.

Conditions on National Forest System Lands

The Forest Service administers 9,719,900 acres of federal mineral estate in the planning area. Mining claims for gold, silver, and copper may be found throughout the planning area. However, mining projects are not as common on National Forest System land as on BLM-administered land.

Trends on BLM-Administered Lands

The price of gold, silver, and copper have risen over the last few years, and there is increased interest in developing ore deposits for these minerals and expanding existing mines in the decision area, particularly in Nevada. As technology has improved, there has also been interest in processing mining tailing piles in previously mined areas to extract additional minerals. There have been approximately 6,727 notices and 576 plans of operation submitted in Nevada and 1,012 notices and 944 plans of operation submitted in California since 1981 (LR2000). Before 1981, no regulations existed giving the BLM the authority to regulate mining operations. Therefore, the total number and locations of previously mined areas in the planning area is undocumented.

The number of notices and plans of operation received by the California and Nevada BLM from 2004 to 2013 is shown in **Table 3-54**.

This table does not show a defined trend for the number of notices and plans of operation being reviewed by the California BLM. However, the number of notices received by the Nevada BLM show a general increase and then a decrease. This trend may be explained by the increase and subsequent decrease in metal prices for gold, silver, and copper.

Table 3-54
Notices and Plans of Operations Received by the California and Nevada BLM

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
California										
Notices	23	26	5	13	14	24	35	21	21	25
Plans	20	6	12	5	13	19	9	14	12	12
Nevada										
Notices	182	146	207	136	149	233	217	318	276	223
Plans	42	22	11	11	16	37	46	50	49	60

Source: Public Land Statistics 2004-2014

Trends on National Forest System Lands

Most development on National Forest System lands has been in the form of exploration projects. The trend for locatable mineral development has remained fairly constant between 2004 and 2013 and is expected to remain constant.

Mineral Materials

Mineral materials include sand, gravel, and construction materials that are sold or permitted under the Materials Act of 1947. Mineral materials are sold at a fair market value or through free use permits to governmental agencies. Local government agencies and nonprofit organizations may obtain these materials free of cost for community purposes. These operations can occur for a specific time frame or can be permitted for a 10-year term.

The BLM sells material out of community pits at fair market value using a mineral material negotiated contract or cash sale. The Forest Service also disposes of mineral materials by free use or sale. Disposal of mineral materials is discretionary, as is the sale or disposal of mineral materials. The BLM and Forest Service may choose to not allow mineral material production to protect resources. 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 (e.g., 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.

California and Nevada are producers of significant quantities of construction sand and gravel, crushed stone, dimension stone, and common clays. Occurrence potential for these resources and other mineral materials spans the two states, with heavier concentrations on their northern halves.

Conditions on BLM-Administered and National Forest System Lands

Most of the decision area is open to salable mineral material development. Specific closures of areas to salable mineral materials, such as ACECs or crucial

or essential wildlife habitat, exist throughout the planning area. Some LUPs contain use and development restrictions in terms of seasonal timing limitations in relation to GRSG habitat and leks, similar to oil and gas leasing; however, this is not consistent across the planning area. These are identified mostly in the more recent LUPs and use similar buffers (e.g., 2 miles). No LUPs in the planning area contain specific goals, objectives, or management actions relative to conservation or protection of GRSGs beyond the use restrictions identified above.

Sand and gravel are the primary mineral materials found in the planning area and are therefore the focus of discussion for this section. **Table 3-55** lists data compiled in a baseline environmental report produced by the USGS for the BLM. Acres are presented by surface management agency and their presence in PGH and PPH in the planning area.

Table 3-55
Acres of Mineral Material Disposal Sites in GRSG Habitat

Surface Management Agency	Management Zone	Acres in PPH	Acres in PGH	Total
BLM	III	6,100	13,100	19,200
	IV	2,900	2,200	5,100
	V	300	900	1,200
Forest Service	III	0	200	200
	IV	0	0	0
	V	0	0	0
Other	III	400	6,100	6,500
	IV	4,000	4,800	8,800
	V	200	0	200

Source: BLM and Forest Service GIS 2015

Trends on BLM-Administered and National Forest System Lands

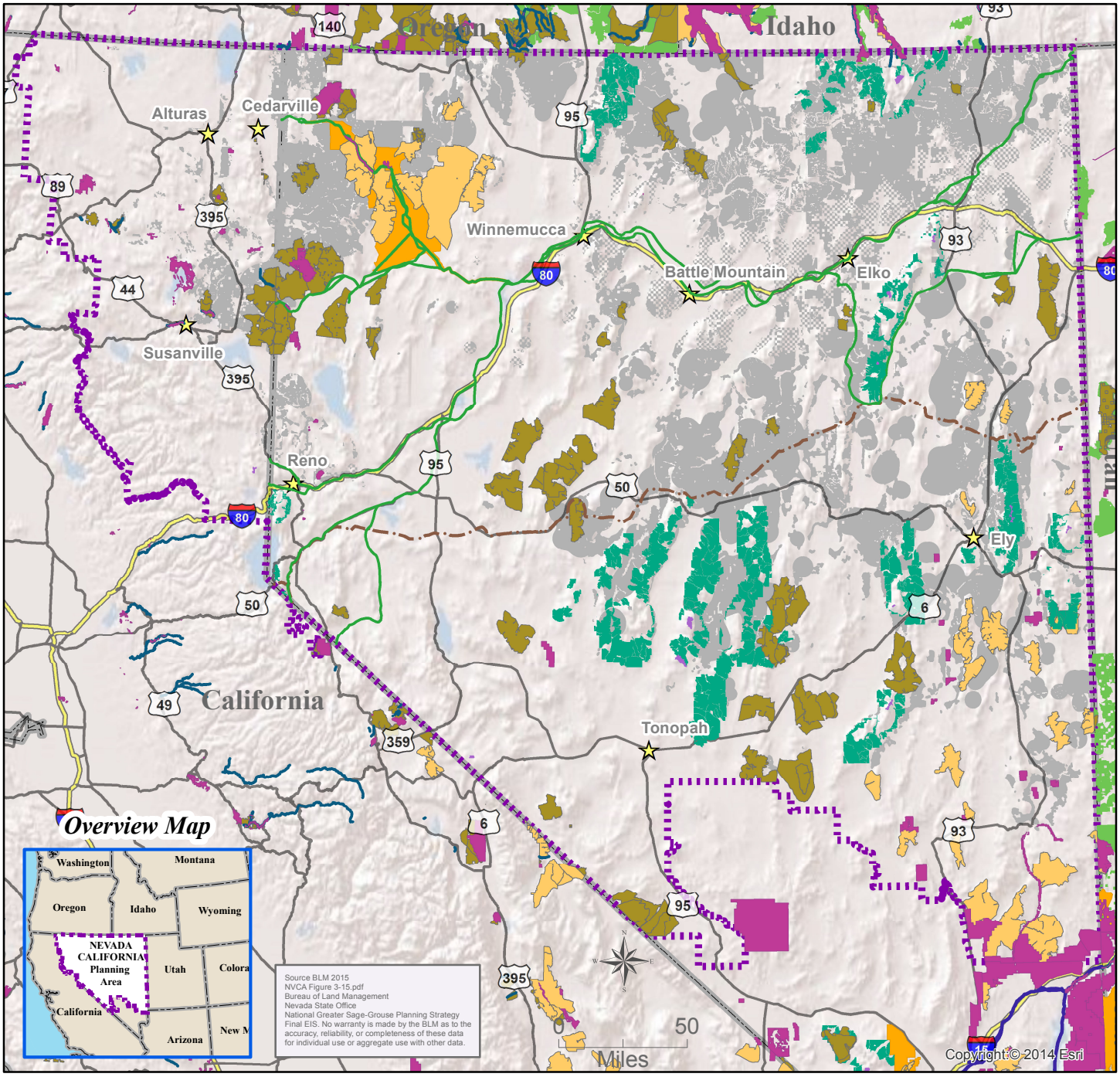
In remote areas, an increased demand for future mining of mineral materials is unlikely in areas identified as PPH or PGH. In nearby urban areas, such as Elko, Winnemucca, and Reno, demand will continue to be significant, with long-term concerns regarding the availability of mineral materials in future decades.

3.14 SPECIAL DESIGNATIONS

This section discusses existing conditions for the following BLM special designation areas: ACECs, Wilderness, WSAs, NCAs, NHTs, Byways, and WSRs.

The following areas are considered special designations on National Forest System lands and are discussed in this section: Wilderness, inventoried roadless areas, special interest areas, and research natural areas (RNAs). **Figure 3-15** provides a visual overview of the locations of special designations in relation to GRSG habitat in the planning area.

Special Designations and Other Important Resources



Legend

National Scenic and Historic Trails

- California
- Old Spanish
- Pony Express
- National Wild and Scenic Rivers
- National Wilderness Areas
- National Wilderness Study Areas
- National Monuments, Conservation Areas and Similar Designations
- NLCS Other Related Lands Polygons
- Areas of Critical Environmental Concern
- Research Natural Areas (RNAs)
- Forest Service Roadless Areas
- City / Town
- Interstate
- US Routes
- States
- Planning Area
- Preliminary Priority and General Habitat

3.14.1 Areas of Critical Environmental Concern and Research Natural Areas

An ACEC is defined in 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 FLPMA are found in 43 CFR, Part 1610.7-2(b), and guidance is provided in BLM Manual 1613 (BLM 1988b).

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 relevance and importance 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 relevance and importance 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, Part 3809.1-4(b)(3), which requires an approved plan of operations for activities resulting in more than 5 acres of disturbance under the mining laws.

BLM RNAs are where natural processes are allowed to predominate and that are preserved for the primary purposes of research and education. Under current BLM policy, RNAs must meet the relevance and importance criteria of ACECs and are, therefore, designated as ACECs. The ACEC procedures also are used to designate outstanding natural areas (ONAs), which may also be included as part of designated ACECs.

Current Condition

There are approximately 256,000 acres in 29 currently designated BLM ACECs in the planning area; of this, approximately 113,700 acres contain PPH and PGH GRSG habitat. These ACECs are shown on **Table 3-56**.

Appendix S details the evaluation of relevance and importance criteria for ACECs nominated as part of this effort.

Table 3-56
Designated Areas of Critical Environmental Concern in GRSG Habitat

ACEC Name	District/Field Office	ACEC Total Acres	Relevant and Important Values of the ACEC	Acres in PPH	Acres in PGH	Total Acres in Habitat
Ash Valley	Alturas Field Office	1,200	Threatened and endangered species	-	100	100
Baking Powder Flat	Ely District	13,600	Vegetation	700	2,100	2,800

Table 3-56
Designated Areas of Critical Environmental Concern in GRSG Habitat

ACEC Name	District/Field Office	ACEC Total Acres	Relevant and Important Values of the ACEC	Acres in PPH	Acres in PGH	Total Acres in Habitat
Bitner	Surprise Field Office	1,900	Cultural and wildlife	1,900	-	1,900
Blue Mass Scenic Area	Ely District	1,000	scenic and cultural	-	-	0
Buffalo Creek Canyons	Eagle Lake and Surprise Field Offices/Winnemucca District	35,800	Cultural and scenic	17,700	6,800	24,500
Carson Wandering Skipper	Carson City District	330	Biological	-	-	0
Condor Canyon	Ely District	4,500	Spinedace critical habitat	-	4,500	4,500
Eagle Lake Basin	Eagle Lake Field Office	32,100	Cultural and wildlife	-	5,800	5,800
Emigrant Trails	Alturas Field Office	1,700	Cultural	-	200	200
High Rock Canyon	Winnemucca District	6,000	Cultural, scenic, wildlife	6,000	-	6,000
Honeymoon Hill/City of Rocks	Ely District	3,900	Cultural	1,900	1,100	3,000
Incandescent Rocks	Carson City District	1,100	Scenic	-	100	100
Lower Meadow Valley Wash	Ely District	24,900	Threatened and endangered wildlife	-	-	0
Lower Smoke Creek	Eagle Lake Field Office	900	Watershed and cultural	-	100	100
Massacre Rim	Surprise Field Office	48,400*	Cultural and wildlife	46,300	1,500	47,800
Mountain Peaks	Alturas Field Office	3,800	Scenic and vegetation	-	1,500	1,500
North Dry Valley	Eagle Lake Field Office	10,400	Cultural, geologic, wildlife	-	900	900
Old Growth Juniper	Alturas Field Office	3,200	Vegetation	-	900	500
Osgood Mountains Milkvetch	Winnemucca District	100	Vegetation	-	-	0
Pah Rah Basin Petroglyph	Carson City District	3,900	Cultural	-	1,400	1,400
Pine Dunes	Eagle Lake Field Office	2,900	Geologic and vegetation	-	2,600	2,600
Schlesser Pincushion	Ely District	4,900	Threatened and endangered species—vegetation	-	-	0
Shoshone Ponds	Ely District	1,200	Vegetation and threatened and endangered fish	-	200	200

Table 3-56
Designated Areas of Critical Environmental Concern in GRSG Habitat

ACEC Name	District/Field Office	ACEC Total Acres	Relevant and Important Values of the ACEC	Acres in PPH	Acres in PGH	Total Acres in Habitat
Solider Meadows	Winnemucca District	2,100	Cultural	-	-	0
Swamp Cedar	Ely District	3,200	Vegetation and historical	-	-	0
Upper Bruneau Canyon	Elko District/Twin Falls District	7,100	Cultural, wildlife, and scenic	5,500	1,300	6,800
White River Valley	Ely District	13,100	Threatened and endangered species	-	1,100	1,100
Willow Creek	Eagle Lake Field Office	2,200	Cultural and scenic	-	1,600	1,600
Yankee Jim	Alturas Field Office	1,700	Cultural and vegetation	400	500	900

Source: BLM and Forest Service GIS 2015
*Nevada acreage

3.14.2 Wilderness

In 1964, Congress passed the Wilderness Act (Public Law 88-577), establishing the National Wilderness Preservation System, a national system of lands, for the purpose of preserving a representative sample of ecosystems in a natural condition for the benefit of future generations. Wilderness areas are generally defined as natural environments that have not been significantly modified by human activity.

With few exceptions, most designated wilderness areas in Nevada have been managed as Wilderness Study Areas since 1979. Through congressional action regarding the establishment of NCAs or through proposed county land bills, some WSAs have been designated as wilderness. Designation has not been limited to WSAs; also included are several areas that were not previously managed for wilderness.

Current Condition

Currently, there are 40 Wilderness Areas (23 managed by the BLM and 17 managed by the Forest Service) in GRSG habitat in the planning area (see **Table 3-57**).

Table 3-57
Wilderness Areas

Wilderness Area	Acres of PPH	Acres of PGH	Wilderness Total Acres with GRSG Habitat
BLM Wilderness			
Becky Peak	1,600	7,900	9,500
Black Rock Desert	200	9,900	10,100

Table 3-57
Wilderness Areas

Wilderness Area	Acres of PPH	Acres of PGH	Wilderness Total Acres with GRSG Habitat
Bristlecone	-	-	0
Calico Mountains	-	19,400	19,400
East Fork High Rock Canyon	52,600	-	52,600
Far South Egans	500	24,000	24,500
Fortification Range	-	-	0
Goshute Canyon	400	9,000	9,400
Government Peak	-	-	0
High Rock Canyon	46,500	-	46,500
High Rock Lake	1,600	32,300	33,900
Highland Ridge	-	300	300
Little High Rock Canyon	40,900	7,500	48,400
Mount Grafton	6,300	15,500	21,800
North Black Rock Range	27,900	2,800	30,700
North Jackson Mountains	-	400	400
Pahute Peak	-	8,200	8,200
Parsnip Peak	-	1,500	1,500
Pine Forest Range	4,800	3,400	8,200
South Egan Range	100	2,900	3,000
South Jackson Mountains	-	3,100	3,100
White Rock Range	-	3,200	3,200
Worthington Mountains	-	-	0
Forest Service Wilderness			
Alta Toquima Wilderness	3,800	8,100	11,900
Arc Dome Wilderness	5,000	12,000	17,000
Bald Mountain Wilderness	1,000	3,300	4,300
Currant Mountain Wilderness	-	-	0
Currant Mountain Wilderness Addition	-	300	300
East Humboldt Wilderness	7,700	8,700	16,400
Grant Range Wilderness	-	500	500
High Schells Wilderness	2,400	18,100	20,500
Jarbidge Wilderness	1,200	8,100	9,300
Jarbidge Wilderness Addition	10,800	16,000	26,800
Mount Moriah Wilderness	-	-	0
Red Mountain Wilderness	-	200	200
Ruby Mountains Wilderness	7,700	9,300	17,000
Santa Rosa—Paradise Peak Wilderness	1,200	2,800	4,000
Shellback Wilderness	2,100	9,500	11,600
Table Mountain Wilderness	3,500	37,200	40,700
White Pine Range Wilderness	1,200	5,100	6,300

Source: BLM and Forest Service GIS 2015

3.14.3 Wilderness Study Areas

In 1976, Congress directed the BLM through Section 603(a) of FLPMA to identify those lands with wilderness character as potential areas to be included in the National Wilderness Preservation System. Within a 15-year time frame, BLM was to provide to Congress with recommendations of lands that consisted of the following:

> …those roadless areas of five thousand acres or more and roadless islands of public lands, identified during the inventory required by Section 201(a) of this act as having wilderness characteristics described in the Wilderness Act of September 3, 1964 and shall from time to time report to the President his recommendation as suitability or non-suitability of such area or island for the preservation of wilderness…

Since that time, these lands, now identified as Wilderness Study Areas (except those that have been released from Wilderness study by Congress), are managed in accordance with Section 603(c) of FLPMA, so as not to impair their suitability for preserving wilderness. The BLM's policy on managing WSAs is set forth in BLM Manual 6330, Management of Wilderness Study Areas (BLM 2012d).

The BLM manages approximately 50 million acres of public lands in Nevada and northeastern California. Statewide inventories resulted in approximately 4,680,000 acres in 113 areas in Nevada and in northeastern California being designated as Wilderness Study Areas in 1979-1980. Since the inception of the WSAs, various congressional actions have designated 2,079,020 acres of WSAs as Wilderness, which have been added to the National Wilderness Preservation System.

Current Condition

Throughout the planning area, there are 50 WSAs that contain 849,500 acres of PPH and PGH GRSG habitat. Of these, 47 are administered by BLM and three are administered by the Forest Service. On October 28, 1988, Public Law 100-550, also known as the National Forest and Public Lands of Nevada Enhancement Act of 1988, directed an exchange of administration of lands between the Forest Service's Toiyabe National Forest and the BLM's Battle Mountain District. In this exchange, the Forest Service acquired three BLM WSAs; PL 100-550 directed the Forest Service to continue WSA management on these lands in accordance with previous BLM management.

There are 18 other WSAs in Nevada and two WSAs in California that do not contain GRSG habitat; these 20 WSAs are not addressed further in this document. Only those WSAs that contain GRSG habitat are shown in **Table 3-58**. All WSAs are managed under specific guidance regarding activities and other resource management actions, which are provided in BLM Manual 6330, Management of Wilderness Study Areas. Under this guidance, all activities are required to meet nonimpairment criteria, meaning that all uses and facilities must be temporary and not create surface disturbance, unless one of the seven classes of allowable exceptions exists.

Table 3-58
Wilderness Study Areas

	Acres of PPH	Acres of PGH	Total Acres of GRSG Habitat
BLM Wilderness Study Areas—Nevada/California			
Augusta Mountains	-	2,600	2,600
Badlands	9,300	-	9,300
Bitterbrush	-	300	300
Blue Eagle	-	-	0
Bluebell	-	4,900	4,900
Buffalo Hills	44,300	3,400	47,700
Cedar Ridge	5,000	3,000	8,000
China Mountain	7,900	100	8,000
Clan Alpine Mountains	-	4,100	4,100
Desatoya Mountains	11,600	37,000	48,600
Disaster Peak	12,700	-	12,700
Dry Valley Rim	81,600	5,000	86,600
Five Springs	47,000	-	47,000
Fox Range	-	2,500	2,500
Goshute Peak	-	900	900
Job Peak	-	-	0
Kawich	-	2,200	2,200
Lahontan Cutthroat Trout	9,200	2,700	11,900
Little Humboldt River	35,300	3,000	38,300
Massacre Rim	26,000	7,900	33,900
Mount Limbo	-	3,000	3,000
North Fork Little Humboldt River	67,900	500	68,400
Owyhee Canyon	21,500	-	21,500
Palisade Mesa	-	-	0
Park Range	-	-	0
Pit River Canyon	-	300	300
Pole Creek	-	-	0
Poodle Mountain	70,800	22,100	92,900
Pueblo Mountains	600	-	600
Red Spring	-	400	400
Riordan's Well	-	4,100	4,100
Roberts Mountain	6,300	5,300	11,600
Rough Hills	6,500	-	6,500
Selenite Mountains	-	1,700	1,700
Sheldon Contiguous	300	-	300
Simpson Park	29,900	7,800	37,700
Skedaddle	47,900	4,300	52,200
South Fork Owyhee River	8,100	-	8,100
South Pequop	-	-	0
South Reveille	-	200	200
South Warner Contiguous	-	2,000	2,000
The Wall	-	-	0
Tobin Range	-	3,200	3,200

Table 3-58
Wilderness Study Areas

	Acres of PPH	Acres of PGH	Total Acres of GRSG Habitat
Tule Mountain	-	2,500	2,500
Tunnison Mountain	8,700	8,500	17,200
Twin Peaks	52,700	25,600	78,300
Wall Canyon	45,800	1,400	47,200
Forest Service Wilderness Study Areas			
Antelope Range	9,300	2,500	11,800
Fandango	5,100	2,500	7,600
Morey Peak	-	700	700

Source BLM and Forest Service GIS 2015

3.14.4 Wild and Scenic Rivers

Wild and Scenic Rivers are rivers or river sections designated by Congress under the authority of the Wild and Scenic Rivers Act of 1968 (Public Law 90-542, as amended; 16 USC, Sections 1271-1287). This designation is to preserve the river or river section in its free-flowing condition, preserving water quality and protecting its outstandingly remarkable values (ORVs) and tentative classification. River segment ORVs may include scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values. The BLM's policy goal for a suitable river is to manage its free-flowing condition, water quality, tentative classification, and any ORVs until Congress designates the river or releases it for other uses.

There are two suitable Wild and Scenic River segments in the planning area. A 2-mile segment of Twelve Mile Creek in the northwestern corner of the state is managed by the Surprise Field Office; a short segment of the East Fork of the Carson River in California is managed by the Forest Service.

The Forest Service segment of the East Fork of the Carson River has a tentative classification of scenic and has been analyzed through the planning process in the Humboldt-Toiyabe Forest Management Plan for the Sierra Nevada Division (Carson and Bridgeport Ranger Districts). The recently released BLM Carson District Draft RMP has identified approximately 3 miles of the East Fork of the Carson River in three segments as eligible, with a tentative recreational, wild, and scenic classification, respectively. The BLM segments are an extension of the existing Forest Service suitable segment. The East Fork of the Carson River segments do not contain or cross GRSG habitat and are not analyzed further in this document.

The Oregon and California BLM have determined Twelve-mile Creek, with headwaters in Oregon and crossing into the northwestern corner of the state of Nevada as suitable, with a tentative classification of recreational under the

Lakeview RMP (Oregon) and the Surprise RMP (California). The creek enters Nevada for approximately 2 miles before crossing back into Oregon.

This river segment has been designated as suitable through the land use planning process and is documented through the Lakeview and Surprise RMPs, but it has not been designated into the National Wild and Scenic Rivers System. The Twelve-Mile Creek segment in northwestern Nevada does cross GRSG habitat. Potential impacts on the corridor of the river segment through proposed GRSG habitat improvement or restoration projects would not affect the management or tentative classification of the river segment, so Twelve-Mile Creek is not analyzed further in this document.

3.14.5 Other Special Designations

National Conservation Areas

National Conservation Areas (NCAs) are a component of the BLM's National Landscape Conservation System. Generally, NCAs are managed to conserve, protect, restore, and enhance the objects and values for which the unit was designated. The objects and values often include scientific, cultural, ecological, historical, and recreational aspects.

There are three NCAs in Nevada: Black Rock Desert-High Rock Canyon Emigrant Trails NCA, Red Rock Canyon NCA, and Sloan Canyon NCA. Of these three, only Black Rock Desert-High Rock Canyon Emigrant Trails NCA contains GRSG habitat. The other two are not analyzed further in this document.

In 2000, Congress designated the Black Rock Desert-High Rock Canyon Emigrant Trail NCA. It encompasses approximately 1.2 million acres of public lands administered by the BLM (PL 106-554, Black Rock Desert-High Rock Canyon Emigrant Trails National Conservation Area Act of 2000). Included in this acreage are approximately 380,000 acres of designated wilderness and 8,100 acres of ACEC. The focal point of the NCA is the California National Historic Trail Applegate/Nobles Emigrant Trail routes. Other resources of national significance include prehistory, paleontology, wildlife, and wild horses. The most prominent visual aspect of the NCA is the Black Rock Desert Playa.

There are approximately 404,788 acres of GRSG habitat in the Black Rock Desert-High Rock Canyon Emigrant Trail NCA. Of that, 233,149 acres are PPH and approximately 112,243 acres are PGH.

National Scenic and Historic Trails

Congress designates a National Historic Trail (NHT) as an extended long-distance trail, not necessarily managed as continuous. It follows as closely as possible and practicable the original trails or routes of travel of national historic significance. The purpose of an NHT is to identify and protect the historic route and the historic remnants and artifacts for public use and enjoyment. An NHT is

managed to protect the nationally significant resources, qualities, values, and associated settings of the areas through which such trails may pass, including the primary use or uses of the trail.

While National Scenic and Historic Trails cross lands managed by different agencies, trails and trail segments that cross BLM-administered lands are managed in accordance with BLM Manual 6280, Management of National Scenic and Historic Trails and Trails under Study or Recommended as Suitable for Congressional Designation, which mandates that the BLM establish NHT Management Corridors (BLM 2012e). These corridors are established to assist in managing the resources, qualities, values, and associated settings and the primary use or uses for which the NHT was designated. The designation of NHT Management Corridors in the future will encompass lands that may include GRSG habitat and will include management decisions and actions that likely will have positive effects on GRSG populations.

In the planning area, there are two National Historic Trails—the California NHT and the Pony Express NHT—and one National Scenic Trail—the Pacific Crest NST.

California National Historic Trail. More than 250,000 emigrants traveled from Missouri to California during the 1840s and 1850s. More than 1,000 miles of trail ruts and traces can still be seen across 10 states on the California NHT. 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 (NPS 2012). Approximately 2,113 miles of the California NHT fall in the planning area.

Pony Express National Historic Trail. The Pony Express NHT was used to carry the nation's mail from Missouri to California on horseback in the unprecedented time of only ten days. The relay system became the nation's 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. Approximately 419 miles of the Pony Express NHT fall in the planning area.

Pacific Crest National Scenic Trail. The Forest Service administers the Pacific Crest National Scenic Trail. It partners with the BLM, NPS, California State Parks, and the Pacific Crest Trail Association to manage and protect the trail (Forest Service 2012e). Approximately 200 miles of the Pacific Crest National Scenic Trail fall in the planning area. The trail does not traverse any PPH acreage in the planning area.

Forest Service Inventoried Roadless Areas

Inventoried roadless areas are undeveloped areas typically exceeding 5,000 acres that meet the minimum criteria for wilderness consideration under the

Wilderness Act. Inventoried roadless areas may contain such improvements as motorized trails, fences, outfitter camps, and evidence of historical logging activities. As required by 36 CFR, Part 219.17, inventoried roadless areas are identified during forest plan development or revision and are qualified for study if they meet the following criteria:

- They are 5,000 acres or larger
- They are less than 5,000 acres but contiguous with a Wilderness Area
- There are no classified roads (a classified road is one constructed or maintained for long-term highway vehicle use; therefore, inventoried roadless areas may contain motorized and nonmotorized trails and user-created roads)

There are approximately 2,000 acres of inventoried roadless area recommended for wilderness management by the Forest Service in the planning area. This acreage is contiguous with the Mount Rose Wilderness and does not contain GSRG habitat, so it is not analyzed further in this document. Other elements of forest lands throughout the state also contain inventoried roadless areas but are not recommended for wilderness management. As such, wilderness character criteria are not affected by management decisions for GSRG.

3.15 WATER RESOURCES

Water resources are surface and groundwater sources, including streams, springs that support riparian areas, and wetlands. Factors such as the amount of precipitation and runoff, water storage and withdrawals, pollution from outfalls, soil erosion, and overall conditions of the uplands and riparian areas affect surface water resources. Recharge, withdrawal, and infiltration of contaminants affect groundwater resources. The BLM and Forest Service management decisions regarding energy development, lands and realty actions, grazing, recreation, and forestry can result in potential impacts on water resources.

Current Condition

Overview

Surface water and groundwater discharged in the region originate from precipitation. Precipitation that falls to the land surface might infiltrate the soil or bedrock and recharge the groundwater system, evaporate, be transpired by plants, or flow as runoff through drainages. Surface water runoff that originates at higher mountain elevations generally flows in well-defined channels cut into bedrock in the mountain blocks; the runoff then discharges onto alluvial fans at the valley margin.

There are several potential outcomes for runoff that flows from the mountains into the valley bottom. As surface water moves, it is continually removed from

the surface water system by a variety of processes, including infiltration as recharge to groundwater as seepage into fractures in bedrock or permeable sediments in the drainage channel, into alluvial fans at the margins of the mountain fronts, or into basin-fill sediments in the center of the valley; it is removed from the system by evaporation or transpired by plants, both in the channel, in ponds or lakes, and at playas in the valley bottom; and it is diverted for irrigation or other beneficial uses.

Perennial surface water is supported by groundwater discharge in this region. Springs that discharge groundwater at the land surface can collect into channels to form perennial streams. Periodic rainstorms and snowmelt generate runoff that contributes to temporary streamflow increases. However, a consistent base flow for streams and springs in the region observed even after prolonged dry periods is maintained by the discharge from the groundwater system.

In the planning area, the major water features are streams, lakes, wetlands, playas, and dry lakes. Streams can be ephemeral, intermittent, or perennial. Ephemeral streams do not flow during an average water year but do flow in response to large rainstorms. Intermittent streams flow during spring runoff for an average water year but generally dry up later in the summer. Perennial streams contain some water all year for an average water year. Lakes can be permanent or temporary. Wetlands and floodplains vary in extent and depth throughout the year. Permanent waters can also be in the form of ponds and reservoirs developed for human or livestock consumption.

Surface Water

The United States is divided and subdivided into successively smaller hydrologic units called regions, sub-regions, accounting units (or basins), and cataloging units (or sub-basins). Each of these hydrologic units is identified by a unique hydrologic unit code consisting of between two and eight digits. The fourth level of classification (the cataloging unit or sub-basin) is represented by an eight-digit hydrologic unit code. **Table 3-59** lists the sub-basins in the planning area.

Surface water resources in the planning area are intermittent washes, perennial streams, ponds or reservoirs, playas, and springs. In terms of streams, ephemeral drainages represent the predominant feature type based on miles of streams in the project area. Projects for irrigation, livestock, human use, and flood control have significantly altered natural flow regimes, resulting in changes to habitat conditions, channel stability, and timing of sediment and organic material transport. Streamflow has been altered by such management activities as water impoundments, water withdrawal, road construction, vegetation manipulation, grazing, wildfire suppression, and timber harvesting.

Most surface runoff in the planning area is from snowmelt or rainfall at the higher elevations, producing peak discharges in the spring and early summer. Many of the streams in the lower elevation semiarid areas are either

Table 3-59
Hydrologic Sub-basins in the Planning Area

Sub-basin Name	Eight-Digit Hydrologic Unit Code Number	Total Sub-basin Size (Acres)	Sub-basin Size in Planning Area (Acres)	BLM/National Forest System Lands in Sub-basin in Planning Area (Acres)	Length of Streams in Sub-basin in Planning Area (Miles)	Length of Streams Crossing BLM/National Forest System Lands in Sub-basin in Planning Area (Miles)
Alvord Lake	17120009	96,800	97,100	84,900	200	100
Big Chico Creek-Sacramento River	18020157	300	2,300	0	0	0
Bruneau	17050102	511,300	433,200	80,500	800	200
Butte	18010205	151,200	150,700	17,300	100	30
Butte Creek	18020158	600	700	0	0	0
Cactus-Sarcobatus Flats	16060013	616,000	616,500	599,600	1,500	1,400
Carson Desert	16050203	1,391,500	1,392,000	547,400	2,700	1,000
Crowley Lake	18090102	40,900	40,900	3,900	100	0
Death Valley-Lower Amargosa	18090203	195,200	195,400	195,100	400	400
Diamond-Monitor Valleys	16060005	1,997,600	1,999,000	1,426,100	3,300	2,200
Dixie Valley	16060001	2,585,600	2,587,300	2,262,800	5,400	4,700
Dry Lake Valley	16060009	1,388,600	1,388,400	1,507,200	3,200	3,200
East Branch North Fork Feather	18020122	658,800	657,700	600	28,100	0
East Little Owyhee	17050106	441,200	446,300	433,100	1,100	1,100
East Walker	16050301	445,400	445,400	177,000	700	200
Escalante Desert	16030006	68,700	69,000	67,700	200	200
Eureka-Saline Valleys	18090201	4,400	4,400	4,100	0	0
Fish Lake-Soda Spring Valleys	16060010	1,572,300	1,573,400	1,366,600	3,900	3,500
Gabbs Valley	16060002	1,331,300	1,332,100	1,139,500	2,600	2,300
Goose	17040211	204,700	205,500	177,200	400	300
Goose Lake	18020001	232,800	227,500	900	0	0

Table 3-59
Hydrologic Sub-basins in the Planning Area

Sub-basin Name	Eight-Digit Hydrologic Unit Code Number	Total Sub-basin Size (Acres)	Sub-basin Size in Planning Area (Acres)	BLM/National Forest System Lands in Sub-basin in Planning Area (Acres)	Length of Streams in Sub-basin in Planning Area (Miles)	Length of Streams Crossing BLM/National Forest System Lands in Sub-basin in Planning Area (Miles)
Granite Springs Valley	16050104	1,063,600	1,063,700	737,200	2,000	1,400
Guano	17120008	268,400	260,300	55,700	500	100
Hamlin-Snake Valleys	16020301	818,500	822,700	699,800	1,800	1,400
Honey-Eagle Lakes	18080003	1,793,600	1,794,200	720,700	3,000	1,100
Hot Creek-Railroad Valleys	16060012	2,973,300	2,975,000	2,405,600	7,300	6,000
Lake Tahoe	16050101	87,400	87,500	2,500	200	0
Little Humboldt	16040109	1,139,000	1,139,900	747,000	2,500	1,600
Little Smoky-Newark Valleys	16060006	924,200	924,700	881,400	1,600	1,500
Long-Ruby Valleys	16060007	2,633,100	2,633,600	2,074,800	5,000	3,400
Lost	18010204	1,099,300	1,086,800	25,100	2,500	20
Lower Humboldt	16040108	1,659,200	1,660,100	824,800	3,600	1,600
Lower Pit	18020003	1,056,500	1,054,100	121,800	0	200
Lower Quinn	16040202	2,095,400	2,095,900	3,069,700	4,700	4,300
Lower Virgin	15010010	470,800	471,100	512,500	1,500	1,400
Madeline Plains	18080002	539,000	538,900	266,300	600	300
Massacre Lake	16040204	829,500	829,600	714,400	1,700	1,200
McCloud	18020004	77,000	75,500	0	0	0
Meadow Valley Wash	15010013	1,570,700	1,570,100	1,829,700	4,900	4,700
Middle Carson	16050202	531,100	531,000	322,200	800	400
Middle Fork Feather	18020123	735,900	734,700	11,900	0	50
Middle Humboldt	16040105	2,045,900	2,047,500	1,192,100	4,800	2,300
Middle Owyhee	17050107	1,000	1,900	1,000	0	0
Mono Lake	18090101	78,100	78,100	0	100	0

Table 3-59
Hydrologic Sub-basins in the Planning Area

Sub-basin Name	Eight-Digit Hydrologic Unit Code Number	Total Sub-basin Size (Acres)	Sub-basin Size in Planning Area (Acres)	BLM/National Forest System Lands in Sub-basin in Planning Area (Acres)	Length of Streams in Sub-basin in Planning Area (Miles)	Length of Streams Crossing BLM/National Forest System Lands in Sub-basin in Planning Area (Miles)
Muddy	15010012	316,700	316,700	433,600	1,000	900
North Fork American	18020128	200	300	0	0	0
North Fork Feather	18020121	553,800	550,900	700	0	0
North Fork Humboldt	16040102	638,800	639,100	393,900	1,700	900
Northern Big Smoky Valley	16060004	1,220,400	1,221,400	765,700	2,000	1,100
Northern Great Salt Lake Desert	16020308	253,500	257,600	164,900	600	400
Pilot-Thousand Springs, Nevada, Utah	16020307	941,600	942,700	582,400	2,300	1,300
Pine	16040104	643,300	643,700	532,400	1,200	1,000
Pyramid-Winnemucca Lakes	16050103	886,900	886,600	340,600	1,800	700
Ralston-Stone Cabin Valleys	16060011	1,765,000	1,766,400	1,408,900	5,400	4,500
Reese	16040107	1,521,100	1,522,300	1,062,400	2,700	2,000
Rock	16040106	580,100	580,500	374,000	1,800	1,100
Salmon Falls	17040213	781,200	781,800	604,400	1,400	1,000
Sand Spring-Tikaboo Valleys	16060014	1,209,500	1,210,000	1,132,000	3,000	2,700
Smoke Creek Desert	16040203	1,575,500	1,575,700	1,832,200	3,500	3,000
South Fork Humboldt	16040103	835,500	835,900	441,000	1,700	700
South Fork Owyhee	17050105	1,037,200	1,039,000	584,400	2,400	1,200
Southern Big Smoky Valley	16060003	1,311,100	1,312,000	1,017,900	3,500	3,000
Southern Great Salt Lake Desert	16020306	429,400	431,100	351,500	1,100	900
Spring-Steptoe Valleys	16060008	3,403,400	3,402,500	2,926,300	7,200	5,800

Table 3-59
Hydrologic Sub-basins in the Planning Area

Sub-basin Name	Eight-Digit Hydrologic Unit Code Number	Total Sub-basin Size (Acres)	Sub-basin Size in Planning Area (Acres)	BLM/National Forest System Lands in Sub-basin in Planning Area (Acres)	Length of Streams in Sub-basin in Planning Area (Miles)	Length of Streams Crossing BLM/National Forest System Lands in Sub-basin in Planning Area (Miles)
Surprise Valley	18080001	579,500	580,100	259,600	1,200	400
Thomes Creek-Sacramento River	18020156	0	400	0	0	0
Thousand-Virgin	16040205	568,000	567,600	209,500	1,200	400
Truckee	16050102	711,300	712,900	107,100	1,700	100
Upper Amargosa	18090202	165,200	165,400	154,200	300	200
Upper Carson	16050201	362,000	368,100	93,500	800	100
Upper Humboldt	16040101	1,761,900	1,762,600	752,800	5,000	1,900
Upper Owyhee	17050104	357,600	358,600	54,000	800	100
Upper Pit	18020002	1,718,900	1,716,000	259,100	0	700
Upper Quinn	16040201	1,905,100	1,906,800	1,426,900	3,000	2,100
Upper Yuba	18020125	350,500	350,100	0	0	0
Walker	16050303	572,200	572,300	240,600	900	300
Walker Lake	16050304	517,200	517,300	237,200	700	300
Warner Lakes	17120007	114,600	106,500	71,700	100	100
West Walker	16050302	404,500	404,700	125,100	600	100
White	15010011	1,798,300	1,798,600	1,764,200	4,500	4,000
TOTAL		**70,216,700**	**70,145,900**	**48,012,400**	**168,900**	**96,800**

Source: BLM and Forest Service GIS 2015

intermittent, with segments of perennial flow near springs, or ephemeral, with flow only during spring runoff and intense summer storms. Estimated miles of perennial streams are 15,488 and intermittent streams are 130,353. Perennial and intermittent stream reaches were defined by the USGS National Hydrography Dataset.

Water developments, such as troughs for livestock, are not influential sources of water for GRSGs. However, water developments provide additional and alternative sources of water for wildlife and livestock and can decrease the use of riparian areas as water sources, thereby resulting in improved meadow conditions.

Groundwater

Groundwater resources in the planning area include local basin-fill aquifers, deep, regional aquifers and, in some areas, geothermal aquifers. **Figure 3-16** shows a conceptual model of a groundwater flow system typically found in the planning area (Welch et al. 2007).

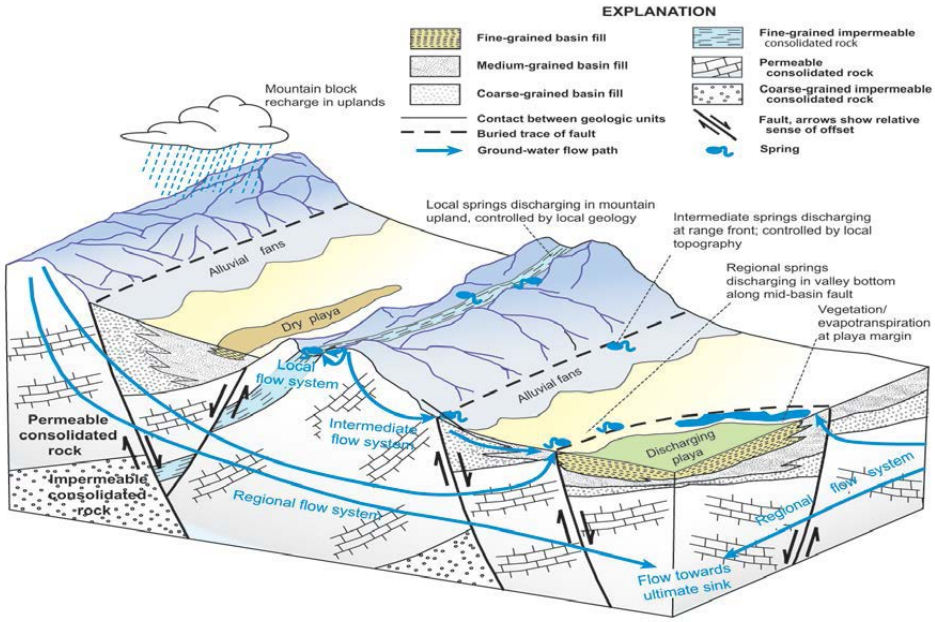
Groundwater in the planning area is primarily used for irrigation, domestic use, and livestock. The quality of the groundwater is a function of the chemical makeup of the underground formation containing the water. Most of the planning area contains good quality water, but the water is usually hard and contains moderate amounts of dissolved minerals.

Springs and seeps occur in areas where water from aquifers reaches the surface. Many springs begin in stream channels; others flow into small ponds or marshy areas that drain into channels. Some springs and seep areas form their own channels that reach flowing streams, but other springs lose their surface expression and recharge alluvial fill material or permeable stratum.

Springs and seeps are important to aquatic habitats because of the perennial base flow they provide. The outflow from springs in summer usually helps to maintain lower water temperatures. In winter, especially in small streams, base flow helps to maintain an aquatic habitat in an otherwise frozen environment.

Approximately 16,700 springs have been inventoried in the planning area. Many have been disturbed, either by management activities that have affected the volume of water available to the vegetation and soils where springs begin or by activities that have affected the vegetation and soils directly. Such activities as livestock or wild horse grazing and watering, recreation use, mining, road construction, and vegetation management have affected spring systems in the past. Well drilling or blasting can affect springs by reducing the volume of water in their aquifers or by affecting subsurface flow patterns.

Figure 3-16
Conceptual Groundwater Flow System



Source: Welch et al. 2007

Riparian Areas and Wetlands

As described in **Section 3.4**, riparian areas are ecosystems that occur along rivers, streams, or water bodies. Although these areas represent only 5 percent of the planning area, riparian habitats play an integral role in restoring and maintaining the chemical, physical, and biological integrity of water resources (Fitch and Ambrose 2003).

The condition and trend of riparian areas and wetlands varies throughout the planning area (refer to **Table 3-12** and the discussion in **Section 3.4**, Riparian Areas and Wetlands).

Water Quality

Water quality on BLM-administered and National Forest System lands is regulated by the Clean Water Act (CWA), the Safe Drinking Water Act, Public Land Health Standards, the Watershed Conservation Practices Handbook, and other laws, regulations, and policy guidance at the federal, state, and local levels.

The CWA (33 USC, Section 1251 et seq.) requires maintenance and restoration of the physical, biological, and chemical integrity of Waters of the United States. Sections 208 and 319 of the CWA recognize the need for control strategies for nonpoint source pollution. Soil and water conservation practices and BMPs are recognized as the primary control mechanisms for nonpoint source pollution on BLM-administered and National Forest System lands. The EPA (1987) supports this perspective in its guidance, Nonpoint Source Controls and Water Quality Standards.

The water quality standards for the State of Nevada and the State of California support other federal laws such as the CWA, the Water Resources Planning Act, the Pollution Prevention Act, and the Safe Drinking Water Act.

Water quality, as defined by the CWA, includes all of the physical, biological, and chemical characteristics that affect existing and designated beneficial uses. Water that does not meet these standards is considered impaired. Nevada and California are required to identify impaired surface water bodies under Section 303(d) of the CWA. There are approximately 517 miles of Section 303(d)-listed streams and water bodies in the planning area.

The most common impairments for Section 303(d)-listed waters in the planning area are pH, phosphorus, mercury, iron, zinc, temperature, and arsenic. Most of these heavy metals are found naturally in planning area soils and geology. High concentrations in surface waters could be a result of nonpoint source pollution due to land use practices resulting in increased erosion or mining or could be naturally occurring. High temperatures and nutrient concentrations are typically a result of decreased riparian function, which could be a result of land use practices resulting in increased erosion, including roads and livestock use.

Causes of stream degradation are removing riparian vegetation and destabilizing stream banks. Removing riparian vegetation and the shade it provides contributes to elevated stream temperatures (Rishel et al. 1982; Brown 1983; Beschta et al. 1987). Channel widening can similarly increase solar radiation loading. The principal source of heat energy delivered to the water column is sunlight striking the stream surface directly (Brown and Krygier 1970). The ability of riparian vegetation to shade the stream throughout the day depends on vegetation height, width, density, and position relative to the stream, as well as the direction of streamflow; streamside vegetation provides less shade on a north- or south-flowing stream than on an east- or west-flowing stream.

The land use most commonly associated with stream degradation in the planning area is livestock grazing. Other land uses associated with degraded streams are roads, trails, water withdrawal, reservoir storage and release, altered physical characteristics, and wetlands alteration.

Water Availability

Water availability can vary annually, depending on the volume of water recharged and the volume of water used in the planning area. Since most of the water in the planning area originates from precipitation, yearly climatic conditions play an important role in the volume of water available in these systems. This in turn determines available riparian habitat and conditions, particularly in systems that are more dependent on snowmelt and local precipitation events. See **Section 3.21**, Climate Change, for more information on past and current precipitation conditions.

The volume of water used in the planning area depends on the quantity of water appropriated in water rights through Nevada and California water law.

Water Rights

The right to use surface and groundwater and the management of water appropriations in the planning area is administered by the Nevada Division of Water Resources and the California State Water Resources Control Board. The BLM authorizes the use of water on BLM-administered lands if it has permitted the applicant to apply the water to beneficial use.

The Nevada State Engineer's duty is to conserve, protect, manage, and enhance the state's water resources for Nevada's citizens through the appropriation and reallocation of the public waters. All water in the boundaries of the state, whether above or beneath the surface of the ground, belongs to the public and is subject to appropriation for beneficial uses.

Nevada issues water rights for various beneficial uses for both groundwater and surface water. Since it is based on prior-appropriation and beneficial use, this system of water allocation controls who uses how much water, the types of uses allowed, and when those waters can be used. Often referred to as First in time, first in right, the system stipulates that the first individual to put a water body to beneficial use is considered the senior water-rights holder and the first one allowed to use the water. Water available above the senior water-rights holder's appropriation would then be made available to subsequent water-rights holders based on priority date. Consumptive water uses in the planning area are agricultural, municipal, mining and milling, industrial, stock watering, and wildlife.

Since all water in the state is available for appropriation, Nevada water law does not necessarily protect riparian habitat or unappropriated surface waters. The water law allows for the capture of natural groundwater discharge so long as the amount captured is not greater than the perennial yield for the basin. Additionally, any appropriated surface water rights can be diverted, resulting in a reduction in riparian conditions. The Nevada State Engineer recognizes that a water right does not give the holder automatic ingress or egress across public, private, or corporate lands. Additionally, a water right permit does not waive the requirements that the permit holder obtain other permits from federal, state, and local agencies.

In Nevada, wildlife is considered a beneficial use for water rights, and the BLM and Forest Service hold wildlife water rights not only to provide a watering source for wildlife but also to maintain wildlife habitat. However, a water right is not required on surface waters to allow for a wildlife use. Nevada Revised Statute 533.367 requires all permit holders for springs or seeps to allow access to wildlife that customarily use it. The BLM usually applies for a wildlife water right only if it wants to develop the source, such as put in a trough or well, or if it feels a water right is necessary to protect the source and the associated

habitat. Wildlife guzzlers and other types of precipitation collectors do not require a water right in Nevada (Masto 2011).

In Nevada, the BLM and Forest Service have been precluded from applying for water rights for stock watering use in most cases. Under Nevada water law, the State Engineer will issue a permit to appropriate water for watering livestock only to permit applicants who are legally entitled to place livestock on the lands for which the permit is sought and who own or have an interest in the livestock (Nevada Revised Statute 533.503).

In addition, new regulations tying appurtenance to ownership of livestock is set forth in Nevada Revised Statute 533.040. These changes apply to any water application processed by the Nevada State Engineer after June 12, 2003. Such water developments as troughs for livestock are not influential sources of water for GRSGs; however, water developments provide additional and alternative sources of water for wildlife and livestock and can decrease the use of riparian areas as water sources (Wyman et al. 2006).

The California Doctrine is a system of water rights that recognizes both appropriative and riparian rights. The California Supreme Court has held that a person's riparian rights are superior to the appropriator's rights, except in cases where the water has been appropriated before the person acquired the patent to his land and after the passage of the 1866 Mining Act that recognized appropriation.

Generally, a reasonable riparian use will trump an appropriative right so long as the patent to the riparian parcel was acquired from the United States before the date of appropriation. In 1928, the California Constitution was amended to require all water use in California to be "beneficial and reasonable." Generally today, a riparian user cannot defeat an appropriative right unless the riparian user proves the appropriation is unduly interfering with the riparian user's reasonable use of the water.

Federal reserved water rights are made by presidential executive order or by an act of Congress; they are derived from federal, not state, law. When the United States reserves public land for such uses as Indian reservations, military reservations, national parks, forests, or monuments, it also implicitly reserves sufficient water to satisfy the purposes for which the reservation was created. Reservation of water is inferred if water is necessary to accomplish the purposes for which the land reservation was created. The date of priority of a federal reserved right is the date the reservation was established.

3.16 SOIL RESOURCES

The BLM and National Forest System land management and resource use decisions influence long-term soil health, stability, and productivity. Many management activities and resource uses depend on suitable soils for the type, location, and use level of that resource, including livestock grazing, mineral

activities, fire management, road and travel management (including OHV use), recreation, wildlife habitat, riparian habitat, special status species, fisheries, water quality, and forestry. Consequently, soil attributes and conditions are important to BLM and Forest Service management decisions.

Soils are defined by the interaction of the processes that form them, including parent material (geology), climate, topography, biologic organisms, and time. Of these, soil surveys indicate that climate and topography have the primary influences on soil formation (NRCS 2000).

Soils are classified by their degree of development into distinct layers/horizons and their dominant physical and chemical properties. These characteristics are used to groups soils into 1 of 12 orders that are based on defining soil properties, such as organic matter, dominant sediment particle (silt, sand, or clay), amount of mineral material present, and water and temperature regimes, and unique properties, such as salt content or volcanic ash layers. These soil characteristics, in combination with climate, determine whether sagebrush can exist in a given location and which variety of sagebrush communities are able to thrive. Since the presence of GRSGs depends on sagebrush and sagebrush type and viability depend on soil type and quality, soils are an important element in GRSG habitat.

Current Condition

Soil Productivity

Soil productivity in the planning area varies widely due to the diversity of soils and site characteristics, specifically differences in elevation and slope gradient. Some of the most productive soils are found in well-drained valley bottoms, toe-slopes, benches, and broad ridgetops. On uplands, where rainfall is moderate to low, medium-textured soils may produce favorable conditions, depending on land uses, such as livestock grazing. Soils that feature shallow claypans, hardpans, or salts pose substantial constraints to land use and management.

Management practices affect the ability of soils to maintain productivity by influencing disturbances, such as displacement, compaction, erosion, and alteration of organic matter and soil organism levels. When soil is degraded in semiarid, high desert regions, natural processes are slow to return site productivity. Preventing soil degradation is far more cost- and time-effective than remediation or waiting for natural processes. Certain management practices have reduced erosion effects and improved soil conditions; examples are proper stocking rates for livestock, grazing rotation, periodic rest from grazing, improved design, road construction and maintenance, selective logging, rehabilitation of unneeded surface disturbance, restricting vehicles to roads and trails, rehabilitating mined areas, and concentrated recreation control.

Soil Erosion

Erosion is a continuing natural process that can be accelerated by human disturbances. Factors that influence soil erosion are texture, structure, length and percent of slope, vegetative cover, and rainfall or wind intensity. Soils most susceptible to erosion by wind or water are typified by bare or sparse vegetative cover, non-cohesive soil particles with low infiltration rates, and moderate to steep slopes. The semiarid planning area has between 17,730,500 acres of native vegetation and 189,200 acres of nonnative vegetation, allowing the soils to erode naturally in wind and during infrequent rainstorms.

Soil Types

When making land management decisions based on soil-related hazards or limitations, the BLM evaluates soil surveys available from the Natural Resources Conservation Service. Soils are mapped according to the boundaries of major land resource areas, which are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA 2012). Each soil survey describes the specific properties of soils in the area surveyed and shows the location of each kind of soil on detailed maps. The BLM evaluates soil map units to make management decisions that would likely affect soils. Each soil survey applicable to the planning area describes soil map units by the individual soil or soils that make up the unit.

3.17 CULTURAL HERITAGE RESOURCES

Cultural resource refers to historic or architectural objects, sites, structures, or places with potential public and scientific value, including locations of traditional cultural, ethnic, or religious significance to a specific social or cultural group.

Cultural resources are located, classified, ranked, and managed in order to identify, protect, and use them for public benefit. Fragile and irreplaceable, cultural resources represent an integral part of American heritage and the physical locations of human activity, occupation, or use identified through field inventories, historical documentation, and oral evidence (BLM Manual 8110, Identifying and Evaluating Cultural Resources [BLM 2004f]).

Archaeological resources are a subset of cultural resources that include any material remains of human life or activities that are at least 50 years old and are of archaeological interest (as defined in 43 CFR, Part 7.3). Native American religious concerns, a critical element noted in Appendix 5 of the BLM NEPA Handbook, H-1790-1 (BLM 2008e), are addressed in **Section 3.17**, Tribal Interests (including Native American Religious Concerns).

In the study area, prehistoric or historic cultural resource sites, structures, or objects listed on or eligible for listing on the National Register of Historic Places are managed as directed by 36 CFR, Part 800 (Protection of Historic and Cultural Properties) and the statewide protocol agreements between the BLM and the Nevada and California State Historic Preservation Offices. These

regulations and protocols stipulate that cultural resources must be assessed for integrity of location, design, setting, materials, workmanship, feeling, and association. A property may be considered eligible for listing on the National Register of Historic Places if it retains sufficient integrity of these elements and meets certain criteria outlined in National Register Bulletin 15 (NPS 1997). As listed in 36 CFR, Part 60, historic properties (including prehistoric and historic archaeological sites and places considered important to Native Americans) must meet a specific set of criteria, as follows (NPS 1997):

- The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association
- Association with events that have made a significant contribution to the broad patterns of our history
- Association with the lives of persons significant in our past
- Embodiment of 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 that represent a significant and distinguishable entity whose components may lack individual distinction
- Yielding, or may be likely to yield, information important in prehistory or history

Current Condition

Cultural resources, including historic properties eligible for the National Register, are known to exist in the study area. Potential impacts on cultural resources are unknown and will be determined through future NEPA analysis and decision-making to implement the management goals and objectives set forth in this plan amendment process All future project-related activities analyzed in order to implement the goals and objectives set forth in this plan amendment will comply with Section 106 of the National Historic Preservation Act and the Statewide Protocol Agreements of Nevada and California. Therefore, no further analysis is warranted in this planning document, and cultural resources are not brought forward for detailed analysis in **Chapter 4**.

3.18 TRIBAL INTERESTS (INCLUDING NATIVE AMERICAN RELIGIOUS CONCERNS)

Numerous laws and regulations require consideration of Native American concerns and interests during the federal planning process. These are as follows:

- The National Historic Preservation Act of 1966, as amended
- The American Indian Religious Freedom Act of 1978, as amended
- Executive Order 13007, Indian Sacred Sites

- Executive Order 13175, Consultation and Coordination with Tribal Governments
- Executive Order 3317, DOI Policy on Consultation with Indian Tribes
- The Native American Graves Protection and Repatriation Act of 1990, as amended
- The Archaeological Resources Protection Act, as amended
- The 2012 MOU Regarding Interagency Coordination and Collaboration for the Protection of Indian Sacred Sites
- BLM Manual 8160, Native American Coordination and Consultation (1990d)
- BLM Handbook H-8120-1, Guidelines for Conducting Tribal Consultation (2004g)
- USDA Department Regulations 1340-007 and 1350-002
- Forest Service Manual FSM 1500, External Relations (1990)
- Forest Service Handbook Direction FSM 1509 (2004b)
- NEPA and FLPMA

These laws, regulations, policies, and executive orders provide consultation requirements and procedural guidance to ensure that the consultation process demonstrates "that the responsible manager has made a reasonable and good faith effort to obtain and consider appropriate Native American input in decision making" (BLM 1994).

Current Condition

Archaeological and Paleontological Context

GRSG bones and feathers have been found in archaeological and paleontological contexts dating back 14,000 years in the Great Basin, including the Nevada and Northeastern California Sub-region. The oldest, well-dated GRSG bones (circa 14,000 years ago) come from the Paisley Caves in south-central Oregon (Jenkins et al. 2012). Although the GRSG bones from this period cannot be confidently attributed to human hunting, humans were occupying the site beginning about 14,000 years ago, and thus GRSG hunting was a possibility near these caves. In addition, bones of GRSGs were the most common bird remains found at Smith Creek Cave in east-central Nevada (122 elements; Howard 1952). Most of these bones likely date to circa 14,000 to 12,000 years ago based on dating of other faunal elements at the site, but the GRSG bones have not been directly dated at this time.

The oldest GRSG bones definitely deposited by Native Americans in an archaeological context come from Bonneville Estates Rockshelter in eastern

Nevada (Hockett 2007) and the Paisley Caves in Oregon (Hockett and Jenkins, in press). The Bonneville Estates Rockshelter is in eastern Nevada along the Nevada-Utah border. Burned GRSG bones with stone tool cut marks were found next to hearths dating back 12,000 years ago. GRSGs were one of the most common animals exploited at this time near the rockshelter. Also common in the Bonneville Estates Rockshelter deposits of this time were those of pygmy rabbits (*Brachylagus idahoensis*), suggesting that mature stands of sagebrush once grew near the site. The flat shoreline terraces created by the Late Pleistocene high stands of Lake Bonneville (circa 17,000 to 12,000 years ago) in this region probably created ideal habitats for leks; the Native Americans who occupied the shelter hunted GRSGs off these ancient leks (Hockett 2007).

Burned GRSG bones in an undisputed cultural context dating to circa 12,000 years ago were also discovered recently at the Paisley Caves (Hockett and Jenkins, in press). Of similar age (Late Pleistocene-Early Holocene, circa 11,000 to 9,500 years ago) are the GRSG bones recovered from Danger Cave, Utah, along the Nevada-Utah border north of Bonneville Estates Rockshelter (Jennings 1957; Parmalee 1988a) and those recovered from the Connley Caves in south-central Oregon (Grayson 1977). At the Connley Caves, Grayson (1979) also argued that Native Americans hunted GRSG off leks, based on the ratio of female to male bones identified. Also noteworthy in the Late Pleistocene-Early Holocene deposits at Danger Cave was the recovery of a bone and feathers of the sharp-tailed grouse (*Tympanuchus phasianellus*).

These data suggest that GRSGs have been present in the study area, particularly in northern and eastern Nevada, for at least the past 14,000 years. Native Americans began hunting GRSGs at least 12,000 years ago. The known distribution of GRSGs between circa 14,000 to 9,500 years ago included habitats that currently do not support GRSGs, due to a lack of suitable sagebrush habitat (such as near Bonneville Estates Rockshelter), as well as habitats that continue to support sagebrush and GRSGs (such as near Smith Creek Cave). During the relatively cool and moist climates of the Late Pleistocene-Early Holocene, there were sagebrush habitats that supported active GRSG populations across northern and eastern Nevada.

Following the cool and moist Late Pleistocene-Early Holocene climatic phase, the Great Basin experienced a 4,000-year warm and relatively dry climatic phase during the Middle Holocene (also referred to as the Altithermal) between circa 9,500 to 5,100 years ago. This period witnessed a contraction, but not necessarily a complete extirpation, of sagebrush habitat near Bonneville Estates Rockshelter and the Paisley Caves that earlier supported GRSGs. This climatic phase also witnessed the northern migration of single-needle pinyon pine from areas to the south currently occupied by the Mojave Desert, as well as an expansion of Utah juniper trees, creating the classic pinyon/juniper habitat of central Nevada. Dated GRSG bones are rare for this period. However, following a several millennia absence from Bonneville Estates Rockshelter,

GRSGs were once again hunted by Native Americans and deposited in the rockshelter approximately 7,000 years ago (Hockett 2007). Middle Holocene-aged GRSG remains were also recovered from Hogup Cave, northwestern Utah, near the study area (Baldwin 1970; Parmalee 1970).

The Late Holocene Great Basin (circa post-5,100 years ago) experienced a generally cooler and wetter climate, compared to the Middle Holocene, but several significant subclimatic phases have been identified. These are the Early Late Holocene (circa 5,100 to 3,500 years ago; generally cool), Neoglacial or Neopluvial (circa 3,500 to 2,650 years ago; generally cool and wet), Late Holocene Drought (circa 2,650 to 1,650 years ago; generally warm and dry), Medieval Climatic Anomaly (circa 1,650 to 650 years ago; generally warm and wet), Little Ice Age (circa 650 to 250 years ago; generally cool), and Industrial/Modern (250 years ago to present; increasingly warm).

GRSG dated to the Late Holocene in Nevada and surrounding regions are those recovered from the Early Late Holocene deposits of Mineral Hill Cave in central Nevada (Hockett and Dillingham 2004; James 2004) and those recovered from the Early Late Holocene, Neoglacial/Neopluvial, and Medieval Climatic Anomaly deposits in Hogup Cave in northwestern Utah (Baldwin 1970; Parmalee 1970). In addition, undated Late Holocene specimens have been recovered from Last Supper Cave and Hanging Rock Shelter, both located in the Black Rock Desert region of northwestern Nevada (Grayson and Parmalee 1988; Parmalee 1988b).

Ethnographic Context

During the Industrial/Modern climatic phase of the past 250 years, GRSGs were a common food in the diet of northeastern California and Nevada Native Americans, including the Northern Paiute, Western Shoshone, Pit River, Achumawi, and Atsugewi (Fowler 1986; Garate 1975; Gilmore 1953; Olmstead and Stewart 1978; Steward 1941, 1943; Stewart 1941). GRSGs were generally hunter in the spring at leks. Deadfalls, hunting blinds, nooses, snares, and even nets with associated brush wings were all commonly used (Steward 1941, 1943). In some cases, a hunter wore a deer or antelope costume to hunt GRSGs (Kelly 1932).

There are cursory ethnographic reports of GRSG hunting for the following Paiute bands: *Agai-Panina* (Summit Lake Paiutes), *Atsa'kudökwa-tuviwarai* (Fort McDermitt Paiutes), *Kidü-dökadö/Gidü'tikadü* (Fort Bidwell Paiutes), *Kuyu-dökadö* (Pyramid Lake Paiute Tribe), *Küpa-dökadö* (Lovelock Colony), *Pakwi-dökadö* (Walker Lake Paiutes), *Sawa'waktödö-tuviwarai* (Winnemucca Colony), *Tagö-töka* (Duck Valley Paiutes), *Tasiget-tuviwarai* (Reno-Sparks Indian Colony), *Toe- dökadö* (Fallon Paiutes), *Tövusi- dökadö* (Yerington Paiutes), and *Wada-dökadö* (Burns Paiutes; Deur 2010; Fowler 2002; Kelly 1932; Stewart 1941). Steward (1941) has cursory accounts of GRSG hunting among Western Shoshone bands at Battle Mountain, Egan, Elko, Ely, Hamilton, Ione Valley, Morey, Ruby Valley, and Snake River.

Quantitative information on the significance of GRSGs in the Northern Paiute and Western Shoshone diet, past or present, is lacking. While the bird was hunted in the spring, the meat was dried and could be eaten as long as supplies lasted. Kelly (1932), reaffirmed by Deur (2010), notes GRSGs was and is the most commonly hunted bird by the *Kidü- dökadö*. Among the *Toe- dökadö*, it is a favorite, due to its size and flavor, but GRSGs were no longer common in the Stillwater Range (Fowler 2002).

In addition to being a food source, GRSG wings were used as fans in hunting, and the feathers were used on the ends of arrows by several Paiute and Western Shoshoni bands.

Hunting for the Native Americans in northeastern California and Nevada served more than a means of providing food. As noted by Deur (2010), Hanes (1982, 1995), and Walker and Deward (2010), hunting is a way in which Native Americans preserve part of their cultural traditions. Hunting in traditional areas is an active way of maintaining a tie to their past and a means of preserving cultural traditions. During the hunt, children are taught traditional knowledge and practices by their parents and elders. Hunting is also a means of cementing social relationships: after a successful hunt, the game is shared between the young hunters, their parents, and their extended family.

GRSGs also play prominent roles in some oral traditions. For example, the GRSG has a significant role in Northern Paiute oral traditions. Fowler (2002) and Kelly (1938) collected several variants explaining how the GRSGs saved fire during the world flood. GRSGs, the only bird (or animal in other variants) to survive the flood, protected a fire on a mountaintop, so that the succeeding animals and humans could have it when the flood waters receded. In the Owens Valley Paiute story of how pine nuts came to the world, the GRSG is a minor character that helps with the theft of the pine nuts (Steward 1936).

Leks are also considered important cultural sites by the Northern Paiutes and Western Shoshone since strutting is the basis of the Round Dance (also called Circle Dance; Bengston 2006). Round Dance locations may or may not be near leks. The timing and meaning of the Round Dance varies across the Great Basin, but the dance is tied to marking seasonal subsistence activities and is imbued with cosmological ideas related to renewal of the world and human relationships to the creator/god (Hultkrantz 1986).

Summary of Archaeological, Paleontological, and Ethnographic Evidence for Sage-Grouse in the Study Area

In general, archaeological and paleontological evidence suggest that GRSG populations expanded and contracted across the Great Basin for at least the past 14,000 years. This was in response to climatic conditions that were either favorable or unfavorable to sagebrush. GRSG bones and feathers have been recovered across the entire study region at various times in the past. GRSGs have been hunted in the study area for the past 12,000 years, and were hunted

by Native American families at historic contact. Therefore, Native Americans have hunted GRSGs in the study area from the Late Pleistocene through the Industrial/Modern climatic phases.

Consultation with Modern Native American Tribes

The BLM and Forest Service sent letters to the tribes listed in **Tables 6-1** and **6-2**, requesting a consultation to discuss the details of the GRSG planning efforts. The letters included a fact sheet about the Proposed LUPA/Final EIS and maps showing GRSG preliminary habitat and management units. Each of the tribes listed were also invited to participate in the planning process as cooperating agencies. **Tables 6-1** and **6-2** summarize the tribes consulted, as well as the results of the joint consultation efforts by the BLM and the Forest Service during the Draft and Final phases of the EIS.

Although participating as a cooperating agency is not formal government-to-government consultation, both efforts to outreach and solicit comments by the BLM and the Forest Service and suggestions from tribes (government-to-government consultation and participating as a cooperating agency) are included in **Tables 6-1** and **6-2**. Tribal concerns are summarized below. The implications of the seven alternatives to these concerns that are analyzed in this Proposed LUPA/Final EIS are discussed in **Chapter 4**.

- The Fort McDermitt Tribe is especially concerned with GRSG populations in the Double H Mountains.
- The Summit Lake Tribe is concerned that proposed road realignment projects near their reservation that were planned before GRSG planning may be negatively impacted by management actions in occupied habitat.
- The Summit Lake Tribe is concerned that the GRSG planning will negatively impact plans to expand their reservation boundaries because their reservation is surrounded by priority habitat.
- Access to pine nutting areas used by tribes needs to be maintained.
- Access to leks needs to be maintained, as tribal traditional practices include observing lekking behavior.
- Tribes are concerned how the GRSG planning will affect grazing, as some tribes raise cattle as an economic benefit.
- Crows and ravens are eating GRSG eggs, negatively affecting GRSG populations.
- Raptors roosting and perching on transmission lines are negatively affecting GRSG populations.
- Drought is negatively affecting GRSG populations.

- Four-wheel drive and OHVs creating new roads are negatively affecting GRSG populations.
- In some areas, low-flying jets breaking the sound barrier are negatively affecting GRSG populations by adversely affecting egg development and leks.
- Wind farms are not conducive to GRSG populations.
- Tribes cannot understand why licenses to hunt GRSGs are approved, while GRSG numbers are dwindling.

3.19 LANDS WITH WILDERNESS CHARACTERISTICS (BLM)

The purpose and need of the National GRSG Planning Effort is limited to making land use planning decisions specific to the conservation of greater sage-grouse habitats. No decisions related to the management of lands with wilderness characteristics will be made as part of this planning effort; therefore, management of lands with wilderness characteristics is considered outside the scope of this plan amendment process. Impacts to lands with wilderness characteristics from the alternatives being analyzed for this planning effort are presented in Chapter 4, section 4.16. Other program management direction (e.g., land tenure) may generally affect wilderness characteristics (e.g., exclusion areas would benefit lands with wilderness characteristics but would not guarantee protection because the purpose of and need for the exclusion area in that management direction is not specifically tied to wilderness characteristics.)

As part of the original FLPMA Section 603-mandated inventories, inventories were conducted during past RMP revisions and amendments efforts, and through other various lands with wilderness characteristics inventory updates that have recently taken place. Inventories for wilderness characteristics were conducted between 2009 and 2014. For inventories that were conducted after 2011, findings were documented following guidance in IM 2011-154, Requirement to Conduct and Maintain Inventory Information for Wilderness Characteristics and to Consider Lands with Wilderness Characteristics in Land Use Plans, which is now encompassed in BLM Manuals 6310 and 6320. Lands with wilderness characteristics inventories will be updated for any site-specific project NEPA analyses that are conducted in the planning area to determine if a project will have impacts to lands with wilderness characteristics identified through previous or updated inventory efforts.

Existing Conditions

Beginning in 2009, Nevada BLM updated several inventories for wilderness characteristics associated with specific energy-related projects. These projects include Ruby Pipeline Project, China Mountain Wind Energy Project, Gateway West Transmission Line Project, Spring Valley Wind Project, McGinness Hills Geothermal Project, and Crescent Dunes Solar Project. In addition, some citizen wilderness proposals and recently acquired lands have been inventoried for wilderness characteristics. However, these inventories are limited in scope

and location within the state. Approximately 583,199 acres in 14 units have been determined to possess wilderness characteristics and are identified as LWCs.

With the issuance of BLM manuals 6310 and 6320, District Offices undergoing LUP revision are directed to include analysis and management decisions regarding lands with wilderness characteristics. Currently, Carson City District, Battle Mountain District, and the Southern Nevada District are undergoing new planning efforts and are in the process of completing wilderness characteristic inventories. Elko District is not yet scheduled to initiate the RMP revision process and has not initiated an inventory. Winnemucca District released the Proposed RMP/Final EIS in September 2013 and has completed an area-specific inventory district-wide. The Ely District (Nevada) and Eagle Lake Field Office and Surprise Field Office (California) completed their RMPs in 2008 (BLM 2008d, BLM 2008b, BLM 2008c). These three offices did not include an inventory of wilderness characteristics or make management decisions regarding wilderness characteristics in their land use planning. However, LWC inventories will be updated for any site-specific NEPA analyses of the planning area to determine if a project will have impacts on LWCs identified through previous or updated inventorying.

To date, none of the lands identified as having wilderness characteristics have been designated as being managed for those characteristics within a final LUP. No available statewide GIS data track how lands with wilderness characteristics are being managed, and there is no statewide GIS database available for GIS supported analysis. As such, all lands with wilderness characteristics in this analysis are treated as if their wilderness characteristics are not protected.

Trend

As the BLM completes its inventories of wilderness characteristics, it anticipates that more units might be determined to contain wilderness characteristics. Until an inventory can be completed for all lands in the decision area, lands not yet inventoried for wilderness characteristics will be evaluated when any surface disturbing activity is proposed. Any lands with wilderness characteristics found in this inventory update will be considered in alternative formulation, and impacts of the proposal on their wilderness characteristics will be analyzed and disclosed in individual NEPA analyses. Absent specific management direction for protecting wilderness characteristics, the BLM anticipates that some characteristics may degrade over time depending upon on BLM-administered activities, which will be subject to project-level NEPA.

3.20 VISUAL RESOURCES

Visual resources refer to the visible features on a landscape (e.g., land, water, vegetation, animals, 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 either positive or negative, depending on a variety of factors or conditions (e.g., personal experience, time of day, and weather or seasonal conditions; BLM 1984).

Conditions on BLM-Administered Lands

Visual Resource Inventory

Visual resource inventory involves identifying the visual resources of an area and assigning them to inventory classes using the BLM's visual 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. This process is described in detail in BLM Handbook H-8410-1, Visual Resource Inventory (BLM 1986b).

The results of the visual resource inventory become an important component of the LUP for the area. The LUP establishes how BLM-administered lands will be used and allocated for different purposes; it is developed through public participation and collaboration. Visual values are considered throughout the LUP process, and the area's visual resources are then assigned to the management classes with established objectives.

Based on the three inventory components (scenic quality, sensitivity, and distance zones), lands in the planning area are placed into one of four classes. These class assignments are informational and provide the basis for considering visual values during the LUP process.

Visual Resource Management System

The BLM VRM system categorizes visual land values into four distinct classes. These classes provide direction as to the amount of surface or landscape disturbance that is considered acceptable in each of these classes. The most restrictive class in terms of visual impacts is VRM Class I, and the least restrictive is Class IV. The objectives for each of these classes are as follows:

- Class I—The objective of this class is to preserve the existing character of the landscape. It 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 basic element repetition.

The analysis of a visual contrast rating process is used to resolve visual impacts. The process of a visual contrast rating, which involves comparing the project features with the existing landscape features using basic elements of form, line, color, and texture, is described in detail in BLM Handbook H-8431-1, Visual Resource Contrast Rating (BLM 1986c).

Conditions on National Forest System Lands

Historically, the Forest Service managed visual quality using the Visual Management System. Its key component is the establishment of visual quality objectives.

Visual quality objectives consist of five levels: preservation, retention, partial retention, modification, and maximum modification.

- Preservation—Allows ecological change only. Management activities are prohibited, except for very low visually impacting recreation facilities.
- Retention—Management activities may not be visually evident. Contrasts in form, line, color, and texture must be reduced during or immediately following the management activity.
- Partial Retention—Management 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 or, at a minimum, in the first year.
- Modification—Management activities may visually dominate the characteristic landscape. However, landform and vegetation alterations must borrow from naturally established form, line, color, or texture so as to blend in with the surrounding landscape character. The objective should be met within one year of project completion.

- Maximum Modification—Management activities, including vegetation and landform alterations, may dominate the characteristic landscape. However, when viewed as background they must visually appear as natural occurrences in the surrounding landscapes or character type. When viewed as foreground or middle ground, they may not appear to completely borrow from naturally established form, line, color, or texture. Alterations may also be out of scale or contain detail that is incongruent with natural occurrences as seen in the foreground or middle ground. Contrast should be reduced within five years.

With an amendment to the Forest Service Manual Chapter 2380 in 2003, the Forest Service began transitioning from the Visual Management System to the Scenery Management System. Many National Forests still use the Visual Management System as they transition to the newer scenery management system.

Current Conditions

BLM LUPs and Forest Service Forest Management Plans have identified the visual resource management decisions in each respective document for those BLM districts and Forest Service ranger districts in the planning area. Some of these planning documents are subject to ongoing revision and others have recently been completed. All activities that affect GRSG habitat are subject to the management decisions in these LUPs.

3.21 AIR QUALITY

Meteorological and topographical characteristics in the planning area and the surrounding lands affect the transport, deposition, and dispersion of emissions in the planning area and region. Both emissions and management decisions influence air quality throughout the region, not just in the planning area boundaries. This section describes the existing air quality conditions in the planning area.

Current Condition

The EPA has the primary responsibility for regulating air quality, including seven criteria air pollutants subject to the National Ambient Air Quality Standards (NAAQS). Pollutants regulated under the NAAQS are carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), 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 (SO_2). In addition, California and Nevada have established state standards for hydrogen sulfide (H_2S), and California has established state standards for sulfates (SO_4^{2-}) and vinyl chloride (chloroethene). Two additional pollutants, nitrogen oxides (NO_X) and volatile organic compounds (VOCs) are regulated separately because they significantly contribute to ozone formation in the atmosphere.

Air quality is determined by pollutant emissions and emissions characteristics, atmospheric chemistry, dispersion meteorology, and terrain. Air quality-related values include the 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 individual state and local air quality management districts.

In Nevada, the Division of Environmental Protection, Bureau of Air Quality Planning (BAQP) and Bureau of Air Pollution Control (BAPC) implement air pollution controls for all of the state except for Clark and Washoe Counties. These two counties have their own air regulatory agencies to implement air pollution controls for their respective air districts (counties). These agencies are the Clark County, Health District, Air Pollution Control Division (CCDAQ), and the Washoe County District Health Department, Air Quality Management Division (WCAQMD).

In California, the California Air Resources Board (CARB) and 35 local air district agencies, covering the entire state, implement air pollution controls. In the planning area, only two California air quality management districts are involved: the Lassen County Air Pollution Control District (LCAPCD) and the Modoc County Air Pollution Control District (MCAPCD).

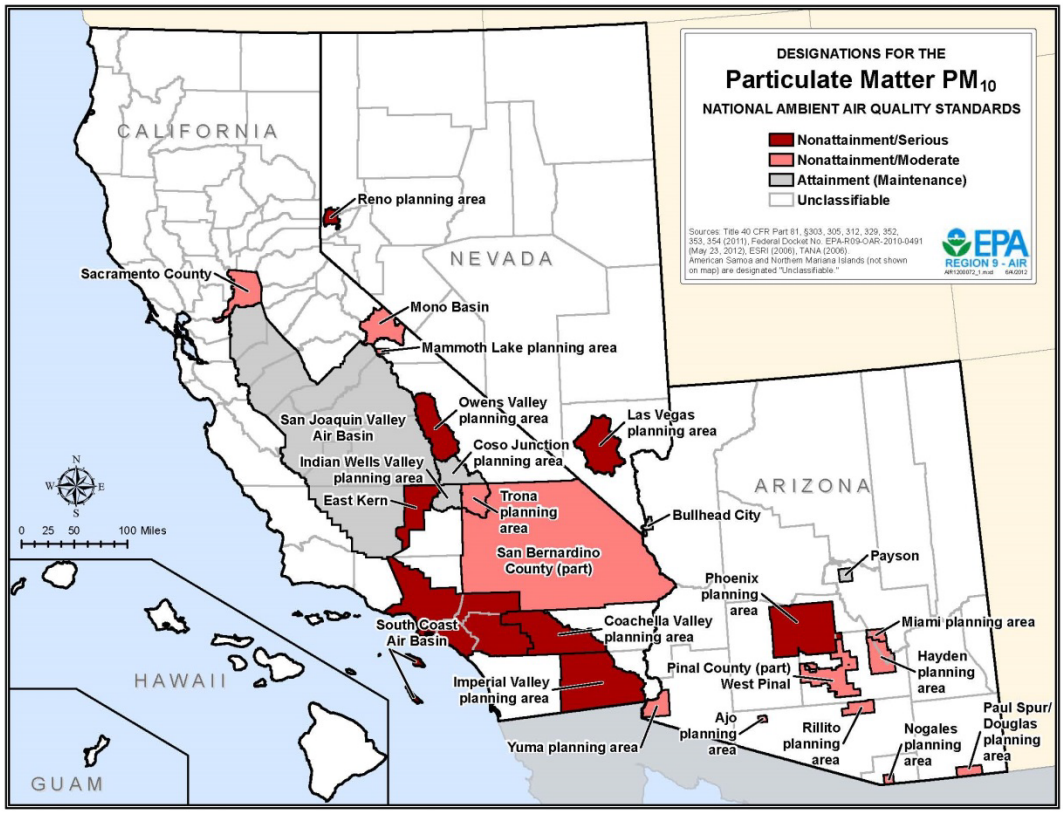
All of these agencies develop state- and air district-specific regulations and issue air quality permits for significant pollutant emission sources.

In the planning area, there is only one locality that is not in compliance with the NAAQS (federal standards). The WCAQMD is classified as nonattainment (at or above the regulatory level) for the federal and Nevada PM_{10} standards (150 micrograms per cubic meter [$\mu g/m^3$] concentration in ambient air). The WCAQMD encompasses all of Washoe County, Nevada; however, the actual subarea in nonattainment is the smaller Reno planning area (see **Figure 3-17**). The balance of the WCAQMD is in attainment of the federal and Nevada standards.

The two California counties in the planning area are in attainment (below the regulatory level) for all of the NAAQS. However, they are in nonattainment of the California PM_{10} standard of 50 grams per cubic meter.

The northern three-quarters of the WCAQMD (Washoe County) contains GRSG habitat but does not show any significant levels of the federal or Nevada regulated pollutants. The Reno planning area portion of the WCAQMD does not contain any GRSG habitat; consequently, the elevated levels of PM_{10} will not impact any known habitat of concern.

Figure 3-17
Designations for the Particulate Matter PM_{10} National Ambient Air Quality Standards



Portions of the LCAPCD and MCAPCD (California's Lassen and Modoc Counties) do contain GRSG habitat; however, since these air pollution control districts meet the federal NAAQS, the measured PM_{10} levels are not considered harmful to the GRSG habitat in these areas.

Ozone and particulate matter (PM_{10} and $PM_{2.5}$) are the most common air pollution emissions of concern in the planning area. Significant levels of these emissions commonly occur at or downwind of major metropolitan areas and industrial developments (e.g., mining and oil and gas operations). Their concentrations, although often significant on-site, are generally mitigated through dispersion downwind before reaching significant GRSG habitat. There is little information concerning the effects of PM_{10} and $PM_{2.5}$ or ozone on GRSG habitat.

3.22 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 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 public lands. Incorporating effective application of climate information into public lands programs, projects, activities, and decisions authorizing use of the public lands is critical for effective management.

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 order's tasks requires each bureau and office in the DOI to analyze the potential climate change impacts in planning exercises and when making decisions affecting DOI resources (Kempthorne 2009).

The BLM is developing its climate change adaptation strategy to provide guidance on how to fulfill the mandate of amendment. This strategy is due to the DOI in September 2013. The current proposal would require additional strategies to be set at the ecoregional scale.

USDA Departmental 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 the following two components:

- Facilitated adaptation, which refers to actions to adjust to and reduce the negative impacts of climate change on ecological, economic, and social systems
- 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.

Current Condition

The CBR ecoregion is a large arid and semiarid area covering approximately 10,855,900 acres of PPH and PGH in the decision area in Nevada, Utah, and California. Considered a cool or high elevation desert ecoregion, the CBR receives low annual precipitation with an average ranging from 7 to 12 inches (WRCC 2013; Fiero 1986).

Precipitation typically falls during the winter as snow in higher elevations, with occasional rainstorms during the summer and fall. The amount of precipitation can vary widely throughout the seasons, where a few wet seasons will be followed by several years of drought. Drought is defined as follows:

- A prolonged chronic shortage of water, as compared to the norm, often associated with high temperatures and winds during spring, summer, and fall
- A period without precipitation during which the soil water content is reduced to such an extent that plants suffer from lack of water (Bedell 1998).

Climatic conditions of the eastern Sierra Nevada and western Great Basin are influenced by the rain shadow effect. This results in relatively little precipitation due to the topography of the Sierra Nevada range, causing the prevailing winds to lose their moisture before reaching the Sierra Front. This topography-influenced weather pattern is repeatedly seen on the leeward side of other mountain ranges. Occasional summer thunderstorms can cause flash flooding and debris flows.

Temperature ranges in the ecoregion typically depend on elevation, where higher elevation areas tend to be cooler than lower elevation areas. Fall precipitation influences the soil moisture conditions before the snowpack forms and explains, in part, the effectiveness of the snowpack in producing runoff.

The daily temperature variation can range in excess of 50°F (Fiero 1986). This is a result of strong surface heating during the day and rapid nighttime cooling because of the dry air. Wind conditions reflect the elevation change and temperature gradient between basin and range. Predominantly westerly winds disperse air pollution (e.g., wildland and prescribed fires from California and poor air quality from the Truckee Meadows population center) over the Great Basin.

Over the past 100 years, this ecoregion has observed vast changes in weather, vegetation cover, and wildland fire, suggesting a change in the ecoregion's climate regime. Tang and Arnone (2013) studied trends in surface air temperatures and extreme temperatures between 1901 and 2010. The analysis showed that the annual, average, daily minimum temperature increased considerably between 1901 and 2010, while the daily maximum temperature

increased only slightly. This resulted in a considerable decrease in the daily temperature during the study period.

Overall precipitation in the CBR has increased over the past 100 years; however, timing of precipitation has changed, resulting in increased streamflows (Baldwin et al. 2003; Chambers 2008). Additionally, there has been a decline in the snowpack in the area since the 1950s, with less precipitation coming as snow and an earlier spring resulting in higher streamflows and impacting plant seasonal cycles (Mote et al. 2005; Chambers 2008).

Changes in temperature and precipitation across the CBR have changed vegetation cover and wildland fire regimes. Much of the area has seen changes in species composition, moving from one vegetation type to another and increasing quantities of invasive species. Many areas once dominated by sage-brush have seen increasing stands of pinyon/juniper, as well as cheatgrass (see **Section 3.3**, Vegetation).

Changes in wildland fire conditions throughout the CBR are considered to be a result of changing vegetation communities, as well as years of fire suppression by humans. With increasing invasive species, fires in the area tend to be flashy and large (see **Section 3.7**, Wildland Fire and Fire Management).

Climate Change Forecast

Nevada and eastern California are home to some of the driest and warmest climates, the most mountainous regions, and the fastest growing metropolitan areas of the United States. Throughout Nevada and eastern California snow-dominated watersheds provide most of the water supply for both human and environmental demands. Increasing demands on finite water supplies have resulted in the need to better monitor drought and its associated hydrologic and agricultural impacts (McEvoy et al. 2012).

The sequence of climate conditions presents variability among water years. Current climate conditions will depend on the continued annual variability in precipitation as it relates to groundwater recharge and soil stabilization, due to the duration of snow cover and the vegetation's response (Germino 2012; Wilcox et al. 2012).

According to Chambers and Pellant 2008, climate change impacts in the Great Basin are expected to result in changes in water resources, species and ecosystems, invasive species, and altered fire conditions. Warmer temperatures will result in more precipitation falling as rain instead of snow, decreasing snowpacks and altering flow conditions. This would lead to higher streamflows during the winter and lower streamflows in the spring and summer, decreasing water available for agricultural use.

Increases in temperature and precipitation can also alter vegetation communities, expanding and contracting different habitats. Invasive weed

communities are also expected to expand based on continued land uses and indirect effects from climate change.

Fire conditions are also expected to change with changing vegetation communities, expansion of invasive weeds, and warmer temperatures, which will elongate the overall fire season.

The USDA provides a water supply outlook for the western United States, including selected streamflow forecasts, a summary of snow accumulation to date, and storage in larger reservoirs. These data are monitored and used as a tool for projected forecasts of the Great Basin.

Most of the usable water in the western states originates as mountain snowfall and accumulates during winter and spring, several months before the snow melts and appears as streamflow. Since the runoff from precipitation as snow is delayed, estimates of snowmelt runoff can be made well in advance of its occurrence. The forecasts of natural runoff in this outlook are based principally on measurements of precipitation, snow water equivalent, and antecedent runoff.

Forecasts become more accurate as more of the data affecting runoff are measured. All forecasts assume that climatic factors during the remainder of the snow accumulation and melt season will interact with a resultant average effect on runoff. Early season forecasts are therefore subject to a greater change than those made on later dates (USDA 2013).

Current conditions show most of the planning area in drought conditions for ten of the past fourteen years (Drought Monitor Archives 2015). Precipitation during this period was below average, with the exceptions of 2004, 2005, 2010, and 2011, which all had higher than average precipitation. Mean average temperature has also been above average for eleven of the past twelve years, the exception being 2011, which was below average. The warmest year on record for Nevada and California since record keeping began in the late 1800's was 2014, with average daily statewide temperatures for Nevada of 53.1°F and 61.5°F for California. The second warmest year on record for Nevada was 2012, with average daily temperatures around 51.8°F. The 2015 water year is proving to be one of the driest on record. The April 1 snowpack was the lowest ever recorded at nearly every measuring site throughout Nevada and at record low levels throughout California. Current streamflow forecasts show most of the major river systems in the planning area will be less than 25 percent of average for 2015 (USDA NRCS 2015), which could result in record low streamflow volumes.

Climate change was analyzed in the CBR REA (Comer et al. 2012a), based on the current conditions in the area. This assessment consisted of a trend analysis, using PRISM and EcoClim datasets to describe natural climate variability over a baseline, from 1900 to 1980, producing 80 years of climate data. The analysis

also used several global climate models analyzed for the Intergovernmental Panel on Climate Change Fourth Assessment Report (IPCC 2007; Comer et al. 2012a). These models projected if future climate change values would exceed natural variability. They were run at two different timescales to display future forecasts, near term (2025) and future (2060).

Although climate models have improved over the past few decades, understanding of climate processes is still lacking, resulting in the use of various assumptions during model construction. The public still criticizes the use of modeled predictions from climate change models, with most frequent dispute being that the models are unreliable for use in public policy and project impact analysis. Reichler and Kim 2008 compared 57 different climate models and measured model performance and the ability to predict current climate conditions. The study concluded that current models, although not perfect, are much more accurate than their predecessors and that an increased level of confidence can be placed on their predictions (Reichler and Kim 2008).

Results for precipitation suggest no strong trend toward either wetter or drier conditions in any month for the CBR. With the exception of a slight increase in summer monsoon rains toward the south and east, there were no significant forecasted trends in precipitation for any other time of year in either the near term (2020s) or mid-century (2050s) projections (Comer et al. 2012).

Results for temperature showed increases in daily maximum temperature, particularly from July to September for 2025 and in July and August for 2060.

Table 3-60 summarizes areal extent of climate change for individual variables that have at least two standard deviations of projected change from the baseline (1900 to 1979; Comer et al. 2012a). The greatest changes were typically seen at the southern end of the study area, near the Great Basin/Mojave transitional area. Model forecasts for minimum temperatures show a considerable change in both rate and magnitude over most of the study area. July through September showed the greatest degree of change over most of the area (see **Figure 3-18** and **Figure 3-19**). Potential effects of these forecasts on the landscape could include increased fuel loads in higher elevations, increased frequency and duration of droughts, expansion of invasive species in higher elevations, increased wind erosion, and changes in wildland fire regimes (Comer et al. 2012a).

In addition to the forecast modeling for temperature and precipitation, climate envelope models were also developed in the REA analysis to indicate magnitudes and directions of shifts in climate regimes based on current distribution of conservation elements. One of the specific conservation elements analyzed in the REA was for GRSG-occupied habitat for 2060. This analysis shows that most of the analysis area will see a loss in habitat, with only a relatively small proportion of current distribution forecasted to retain the climate regime close to that currently supporting this species (Comer et al. 2012a).

Table 3-60
Temperature Variations in the Planning Area

Variable (Month, 2060 Forecast)	Percent of Area with Value > 2 Standard Deviation Departure	Mean Departure from Baseline (°F)	Grid Cells > 2 Standard Deviation (StDev) Departure Forecast 2060		
			Min (°F)	Max (°F)	StDev
January minimum temperature	0.2	7.67	6.24	8.77	0.57
March minimum temperature	0.6	5.62	4.67	6.97	0.50
April minimum temperature	8.9	4.94	3.68	6.71	0.39
May maximum temperature	0.005	5.57	5.57	5.57	NA
May minimum temperature	4.4	4.52	3.79	6.26	0.31
June maximum temperature	6.6	6.52	5.43	9.06	0.39
June minimum temperature	54.6	5.42	4.24	8.22	0.47
July maximum temperature	90.5	5.51	4.25	8.70	0.45
July minimum temperature	90.6	6.03	4.17	9.47	0.59
August maximum temperature	85.1	6.14	4.46	8.59	0.39
August minimum temperature	93.9	6.76	4.71	9.76	0.55
September maximum temperature	9.5	6.09	5.07	7.46	0.42
September minimum temperature	90.6	6.77	4.98	10.12	0.56
October maximum temperature	0.6	7.16	5.68	8.33	0.46
October minimum temperature	61.2	5.76	4.33	8.27	0.58
November minimum temperature	0.1	5.39	4.57	5.87	0.36
December minimum temperature	0.1	6.05	5.43	7.57	0.62

Source: Comer et al. 2012a

Figure 3-18
Forecasted Monthly Maximum Summer Temperature Change (degrees F) by the 2020s, for July, August, and September (Comer et al. 2012a)

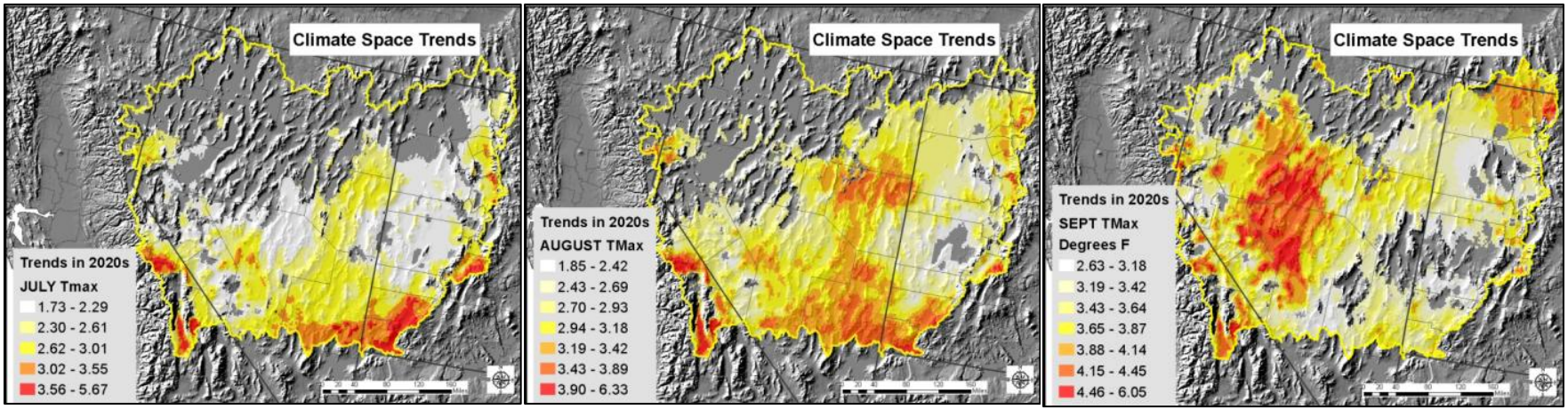
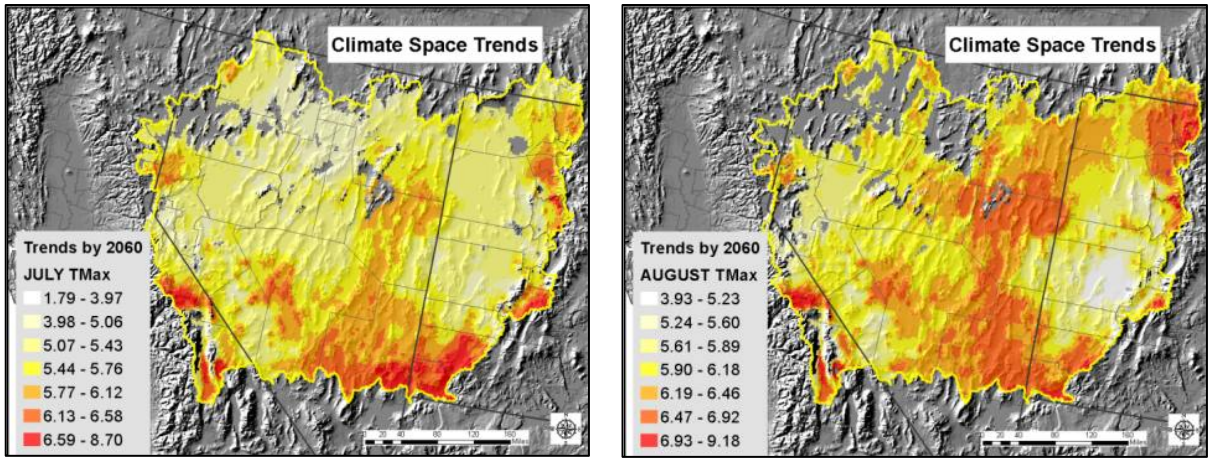


Figure 3-19
Forecasted Monthly Maximum Summer Temperature Increases (degrees F) for 2060, for July and August (Comer et al. 2012a)



Other climate change-related studies in the Nevada planning area are as follows:

- NDOW recently completed a habitat assessment and species vulnerability assessment to climate change as part of its updated Nevada Wildlife Action Plan (NDOW 2013). NDOW contracted with The Nature Conservancy (TNC) to complete predictive modeling of climate change effects on Nevada's vegetative communities.
- The Nevada Natural Heritage Program conducted a wildlife species vulnerability analysis using the NatureServe Climate Change Vulnerability Index evaluation program (Young et al. 2011) to determine which wildlife species exhibited characteristics that might uniquely hinder their adaptation to climate change, including general mobility, physiological challenges, and dependence on certain vegetation types or plant species.
- The GBBO developed data-supported climate change predictions for Nevada's breeding birds using point-count data from the Nevada Bird Count, a 10-year database with georeferencing and coarse-scale habitat association capability. Avian Species of Conservation Priority occurrences in the Nevada Bird Count were geospatially attached to the LANDFIRE map used by TNC to generate the habitats analysis. Results from the TNC analysis were then evaluated for the potential consequences for Nevada's breeding birds, and avian species responses were predicted (NDOW 2013).
- The Connectivity Assessment Group provided an avian climate change analysis to the Nevada Wildlife Action Plan (NWAP) revision process that evaluated possible patterns of movement on the landscape of priority birds, based on the availability and connectivity of suitable habitats as currently understood versus climate change projections in habitat shifts (NDOW 2013).

The results that follow are taken verbatim from the NWAP (NDOW 2013).

Predicted Climate Change Effects

Big Sagebrush Steppe

The Big Sagebrush Steppe currently occurs predominantly in the northern regions: Black Rock, Owyhee, and Elko. In those regions, Big Sagebrush Steppe is relatively intact (more than 75 percent in characteristic classes), but in the Black Rock Plateau and Owyhee Desert regions, sagebrush steppe is heavily weighted in percentage toward the mid-closed class with shrub cover ranging between 31 and 50 percent. In the Elko region, Big Sagebrush Steppe occurs predominantly in the mid-open class under 30 percent shrub cover. The percentage that would roughly represent its mid-closed class in reference condition (18 percent) is currently classified as rabbitbrush (early shrub, 22

percent). The open bunchgrass-dominated stage is largely deficient under current conditions. The 50-year climate change projections predict increases in transition to uncharacteristic classes for these regions: 26 percent in Elko, 45 percent in Black Rock, and 54 percent in Owyhee. Increases in the annual grass class are predicted to stay below 20 percent for each of these regions and tree encroachment (above 20 percent cover) is predicted to occur in about 14 percent of the Black Rock and Owyhee regions, but only 1 percent in the Elko region.

TNC climate change modeling predicts the appearance of Big Sagebrush Steppe in several regions south of the Columbia Plateau in 50 years, including the Calcareous Ranges, Eastern Sierra, Eureka, Humboldt Ranges, Lahontan Basin, Toiyabe, Tonopah, and Walker Corridor. Predicted acreages gained in each region are presented in Appendix G of the NWAP. Big Sagebrush Steppe will be converted primarily from the Montane Big Sagebrush Mountain above what is now the 14-inch precipitation elevation. These converted acreages will be significantly invaded with annual grasses, ranging anywhere from 36 to 84 percent in uncharacteristic classes, mostly occurring in the shrub-annual-perennial class. All but Eastern Sierra (36 percent) will be over 50 percent invaded.

Big Sagebrush Upland

Big Sagebrush Upland occurred in all 13 regions evaluated by TNC. In reference condition, Big Sagebrush Upland should exhibit 84 to 86 percent of its total acreage in the early, mid-open, and mid-closed classes. The early class (10 to 80 percent grass, 0 to 10 percent shrub) is almost non-existent throughout its range, deficient anywhere from 75 to 100 percent in all regions. Most regions also exhibit a significant transition from the mid-open class to the mid-closed and late open/closed classes, indicating that sagebrush age in this biophysical setting is weighted toward the high end with little natural rejuvenation. This is because throughout most of this biophysical setting, stand-clearing events (e.g., fire) are almost always significantly followed by the invasion of annual grasses.

Significant transitioning into uncharacteristic classes (U-classes) has already occurred in most of those regions (Appendix G of the NWAP), particularly the northern half of the state, where percentage in U-classes currently range from 41 to 81 percent, with the exception of the Owyhee (23 percent) and Eastern Sierra (20 percent) regions. In the three southern regions and the Walker Corridor, U-class percentages currently range from 8 to 34 percent.

Climate change modeling indicated that the greatest increases in U-class percentages would occur in those southern regions not currently so advanced in transition, ranging from 13 to 57 percent. The remaining 8 northerly regions increased in U-class percentage less than 10 percent in 50 years with climate change.

Low-Black Sagebrush

The Low-Black Sagebrush biophysical setting occurs in all 13 regions evaluated by TNC. In reference condition, Low-Black Sagebrush should exhibit 15 to 20 percent in the early class, 40 to 50 percent in the mid-open class, and 30 to 40 percent in the late-open/closed classes. Typically, low-black sagebrush in current condition exhibit a healthy 40 to 75 percent in the mid-open class, but early and late classes are invaded by annual grasses with some tree encroachment occurring on the eastern and western borders of the state.

Climate change modeling indicated that 4 of the 13 regions would increase in uncharacteristic class percentages over 10 percent in 50 years (Appendix C of the NWAP), four would increase over 20 percent, and 4 would increase over 30 percent, with the Mojave region transitioning to a 47 percent into U-classes. The eastern side of the state (Elko, Calcareous, and Clover regions) would experience relatively small increases but are largely transitioned to U-classes already (60 to 75 percent). The Black Rock and Owyhee regions would remain relatively intact, starting below 25 percent currently and experiencing 12 to 13 percent increases in U-classes in 50 years.

Low Sagebrush Steppe

The Low Sagebrush Steppe biophysical setting occurs at high elevations in 9 of the 13 regions, absent in the Lahontan Basin, Walker Corridor, Tonopah, and Mojave regions. Low Sagebrush Steppe currently exists in relatively good condition in its northern range (Black Rock, Owyhee, Elko regions) with less than five percent in uncharacteristic classes. Throughout the rest of its Nevada range, the type is already heavily invaded by annual grasses and/or tree-encroached.

Climate change modeling indicated that the northern regions with good condition Low Sagebrush Steppe listed above would transition 12 percent or less to U-classes in 50 years (Appendix C of the NWAP). Across the rest of its range, the type would not transition much further into U-classes, but in the Eureka and Toiyabe regions where current U-class percentage already tops 80 percent, the remaining amount would transition to U-class, while the Humboldt Ranges are predicted to lose their Low Sagebrush Steppe acreages completely in 50 years.

Montane Sagebrush Steppe Mountain

The Montane Sagebrush Steppe Mountain biophysical setting occurs in all 13 regions above the 14-inch precipitation zone and constitutes the upper-elevation element of what is commonly referred to in Nevada as mountain big sagebrush. The type is currently significantly departed from reference conditions in most regions throughout the state without a strong pattern of departure comparable between regions or regional trends (e.g., north, south, east, or west) that can be generally represented. U-class percentages range from 17 (Owyhee Desert) to 81 (Appendix C of the NWAP) percent. Characteristic

classes which should be ranging around 45 percent in the mid-open class are weighted more in the mid-closed and late classes in 10 of 13 regions. Acreage in the early class is almost non-existent, reflecting the continued lack of enough fire activity. The biophysical setting is very productive and should easily recover from fire.

Climate change projections predicted all but two regions (Owyhee and Eastern Sierra) would be over 40 percent transitioned to uncharacteristic classes in 50 years. The largest transitions tended to occur in the southerly regions (Mojave, Clover, Calcareous, Tonopah, and Walker Corridor).

Climate change modeling predicted significant conversion of this to either Big Sagebrush Upland or Big Sagebrush Steppe. Predicted losses by region are reported in Appendix G of the NWAP. Predicted losses in the Montane Sagebrush Steppe mostly run between 18 and 22 percent of its current totals in all regions, with the exceptions of the Elko and Mojave regions (12 and 14 percent, respectively).

Wyoming Big Sagebrush

Wyoming Big Sagebrush occurs in all the evaluated regions except the Mojave. Currently the type is significantly departed from reference conditions in all regions except the Owyhee Desert, where only one percent was classified in any uncharacteristic class (Appendix C of the NWAP). With respect to the distribution of the type between characteristic classes in the Owyhee, there is no early class, and significant invasion by annual grass or juniper encroachment is not yet occurring. All other regions are currently exhibiting greater than 50 percent of their acreage of Wyoming Big Sagebrush in uncharacteristic classes, some as high as 90 percent. For most regions, the bulk of the U-class acreage occurs in the tree-annual grass class. In the Elko region, most of the U-class acreage occurs in rabbitbrush. Both are rather unfriendly habitats to sagebrush-associated wildlife species. Eastern Sierra, Eureka, Humboldt, and Owyhee Desert regions were predicted to increase in U-class percentage over 10 percent in 50 years with climate change. Only Owyhee, Elko, and Eastern Sierra will remain under 60 percent transitioned to U-classes in 50 years.

Possible Wildlife Responses to Climate Change

Sagebrush communities in their characteristic forms provide essential habitat elements for wildlife in several critical ways. The shrub component provides essential nesting structure, protection from the elements (thermal cover), and protection from predators (escape cover). The native grass/forb understory provides food for plant- and seed-eating species, including the important upland forbs for early GRSG brood-rearing immediately after hatch. Rodents such as sagebrush vole, pale and dark kangaroo mouse, and Wyoming ground squirrel depend on the succulent parts, fruits, and seeds of native grasses and forbs. The native understory is also important to the sustenance of abundant, diverse

arthropod[7] communities, which are important food for reptiles, such as the greater and pygmy short-horned lizards, insect-eating mammals, such as Merriam's, Preble's, and Inyo shrew, and all the brood-rearing songbirds, including sage thrashers, Brewer's sparrows, sage sparrows, and loggerhead shrikes. In turn, several of these species are preyed on by predators, including burrowing owls, ferruginous hawks, bald eagles, and prairie falcons.

Predicted high ecological departure in sagebrush communities suggests disruption of many ecological processes required by wildlife species. Primary threats to ecological integrity are the invasion of annual grasses and exotic forbs via wildland fire, land disturbance, and the encroachment of pinyon/juniper trees from their characteristic sites, primarily through natural seed dispersal and fire suppression.

Invasive grasses and forbs change the community by eventually replacing the native understory with species whose seeds and succulent parts are of less nutritional value and are available in nutritious form for a shorter period, compared with the native understory. Eventually, through the change in fire conditions facilitated by annual grass/exotic forb buildup and their better recovery advantage after fire, the shrub component can be lost and the site converted to annual grass/exotic forbs with little natural recovery potential.

Tree encroachment will start a disruptive process that several sagebrush breeding birds, including sage thrashers, Brewer's sparrows, and sage sparrows, avoid in surprisingly early stages of advancement: as low as 6 percent tree cover for sage thrashers (Reinkensmeyer 2000) and around 15 percent for Brewer's sparrows (CalPIF 2005). GBBO bird response analysis predicted that among the three species, sage sparrows demonstrated the greatest negative sensitivity to the presence of trees, with reductions in densities ranging between 87 and 89 percent from absence of trees to presence of trees (NDOW 2013).

Similarly, the Connectivity Study Group Report predicted a 29 percent reduction in area occupied by sage thrashers, 18 percent reduction in area occupied by sage sparrows, and an 11 percent reduction in area occupied by Brewer's sparrows as pinyon/juniper woodland expanded (Fleishman et al. 2012).

Small mammal and reptile response to tree encroachment into sagebrush has been less studied, but intuition would suggest that these species would continue to inhabit sagebrush as long as a native understory and some of the shrub component persist. Tree encroachment can reach a point to where the understory is deprived of sufficient water by the tree root systems and disappears, as reflected in the uncharacteristic tree-encroached class description for several sagebrush communities in this analysis.

[7]Insects, spiders, and crustaceans

Evaluating the relative values of the different classes of sagebrush identifies uncharacteristic classes that will have definite impacts on wildlife's ability to stay on the landscape. For this analysis, the following classes have been identified as unsatisfactory to sagebrush-associated wildlife: annual grassland, early shrub (rabbitbrush), tree-annual grass, and tree-encroached.

The characteristic early classes (usually resultant from a stand-changing event, such as wildland fire or applied management) can be expected to be abandoned by shrub-associated wildlife species for the first 12 or so years. However, since this is a natural rejuvenation process and the sagebrush community is on track for natural succession, it is a stage that results in long-term benefits for the sagebrush wildlife community.

The depleted and shrub-annual grass-perennial grass classes will likely continue to hold shrub-nesting birds, such as sage thrashers, Brewer's sparrows, and sage sparrows. These species seem not to respond to changes in understory condition as long as the shrubs persist, particularly in their mature stages. GRSGs should conceivably find the depleted and shrub-annual/grass-perennial grass classes acceptable as wintering habitat because the understory would be under the snow; however, GRSGs would find the depleted class less suitable during nesting and summer foraging.

The lack of understory impacts nesting success through increased nest predation (Coates and Delehanty 2010) and lack of herbaceous material, and associated plant-eating insects would impact brood nutrition in the first few weeks after hatch (Klebenow and Gray 1968; Gregg et al. 2008). Ground-dwelling small mammals and reptiles may be negatively impacted by the loss of understory in the depleted classes, but necessary research is lacking.

Cumulative increases in the annual grass, early shrub, and tree-encroached classes of sagebrush types after 50 years of climate change consistently averaged between 10 and 25 percent when determined for each region, with some notable exceptions. In the Mojave region, sagebrush types are typically found or associated with mountainous dry washes and are largely restricted to the Spring Mountains and Sheep Range. Here, the cumulative increase in wildlife-unfriendly sagebrush classes reached 58 percent for Big Sagebrush Upland (affecting 9,200 acres), 64 percent for Low/Black Sagebrush (affecting 90,000 acres), and 65 percent for Montane Sagebrush Steppe Mountain (affecting 8,300 acres). The bulk of these increases were predicted to occur in the early shrub class (rabbitbrush), presumably following wildland fire.

The Lahontan region was predicted to transition an average of 46 percent of all its sagebrush communities to unsuitable classes in 50 years, while the Humboldt Ranges were predicted to transition 34 percent and the Clover region 30 percent to unsuitable classes. Large transitions in the Lahontan and Humboldt Ranges might particularly affect the sage sparrow, a species with more prevalent Wyoming big sage biophysical setting than other types of sagebrush. Pygmy

rabbits might particularly suffer range retractions in the two regions, where nearly all types of big sagebrush were predicted to transition over 40 percent to unsuitable classes.

Generally, sagebrush-associated species in Nevada could experience a 10 to 30 percent decrease in acres of suitable habitat over the next 50 years with climate change. GBBO bird population modeling predicted a 14 percent reduction in statewide population for Brewer's sparrows, 20 percent for sage sparrows, and 21 percent for sage thrashers, based on the TNC climate change analysis.

Whether populations will be able to adjust to greater densities in reduced suitable habitat, thus maintaining their current levels, remains to be seen and should be monitored. Evidence suggests that nesting sagebrush songbirds do have demographic capabilities to nest at densities higher than they typically do when unstressed for space (GBBO 2010). How mammals and reptiles might respond to such reductions is largely unknown and should be monitored.

3.23 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

Due to the nature of social, economic, and environmental justice conditions, the social and economic analysis is based on a somewhat different area of analysis than is used for other resources. Specifically, the socioeconomic study area is made up of counties in the Nevada and Northeastern California Sub-region that contain GRSG habitat and in which social and economic conditions might reasonably be expected to change, based on alternative management actions[8].

In addition, the BLM reviewed the need to include additional counties that may not contain habitat but are closely linked from an economic or social perspective to counties that do contain habitat. This latter category includes what are sometimes called "service area" counties, or those where businesses regularly provide critical economic services, such as recreational outfitting or support services for the livestock grazing sector (METI Corp/Economic Insights of Colorado 2012). Including service area counties could be important because a change in economic activity in a county containing habitat may change economic activity in service area counties as well.

[8] As discussed in **Chapter 1**, minor changes to the habitat boundaries used in the draft LUPA/EIS resulted in three additional counties containing GHMA including Lyon and Storey in Nevada and Sierra in California. The GHMA in these counties amounts to about 1,200 acres and represents less than 0.02% of the GHMA in the decision area (none of the habitat falls within PHMA). Given the amount of habitat as well as the analysis of commuting patterns, the BLM does not expect this planning effort to have any measureable socioeconomic impacts in these counties. Therefore, the BLM did not add these counties to the socioeconomic study area. However, for informational purposes, population, employment and earnings data for these counties have been included in **Appendix T**, Detailed Employment and Earnings Data. Additional information related to potential impacts in these counties is provided in the **Chapter 4**.

The socioeconomic study area contains 12 counties, all containing GRSG habitat: two in California (Lassen and Modoc) and 10 in Nevada (Churchill, Elko, Eureka, Humboldt, Lander, Lincoln, Nye, Pershing, Washoe, and White Pine).

The BLM considered whether there would be a secondary study area, made up of counties providing services to the primary study area or linked through commuter patterns. **Table 3-61** shows the share of workers employed in a given county of the socioeconomic study area who reside in the same county. It also shows other counties that provide labor to the county. The table shows that no labor market in the socioeconomic study area relies on a county outside the socioeconomic study area for a considerable share of the workers employed. Some counties (not shown in **Table 3-61** but for example Storey County) do depend considerably on Washoe County as a source of employment; however, because this link is mostly to Reno, which is expected to be less impacted by management alternatives than rural areas of Washoe County, counties economically connected to Reno were not included in a secondary study area. Because the BLM also found no evidence of important service areas outside the counties already included in the study area, it did not identify a secondary study area.

Table 3-61
Commuter Patterns in the Socioeconomic Study Area, 2010

Geographic Area of Employment	Percent Who Live in Same Area of Employment	Other Counties (Percentages) Where A Considerable Share of Workers Live
Primary Socioeconomic Study Area		
Lassen County, California	75.7	Shasta (3.4), Plumas (3.1), and Washoe, Nevada (2.6)
Modoc County, California	63.3	Siskiyou (10.0), Klamath, Oregon (7.5), Shasta (4.7), and Lassen (2.5)
Churchill County, Nevada	70.6	Washoe (9.2), Lyon (6.6), and Clark (2.1)
Elko County, Nevada	75.3	Washoe (2.9), Humboldt (2.5), Clark (2.4), Tooele, Utah (2.4), and Twin Falls, Idaho (2.2)
Eureka County, Nevada	25.3	Elko (56.0) and Lander (10.6)
Humboldt County, Nevada	64.2	Elko (11.7), Washoe (5.8), Pershing (3.9), and Lander (3.8)
Lander County, Nevada	56.8	Elko (18.3), Humboldt (11.8), and Washoe (2.4)
Lincoln County, Nevada	73.2	Clark (15.1) and White Pine (2.2)
Nye County, Nevada	70.1	Clark (19.8)
Pershing County, Nevada	59.0	Washoe (9.6), Humboldt (9.2), Clark (5.1), Lyon (4.7), Churchill (3.4), and Carson City (2.7)
Washoe County, Nevada	80.6	Clark (4.0), Lyon (3.1), Carson City (2.8), and Douglas (2.0)
White Pine County, Nevada	75.7	Elko (9.3), Clark (4.3)

Source: US Census Bureau 2012a

Table 3-62 shows the planning documents that may be altered by the Nevada and Northeastern California Sub-region GRSG planning process and the counties containing GRSG habitat in the area encompassed by those plans. Although this table shows counties other than the 12 listed above, the BLM's analysis of habitat and cross-county labor flows indicates that any economic or social effects in these additional counties resulting from actions analyzed in this Proposed LUPA/Final EIS are likely to be small, relative to the 12 study area counties.

Table 3-62
BLM and Forest Service Plans in the Socioeconomic Study Area, Management Units, and Counties

Agency	Plan or Document	Management Unit	Counties
BLM	Battle Mountain RMP	Battle Mountain District Office (Mountain Lewis and Tonopah Field Offices)	Lander, Eureka, Nye, and Esmeralda (Nevada)
	Black Rock Desert National Conservation Area RMP (2004)	Surprise Field Office, Winnemucca District Office (Black Rock, Humboldt River Field Offices)	Humboldt, Pershing, and Washoe (Nevada)
	Carson City RMP	Carson City District Office (Sierra Front and Stillwater Field Offices)	Washoe, Storey, Carson City, Douglas, Lyon, Churchill, Mineral, and Nye (Nevada); Alpine, Plumas, and Lassen (California)
	Elko RMP (1987)	Elko District Office (Tuscarora Field Office)	Elko, Eureka, and Lander (Nevada)
	Ely RMP (2008)	Ely District Office (Egan, Schell, and Caliente Field Offices)	White Pine, Lincoln, and Nye (Nevada)
	Wells RMP (1985)	Elko District Office (Tuscarora Field Office)	Elko (Nevada)
	Winnemucca RMP	Winnemucca District Office (Black Rock and Humboldt River Field Offices)	Humboldt, Pershing, Washoe, Lyon, and Churchill (Nevada)
	Alturas RMP (2008)	Alturas Field Office	Lassen, Modoc, Shasta, and Siskiyou (California)
	Eagle Lake RMP (2008)	Eagle Lake Field Office	Lassen, Plumas, Sierra (California); Washoe (Nevada)
	Surprise RMP (2008)	Surprise Field Office	Modoc, Lassen (California); Washoe, Humboldt (Nevada)
Forest Service	Humboldt National Forest LRMP (1986)	Ely, Jarbidge, Mountain City, and Santa Rosa Ranger Districts	Nye, Elko, White Pine, and Humboldt
	Toiyabe National Forest LRMP (1986)	Austin, Bridgeport, Carson, Tonopah, and Spring Mountains National Recreation Area Ranger Districts	Nye, Lander, Mineral, Lyon, Eureka, Washoe, Douglas, Clark, Lincoln, and Carson City (Nevada); Mono, Alpine, Sierra, Nevada, Lassen, and El Dorado (California)

Source: BLM and Forest Service 2015

Social Conditions

Social conditions concern human communities, including towns, cities, and rural areas, and the custom, culture, and history of the area as it relates to human settlement and current social values.

Population and Demographics

Table 3-63 shows current and historic populations in the socioeconomic study area. While the population of California grew at nearly the same rate as that of the United States between 1990 and 2010 (24.1 percent and 25.0 percent, respectively), the population in Nevada increased by 124.7 percent over the same period. Both states experienced a higher percentage of population growth from 1990 to 2000 than from 2000 to 2010. From 2000 to 2009, natural increase (births minus deaths) has accounted for 26 percent of Nevada's population growth, and net migration has accounted for about 74 percent.

Table 3-63
Population Growth in the Socioeconomic Study Area, 1990-2010

Geographic Area	1990	2000	2010	Percent Change (1990-2010)
Lassen County, California	27,598	33,828	34,895	26.4
Modoc County, California	9,678	9,449	9,686	0.1
Churchill County, Nevada	17,938	23,982	24,877	38.7
Elko County, Nevada	33,463	45,291	48,818	45.9
Eureka County, Nevada	1,547	1,651	1,987	28.4
Humboldt County, Nevada	12,844	16,106	16,528	28.7
Lander County, Nevada	6,266	5,794	5,775	-7.8
Lincoln County, Nevada	3,775	4,165	5,345	41.6
Nye County, Nevada	17,781	32,485	43,946	147.2
Pershing County, Nevada	4,336	6,693	6,753	55.7
Washoe County, Nevada	254,667	339,486	421,407	65.5
White Pine County, Nevada	9,264	9,181	10,030	8.3
Socioeconomic Study Area	399,157	528,111	630,047	57.8
California	29,811,427	33,871,648	37,253,956	25.0
Nevada	1,201,675	1,998,257	2,700,551	124.7
United States	248,790,925	281,421,906	308,745,538	24.1

Sources: US Census Bureau 1990, 2000, 2010a

In contrast, about 90 percent of California's population growth is due to natural increase, while only 10 percent is due to net migration (US Census Bureau 2009). Population growth between 1990 and 2010 in the separate counties of the socioeconomic study area ranges from a low of negative 7.8 percent growth in Lander County, Nevada, to a high of 147.2 percent growth in Nye County, Nevada. Washoe County, Nevada, which is by far the most populated county in the socioeconomic study area, grew 65.5 percent over the 1990 to 2010 period.

With a population of 225,221, Reno, Nevada, is the largest city in the socioeconomic study area (US Census Bureau 2010a). Reno is the county seat of Washoe County (NACO 2012) and the third largest city in Nevada, after Las Vegas and Henderson. Reno is serviced by three major highways, the Union Pacific railroad, and a number of trucking and airline carriers. Reno's economy is based predominantly in the trade and service sector, with approximately 65 percent of the workforce employed in these occupations. In 2005, *Inc.* magazine named Reno number one on its list of the Best Places to Do Business in America, based on job growth figures from 274 metropolitan areas (City of Reno 2012).

With a population of 90,264, Sparks, Nevada, is part of the Reno-Sparks metropolitan area. Sparks was reported as the fastest growing city in Nevada between 1999 and 2008.

Two large suburbs, Sun Valley (population: 19,299) and Spanish Springs (population: 15,604), are north of Reno and part of the Reno-Sparks metropolitan area. The GRSG habitat in Washoe County is predominantly found to the north of the Reno-Sparks metropolitan area.

With a population of 17,947, the largest California city in the socioeconomic study area is Susanville. The county seat of Lassen County, California (NACO 2012), Susanville is a former mining town and home to two California Department of Corrections and Rehabilitation facilities: High Desert State Prison and California Correctional Center.

Interest Groups and Communities of Place, 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 3-64** shows age and gender characteristics of the population in each county of the socioeconomic study area.

California, Nevada, and the socioeconomic study area generally follow the same trends as the country as a whole, with women comprising approximately 50 percent of the population and an age demographic of 20 to 64, for approximately 60 percent of the population.

Of the counties in the socioeconomic study area, Lassen County, California, and Pershing County, Nevada, have the populations with the highest percentage of males, both at least 14 percentage points higher than the national average. Of the counties in the socioeconomic study area, these two counties also have the highest percentages of working age individuals, both at least 5 percentage points higher than the national average. On the other end of the spectrum, Lincoln County, Nevada, and Nye County, Nevada, have the lowest percentages of working age individuals, both at least 6 percentage points lower than the national average.

Table 3-64
Demographic Characteristics of the Socioeconomic Study Area, Share in Total Population (Percent) 2010

Geographic Area	Women	20 to 64 Years of Age	Under 20 Years of Age	65 Years of Age or Older
Lassen County, California	35.8	69.4	20.6	10.0
Modoc County, California	49.6	56.5	23.8	19.7
Churchill County, Nevada	49.7	57.3	27.5	15.2
Elko County, Nevada	48.1	59.3	32.2	8.5
Eureka County, Nevada	47.3	61.1	26.0	12.9
Humboldt County, Nevada	47.6	60.0	29.8	10.2
Lander County, Nevada	49.3	57.9	30.3	11.8
Lincoln County, Nevada	46.2	52.4	29.5	18.1
Nye County, Nevada	49.5	53.9	22.7	23.4
Pershing County, Nevada	36.8	65.3	21.7	13.0
Washoe County, Nevada	49.5	61.3	26.6	12.1
White Pine County, Nevada	43.4	61.7	23.4	14.9
Socioeconomic Study Area	48.3	60.8	26.5	12.8
California	50.3	60.5	28.1	11.4
Nevada	49.5	60.7	27.3	12.0
United States	50.8	60.1	26.9	13.0

Source: US Census Bureau 2010b

Interest Groups and Communities of Place

There is a range of interest groups in the socioeconomic study area, and the positions advanced by these groups include both overlapping and divergent interests. These groups sometimes define or measure sustainable use or resource conservation differently; these definitions and measures of sustainability sometimes result in different conclusions about how land and resources should be managed.

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. A list of interest groups that requested a copy of the Draft Proposed LUPA/EIS is provided in **Chapter 6**, Consultation and Coordination.

Interest groups in the socioeconomic study area include the following: federal, state, county, and local agencies, congressional representatives, local representatives, academic institutions, civic organizations, local chambers of commerce, environmental groups, land conservation groups, outdoors and sporting groups, local school boards, farm associations, Native American groups and tribal governments, and various business groups.

Specific types of business interest groups include real estate, tourism, mineral extraction, textile manufacturing, crop and livestock farming, and news media.

Residents of Nevada's cities and towns view federal lands as an invaluable open space resource for urban dwellers. For example, the Washoe Comprehensive Plan recognizes the numerous scenic, natural, and cultural values that make Washoe County an attractive and exciting place to visit (Washoe County 2005a). Convenient access to public lands for recreation is one of the area's most attractive features and forms an important element in the personal lifestyle of numerous county residents. The Policies and Action Programs section of the Washoe County Comprehensive Plan includes a policy statement that expresses the intention to maintain the rural character of the planning area and protect its scenic resources, wilderness areas, and natural habitats generally (Washoe County 2005a).

Churchill County's economy is primarily based on agriculture, while also having a strong military presence (BLM 2013c). Churchill County is home to the Naval Air Station Fallon, which hosts over 3,000 military, civilian employees, and Department of Defense contractors (CNIC, undated). Churchill County is also an important producer of renewable energy, generating almost three quarters of the geothermal energy produced in the study area (see **Table 3-72)**.

Churchill County's Master Plan states that its natural areas, historical and archaeological sites, and developed recreation facilities are valued and used by the residents, and they provide significant potential for increasing the tourism economy (Churchill County 2010). A community needs survey was completed in 2004. Of the respondents, 52 percent indicated that parks and recreation were very important, while 38 percent ranked parks and recreation as important. Economic strategy workshops conducted for the BLM's Carson City District LUP and EIS revealed the importance placed by participants on agriculture, military defense, and geothermal energy. They were also interested in maintaining the rural character of the area, although more health care and recreation infrastructure were identified as needed (BLM 2013c).

According to the December 2010 Elko County Public Land Use and Natural Resource Management Plan (Elko County 2010), open space and recreational opportunities are critical to Elko County's economic, historical, and cultural identity. Elko County has a diversified economy built on mining, ranching, recreation, and tourism. Recreation opportunities include camping, hiking, fishing, and hunting.

Elko County also hosts many annual recreational, historical, cultural, and ethnic special events and attractions. The county embraces the multiple use concept of public land management and expects federal land management agencies to maximize public access and use of lands, while addressing environmental concerns.

Mining and cattle ranching are two particularly important economic activities for the county (Elko County 2010). Nearly 73 percent of Elko County is under federal management (Elko County 2010). In 2010, Elko County prepared a study titled The Impact of Federal Land Policies on the Economy of Elko County,

Nevada, presented as Appendix E of the Elko County Public Land Use and Natural Resource Management Plan. This study shows that because a large share of personal income in the county is derived from activities on federal lands or directly from the federal government, changes in federal policies can have considerable impact on the economy (Leaming 2010).

Humboldt County, west of Elko County, is sparsely populated, with most of its population living in the only incorporated city, Winnemucca (BLM 2010d). Public ownership accounts for 80 percent of Humboldt County land use. Less than 1 percent of the land is urban or developed. According to the Humboldt County Regional Master Plan, it typifies a rural intermountain western county.

Its economy is derived substantially from natural resource extraction, primarily mining and agriculture, with mining being the single greatest concentration of resources. Mining-related boom-and-bust cycles have dominated Humboldt's history, and the county's Regional Master Plan aims at a more diversified economy (Humboldt County 2002).

The Pershing County economy is dominated by mining. The long-term goals of Pershing County, as indicated in its 2002 Master Plan, focus on maintaining a rural character, while supporting the existing agricultural and mining industries. The plan advocates concentrating growth in existing developed areas and balancing growth with the desire to protect agricultural and open space land uses. Overall, Pershing County is in a similar position as surrounding rural Nevada and California Counties in its desire to preserve a rural quality of life while promoting reasonable increases in population and economic diversity. Counties like Pershing are highly susceptible to industry-specific fluctuations, due to their less diverse economies. Local mines and the state prison account for nearly half of the county's total employment base. A change in mining regulations could impact the county financially (TMRPA 2010).

In Eureka, Lander, and Nye Counties, specific groups to whom management of public lands is of particular interest include local governments and school districts, ranchers (including those with livestock grazing permits), local sportsmen, mineral claims holders and mineral estate owners, and oil and gas and renewable energy leaseholders. Eureka and Lander are among the least populated counties in the study area.

Mining is a particularly important part of Eureka and Lander's economies; however, with mining jobs often filled by residents of neighboring counties and with the boom-and-bust cycles common to mining-related economies, agriculture has been vital as a steady economic force for the local labor force through the decades (BLM 2011i).

In Nye County, various service sectors, such as retail trade and professional and technical services, are also of particular importance for employment (see **Appendix T**, Detailed Employment and Earnings Data). According to information

provided by the county, local communities and private landowners next to public lands are concerned about the lack of private land available for commercial and residential development or other economic or social uses. In addition, local private landowners are concerned about how the development of public lands may impact the quality or quantity of local natural resources, particularly water.

Additional issues of importance to landowners include rural lifestyle preservation, OHV, and other recreation opportunities (Nye County 2012). Furthermore, special interest groups and individuals who represent resource conservation or resource use perspectives constitute another community with a specific interest in public land management. Various individuals and groups at the local, regional, and national levels are interested in how the BLM administers public lands. Many of their concerns regard wildlife, water quality, and visual quality. They value public lands for open space, wildlife, recreation, and scenic qualities among other aspects (BLM 2011i).

Local residents and organizational interests in Lincoln and White Pine Counties have a strong and often direct relationship with BLM administration of public lands. Many residents of these counties depend at least partially on public lands for their economic livelihood (e.g., ranchers who maintain and operate livestock grazing permits, commercial big game hunting guides and outfitters, individuals employed in mining, and the staff of the agencies themselves).

Some long-time residents see these uses of the land as part of their local customs and culture, which they believe ensures them to at least some preferential consideration. In turn, the revenues generated by those activities help support their local businesses and the function of local government. Maintaining and expanding economic uses of the public lands are important for these stakeholders (BLM 2007e).

Another major stakeholder group in Lincoln and White Pine Counties is local residents who express strong attachments to the public lands for various recreation pursuits and the contributions of such pursuits to their quality of life. These pursuits include rock-hounding, hunting, wildlife viewing, backcountry touring, four-wheeling, OHV touring, and camping. Proximity and ready access to these opportunities, which are ancillary attributes of the rural character and lifestyle of the area, are also key factors influencing their choice to live in the area. Along with factors such as affordable housing and Nevada's favorable personal income tax structure, local economic development interests are promoting outdoor opportunities to recruit retirees and others, to move to the area since their residency choices are largely independent of a specific work site or location (BLM 2007e).

In some areas of the socioeconomic study area, historic, economic, and cultural connections with activities taking place on public lands (e.g., the timber and the livestock industries) may be in a state of transition. For example, the Lassen County General Plan notes that Lassen County has a strong and favorable

historic, economic, and cultural connection with timber production, agriculture, and the livestock industry (Lassen County 1999; BLM 2007f). The plan notes that attitudes and values are subject to compromise because of economic changes and shifting demographics. As people from suburban and urban areas seek out rural communities and accept government, service, or other non-agricultural jobs, they often have different values and expectations regarding resource use and open space (BLM 2007f).

The issue of livestock grazing on federal lands is often cited in rural western communities as epitomizing the relationship of public land use with the lifestyle and economics of these communities (BLM 2007f). A number of ranching operations in Lassen County rely heavily on public grazing allotments.

The agricultural element of the Lassen County General Plan states that the economic viability of these operations depends substantially on the continued and productive use of public rangeland and that there is a direct relationship between federal grazing privilege and the economic viability and real estate value of dependent ranches. The plan maintains that if grazing allotments were no longer available or rendered uneconomical due to unreasonable grazing fees, extensive management requirements, or excessively reduced capacity, the home ranches that depend on public land grazing allotments would lose their economic viability (Lassen County 1999). This could cause or contribute to the failure of small ranching operations that, in addition to the tragic consequences for the families involved, could contribute to the trend to convert valuable agricultural land to other unproductive—but more lucrative—non-agricultural uses. The Lassen County Board of Supervisors firmly believes that such losses to the agricultural base erode basic values and lifestyles cherished by most county residents (Lassen County 1999; BLM 2007f).

Modoc County is mostly rural, with a population of less than 10,000. It developed based on livestock farming, logging, mining, wildlife, and the railroad industries. Modoc County's Comprehensive LUP states that federal and state lands occupy over three-quarters of the county and that its economy depends on commercial and business activities operated on those lands, including cutting, mining, livestock grazing, and commercial and recreational activities. Land use policies include an expectation that private economic activity will be fostered both on private and public lands, including agriculture, sustainable forestry, recreation, mining, and transportation (Modoc County 1995).

Comments received during scoping and included in the scoping reports as well as comments received during the June 2012 Economic Strategies Workshop for planning, reflected many of the themes discussed above (BLM and Forest Service 2012; BLM 2012o). Residents expressed strong support for multiuse management strategies that would maintain or expand access to public lands for grazing, mining, and renewable energy development. Many expressed concern that placing constraints on these existing activities, as well as activities that may

occur in the reasonably foreseeable future, might create economic hardship in their communities and alter traditional cultural values and lifestyles. Some voiced broader concerns about the effects of restricted access to public lands on domestic energy production and the prices of minerals and materials.

Participants in the Economic Strategies Workshop also requested that the BLM address a variety of specific concerns in its analysis of the Nevada and Northeastern California Sub-region, including potential impacts on GRSG habitat not related to humans, major development projects likely to occur in the socioeconomic study area in the reasonably foreseeable future, and potential economic impacts on the hunting and fishing industries.

County Land Use Plans

Federal land administered by the BLM, Forest Service, and other agencies in the socioeconomic study area is intermingled with state and private lands. County governments have land use planning responsibility for the private lands in their jurisdictions. County-level LUPs were identified for nine of the twelve counties in the socioeconomic study area (Lassen County 1999; Churchill County 2010; Elko County 2010; Eureka County 2010; Humboldt County 2002; Lander County 2010; Lincoln County 2007; Nye County 2011; Pershing County 2002). Six of these nine plans (Churchill, Elko, Eureka, Humboldt, Lander, and Nye) include some economic development component, such as promotion of specific industrial sectors and natural resource uses.

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 describes major economic sectors in the socioeconomic study area that can be affected by management actions. Economic activities that rely or could rely on public lands, such as recreation and livestock grazing, are the economic activities that are most likely to be affected.

Economic Sectors, Employment, and Personal Income

The distribution of employment and income by industry sector in the socioeconomic study area is summarized in **Table 3-65** and **Table 3-66**. See **Appendix T** for equivalent data by county.

Employment results for the socioeconomic study area as a whole are driven in large part by Washoe County, which accounted for about 70 percent of the study area jobs in 2010. The largest industry sector in the socioeconomic study area is the services-related sector, which comprised 71.5 percent of total employment in the socioeconomic study area in 2010. This reflects a growth rate of 12.8 percent since 2001 (compared to an overall employment growth rate of 9.4 percent since 2001). Compared with the services-related sector, the government sector and the non-services-related sector represented much lower levels of employment, 14.4 percent and 13.8 percent, respectively.

Table 3-65
Employment by Sector in the Socioeconomic Study Area[1]

Socioeconomic Study Area	Absolute			Percentage of Total		Percent Change 2001-2010
	2001	2010	Change 2001-2010	2001	2010	
Total Employment (number of jobs)	**330,259**	**361,315**	**31,056**	**100.0**	**100.0**	**9.4**
Non-services related	**55,921**	**49,848**	**-6,073**	**16.9**	**13.8**	**-10.9**
Farm	5,070	4,785	-285	1.5	1.3	-5.6
Forestry, fishing, and related activities	1,142	1,087	-56	0.3	0.3	-4.9
Mining (including oil and gas)	9,893	13,224	3,331	3.0	3.7	33.7
Construction	23,414	17,542	-5,871	7.1	4.9	-25.1
Manufacturing	16,402	13,210	-3,192	5.0	3.7	-19.5
Services related	**228,845**	**258,194**	**29,349**	**69.3**	**71.5**	**12.8**
Utilities	1,459	1,057	-402	0.4	0.3	-27.6
Wholesale trade	13,717	11,769	-1,948	4.2	3.3	-14.2
Retail trade	34,985	36,558	1,573	10.6	10.1	4.5
Transportation and warehousing	12,271	14,615	2,345	3.7	4.0	19.1
Information	5,146	4,136	-1,010	1.6	1.1	-19.6
Finance and insurance	13,455	19,855	6,400	4.1	5.5	47.6
Real estate and rental and leasing	12,579	21,710	9,131	3.8	6.0	72.6
Professional and technical services	17,486	21,581	4,094	5.3	6.0	23.4
Management of companies and enterprises	2,311	4,712	2,401	0.7	1.3	103.9
Administrative and waste services	17,304	19,658	2,354	5.2	5.4	13.6
Educational services	1,986	3,790	1,804	0.6	1.0	90.8
Health care and social assistance	22,746	29,561	6,814	6.9	8.2	30.0
Arts, entertainment, and recreation	11,050	11,387	337	3.3	3.2	3.0
Accommodation and food services	48,134	40,376	-7,758	14.6	11.2	-16.1
Other services, except public administration	14,216	17,430	3,214	4.3	4.8	22.6
Government	**44,539**	**51,877**	**7,338**	**13.5**	**14.4**	**16.5**
Federal[2]	8,101	10,065	1,964	2.5	2.8	24.2
State[2]	10,406	14,498	4,092	3.2	4.0	39.3
Local[2]	20,700	26,386	5,686	6.3	7.3	27.5

Sources: Headwaters Economics 2012; BEA 2012a.

Note: Because government employment includes estimates of data not disclosed for state and local employment in two counties in the study area, the sum of local, state, and federal employment is less than the total government employment shown and slightly underestimates state and local government employment.

[1]US Department of Commerce, Bureau of Economic Analysis, data for employment and earnings are used in this chapter and in **Appendix T**. Bureau of Economic Analysis data reflect place of work (not necessarily residence). Proprietor's employment and earnings are counted, although not employment and earnings of unpaid family members and volunteers. For further method details, see http://www.bea.gov/regional/methods.cfm.

[2]The values in the table for Government differ from the sum of the values for Federal, State, and Local because the Government line provided by Headwaters Economics includes estimates for undisclosed data, whereas the three following lines do not.

Table 3-66
Labor Income by Sector in 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	**$15,908.7**	**$16,676.0**	**$767.3**	**100.0**	**100.0**	**4.8**
Non-services related	**$3,466.5**	**$3,279.3**	**-$187.3**	**21.8**	**19.7**	**-5.4**
Farm	$119.9	$177.0	$57.2	0.8	1.1	47.7
Forestry, fishing, and related activities	$40.6	$29.3	-$11.3	0.3	0.2	-27.8
Mining (including oil and gas)	$820.7	$1,200.6	$379.8	5.2	7.2	46.3
Construction	$1,390.1	$1,008.2	-$381.8	8.7	6.0	-27.5
Manufacturing	$1,095.3	$864.2	-$231.2	6.9	5.2	-21.1
Services related	**$9,871.3**	**$10,204.5**	**$333.2**	**62.0**	**61.2**	**3.4**
Utilities	$157.7	$119.8	-$37.9	1.0	0.7	-24.0
Wholesale trade	$842.8	$774.5	-$68.3	5.3	4.6	-8.1
Retail trade	$1,182.1	$1,116.3	-$65.8	7.4	6.7	-5.6
Transportation and warehousing	$648.1	$765.7	$117.6	4.1	4.6	18.1
Information	$293.8	$199.6	-$94.1	1.8	1.2	-32.0
Finance and insurance	$902.3	$763.3	-$139.0	5.7	4.6	-15.4
Real estate and rental and leasing	$283.3	$328.7	$45.4	1.8	2.0	16.0
Professional and technical services	$1,052.4	$1,169.1	$116.7	6.6	7.0	11.1
Management of companies and enterprises	$291.0	$452.2	$161.2	1.8	2.7	55.4
Administrative and waste services	$557.6	$638.7	$81.1	3.5	3.8	14.6
Educational services	$157.4	$212.4	$55.0	1.0	1.3	35.0
Health care and social assistance	$1,251.3	$1,627.1	$375.8	7.9	9.8	30.0
Arts, entertainment, and recreation	$322.4	$281.7	-$40.7	2.0	1.7	-12.6
Accommodation and food services	$1,497.8	$1,161.2	-$336.7	9.4	7.0	-22.5
Other services, except public administration	$431.3	$594.1	$162.8	2.7	3.6	37.8
Government[2]	**$2,766.3**	**$3,482.1**	**$715.7**	**17.4**	**20.9**	**25.9**
Federal	$608.7	$887.0	$278.3	3.8	5.3	45.7
State	$718.9	$884.7	$165.8	4.5	5.3	23.1
Local	$1,162.7	$1,657.4	$494.7	7.3	9.9	42.5
Non-labor Income	**$7,447.5**	**$10,030.7**	**$2,583.2**	**29.8**	**35.3**	**34.7**
Dividends, interest, and rent	$5,279.8	$6,013.1	$733.3	24.4	24.1	13.9
Personal current transfer receipts[3]	$2,167.7	$4,017.6	$1,849.9	10.0	16.1	85.3
Contributions to government social insurance[4]	**$1,626.1**	**$1,718.2**	**$92.1**	**7.5**	**6.9**	**5.7**
Total Personal Income[5]	$24,982.3	$28, 424.9	$3,442.6	100	100	13.8

Sources: Headwaters Economics 2012; BEA 2012a.

Note: Values reported in 2001 dollars were converted to 2010 dollars using the Consumer Price Index (BLS 2012a).

[1]Industry earnings are reported as a share of total labor earnings. Adjustment for residence; dividends, interest, and rent; personal current transfer receipts; and contributions to government social insurance are reported as a share of personal income.
[2]The values in the table for Government differ from the sum of the values for Federal, State, and Local because the Government line provided by Headwaters Economics includes estimates for undisclosed data, whereas the three following lines do not.
[3]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.
[4]Contributions for government social insurance consist 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 (BEA 2012b).
[5]Total personal income is reported by place of residence.

In the services-related sector, the accommodation and food services industry (11.2 percent) and retail trade industry (10.1 percent) accounted for the largest share of employment in 2010, followed by the health care and social assistance industry (8.2 percent). The industries that demonstrated the largest growth between 2001 and 2010 were the management of companies and enterprises industry, with an increase of 103.9 percent, the educational services industry, with an increase of 90.8 percent, and the real estate and rental and leasing industry, with an increase of 72.6 percent.

Eight industries declined in employment levels from 2001 to 2010, including the accommodation and food services industry (16.1 percent decline) and farm industry (5.6 percent decline).

Appendix T provides county-level employment figures for 2010. The greatest difference in industry proportion between counties in 2010 was in the mining industry, which contributed just 0.6 percent of total employment in Washoe County, but contributed a much higher share in Eureka County (79.6 percent), Lander County (44.1 percent), Humboldt County (18.9 percent), and Pershing County (16.2 percent). The employment data is reported by place of work and does not necessarily reflect the sources of income of the population of a given county. Mining in Eureka County is a good example, since mining employs not only Eureka residents but also those of neighboring counties, notably Elko. Note that the data source does not release employment data in three of the counties to protect business confidentiality.

The percentage of employment generated by the accommodation and food services industry also varied across the counties in the socioeconomic study area, from 1.3 percent in Eureka County to 21.6 percent in Elko County. The retail trade industry, which is another recreation-related industry like accommodation and food services, also varied in importance across counties, contributing a low 1.1 percent of employment in Eureka County and higher shares in Lincoln County (11.2 percent), Humboldt County (11.5 percent), and Nye County (11.8 percent).

The arts, entertainment, and recreation industry contributed a consistently low share of employment in all counties (no more than 5.5 percent in any county). Farming also contributed a relatively low share of employment in most counties (with a low of 0.2 percent in Washoe County), although the industry did support a high of 12.7 percent of employment in Modoc County, California. See **Appendix T** for individual county detail.

With respect to personal earnings, the services-related sector accounted for the largest share (61.2 percent) of labor income in the socioeconomic study area in 2010, followed by the government sector (20.9 percent) and the non-services-related sector (19.7 percent).

In 2010, the individual industries that generated the largest shares of personal earnings were local government (9.9 percent), healthcare and social services (9.8 percent), and mining trade (7.2 percent). The management of companies and enterprises, farming , and mining showed strong growth since 2001 (a percent change of 55.4 percent, 47.7 percent, and 46.3 percent, respectively); these were the three highest growth rates between 2001 and 2010. During the same period, information and forestry, fishing, and related activities experienced declines of 32.0 percent and 27.8 percent, respectively, the greatest declines of all the industry sectors.

Appendix T provides county-level labor earnings figures for 2010 by place of work. The county-by-county patterns are similar to those for employment, with relatively more variation in mining-related income; mining contributed the most to earnings in Eureka County, at 92.1 percent, followed by Lander County, at 66.8 percent. Mining labor earnings in Eureka and Lander Counties reflect, in part, labor earnings of residents in neighboring counties. This is reflected in the adjustment for residence. For example, the adjustment for residence for Eureka County was about -$357 million, indicating that almost 80 percent of labor earnings are made by workers who do not live in the county. Alternatively, the adjustment for residence for Elko County was $284 million indicating that a substantial amount of earnings by residents of Elko County are made outside the County.

Mining contributed less than $50,000 to earnings in Modoc County, California. Earnings from the mining sector were left undisclosed in 3 of the 12 counties, due to confidentiality. The share of earnings from the farm industry varied across the 12 counties in the study area. In Washoe County, the farm industry accounted for zero percent of earnings, while farming in Modoc County, California provide 22.1 percent of earnings. The proportion of the county-level labor earnings from the accommodation and food services industry and the retail trade industry, which are both influenced by recreation and travel, differed by county. Accommodation and food services generated 13.2 percent of earnings in Elko County, Nevada, but only 0.2 percent in Eureka County, Nevada. Retail trade provided a maximum of 7.3 percent of earnings in Churchill and Nye Counties, but only 0.2 percent in Eureka County, Nevada. The arts, entertainment, and recreation industry was not a major contributor to earnings in any of the counties.

Table 3-67 presents the unemployment rates for each county in the socioeconomic study area, as well as the rates for the 12 counties aggregated and for California and Nevada.

The data show that the socioeconomic study area has experienced rates of unemployment that are about equal to or lower than those of California and Nevada for each of the years listed. At the county level, in 2011, the

Table 3-67
Annual Unemployment Percentages in the Socioeconomic Study Area, 2007 to 2011

Geographic Area	2007	2008	2009	2010	2011	2012
Churchill County, Nevada	4.5	6.3	8.9	10.6	10.6	9.5
Elko County, Nevada	3.4	4.5	6.5	7.4	7.0	6.1
Eureka County, Nevada	4.3	5.5	6.8	7.6	6.0	6.2
Humboldt County, Nevada	3.7	5.2	7.5	8.1	7.3	6.3
Lander County, Nevada	3.4	4.6	6.0	7.1	6.4	5.3
Lassen County, California	8.2	9.5	12.6	14.0	13.5	12.5
Lincoln County, Nevada	4.4	5.8	9.2	12.6	13.4	13.0
Modoc County, California	8.0	9.6	12.3	14.4	15.0	13.5
Nye County, Nevada	6.8	10.2	14.3	16.5	16.0	13.9
Pershing County, Nevada	5.1	7.3	10.0	10.9	11.2	10.3
Washoe County, Nevada	4.5	7.1	11.4	13.1	12.7	11.3
White Pine County, Nevada	3.8	4.9	7.2	8.8	8.3	7.5
Socioeconomic Study Area	4.7	7.0	10.8	12.4	12.0	10.6
California	5.4	7.2	11.3	12.4	11.8	10.4
Nevada	4.7	7.0	11.6	13.7	13.2	11.5

Source: BLS 2014

unemployment rate ranged from a low of 6.1 percent in Elko County, Nevada, to a high of 13.9 percent in Nye County, Nevada.

Recreation

Approximately 52,600 jobs (24.6 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, the local economy, and the local population. It includes both full- and part-time jobs. Most of these jobs are concentrated in the accommodation and food services sector.

In 2010, the socioeconomic study area's proportion of travel and tourism-related jobs was 9.5 percentage points higher than the national average of 15.1 percent. 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 other sectors. The average annual wage per travel- or tourism-related job was $20,823 (2010 dollars) in the socioeconomic study area in 2011, compared to $48,787 for jobs unrelated to travel and tourism (Headwaters Economics 2012).[9]

Although much of the recreation on BLM-administered lands is dispersed and far from counting devices (e.g., trail registers, fee stations, or vehicle traffic

[9]All dollar values were converted to 2010 dollars using the Consumer Price Index (BLS 2012a).

counters), approximations of the number of visitors to BLM-administered land can be obtained from the BLM Recreation Management Information System (RMIS) database. The BLM recreation specialists provide estimated total visits and visitor days to various sites.[10]

Table 3-68 summarizes BLM visitation data in the study area for fiscal year ending September 30, 2011, and Forest Service visitation data from Round 2 of the National Visitor Use Monitoring program (NVUM).

Table 3-68
Estimated Annual Visits by Planning Unit

Planning Unit	Number of Visits
Carson City District Office	1,007,842
Caliente Field Office	30,073
Egan Field Office	1,034,655
Schell Field Office	160,867
Black Rock Field Office	110,772
Humboldt River Field Office	240,248
Mount Lewis Field Office	97,814
Tonopah Field Office	160,358
Tuscarora Field Office	951,100
Wells Field Office	280,945
Alturas Field Office	33,401
Eagle Lake Field Office	174,433
Surprise Field Office	75,400
Humboldt-Toiyabe National Forest	1,796,132
Total	**6,154,040**

Source: Data for BLM field offices are for fiscal year 2011 (BLM 2012p); data for the Humboldt-Toiyabe National Forest are for fiscal year 2007 (Forest Service 2012f). Fiscal year 2011 is the year ending September 30, 2011.

Note: For the Carson City District Office, recreation data were not available for the two field offices, Stillwater and Sierra Front.

Visitor expenditures can be approximated using the RMIS data in conjunction with data from Forest Service, which has constructed recreation visitor spending profiles based on years of survey data gathered through the Forest Service NVUM. Although the data are collected from National Forest visitors, the analysis that follows is based on the NVUM profiles because the BLM has no analogous database.

[10]In RMIS, a visit is defined as the entry of any person onto lands or related waters administered by the BLM for any 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.

The profiles break down recreation spending by type of activity, day use versus overnight use, local versus visitors, and non-primary visits (i.e., incidental visits where the primary purpose of the trip was other than visiting public lands).

Table 3-69 summarizes individual and party visits and expenditures by trip type and estimated direct expenditure.

Table 3-69
Visitor Spending from Recreation on BLM 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)
Visitor day trips	10	489,675	2.5	195,870	$63.68	$12.5
Visitor overnight on public lands	9	464,057	2.6	178,483	$237.27	$42.3
Visitor overnight off public lands	14	753,798	2.6	289,922	$522.63	$151.5
Local resident day trips	49	3,302,861	2.1	1,572,791	$33.56	$52.8
Local resident overnight on public lands	4	228,200	2.6	87,769	$165.14	$14.5
Local resident overnight off public lands	1	97,463	2.4	40,610	$216.48	$8.8
Non-primary visits	13	817,986	2.5	327,194	$376.62	$23.2
Total		**6,154,040**		**2,692,639**		**$405.6**

[1]Visits on BLM-administered land estimated using the national average distribution of trip types for all National Forests (White and Gooding 2012). Visits on National Forest System lands by trip type are provided in NVUM (Forest Service 2012f). Estimated party spending per visit is converted from 2009 to 2010 dollars using the Consumer Price Index (BLS 2012a).

As **Table 3-69** shows, the estimated total visitor spending on BLM-administered and National Forest System lands in the socioeconomic study area was about $405.6 million in FY 2011. It is important to note that this includes expenditures from local residents and from visitors whose use of public lands was incidental to some other primary purpose.

Grazing

Farming, including ranching (livestock grazing), employed approximately 4,785 people in the socioeconomic study area in 2010, accounting for 1.3 percent of total employment. This includes labor of farm proprietors, although not of unpaid family labor. The average annual wage for a farm job (including ranching) in the socioeconomic study area was $27,965 in 2010. This was lower than the average annual wage for a non-farm job of $41,963 (Headwaters Economics 2012).

Data from the 2012 agricultural census show higher numbers with hired farm labor reaching 6,992 people in the study area (USDA NASS 2014).

Table 3-70 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 Nevada and California as a whole.[11]

Table 3-70 shows that the relative contribution of farm earnings varies substantially across the counties in the socioeconomic study area and that the share of farm earnings is greatest in Modoc County (22.1 percent), Pershing County (7.7 percent), and Lassen County (5.0 percent). Farm earnings in all other counties in the socioeconomic study area made up less than four percent of total earnings.

Table 3-70 also shows that the relative contribution of farm earnings from livestock varies substantially across the counties in the socioeconomic study area and that the share of farm earnings from livestock is greatest in Elko County (96.6 percent), Nye County (95.0 percent), Churchill County (82.8 percent), and White Pine County (77.0). Farm earnings from livestock in all other counties in the socioeconomic study area made up less than 54.3 percent of the total farm earnings.

The right-most column of **Table 3-70** combines the information on relative contribution from livestock with the information on farm earnings as a share of all earnings. This should be interpreted as an approximate measure; even so, it is useful to identify counties in which livestock grazing contributes the greatest portion of overall earnings: Modoc in California and Pershing and Nye in Nevada.

Table 3-71 provides information on active and billed AUMs on BLM-administered and National Forest System land for each of the BLM field offices and National Forest areas. The estimated gross receipts data in the table are calculated from data from the USDA Economic Research Service (ERS), which publishes annual gross receipts for cow-calf operations for different production regions across the country (USDA ERS 2012). Gross receipts reflect the sales value for output from cow-calf operations.

The BLM calculated a ten-year inflation-adjusted average value per cow-calf operation from the ERS 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).

[11]All dollar values were converted to 2010 dollars using the Consumer Price Index (BLS 2012a). Note that farm cash receipts vary considerably from year to year and that the primary purpose of the table is to highlight relative representative shares of earnings and the relative importance of crops and livestock.

Table 3-70
Farm Earnings Detail in the Socioeconomic Study Area, 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	Estimated Share of Earnings from Livestock[3]
Lassen County, California	5.0	(D)[2]	$81.9	32.9	67.1	1.6
Modoc County, California	22.1	3.3	$112.1	33.3	66.7	7.4
Churchill County, Nevada	2.3	(D)	$69.4	82.8	17.2	1.9
Elko County, Nevada	1.4	(D)	$63.6	96.6	3.4	1.4
Eureka County, Nevada	1.2	(D)	$24.1	37.3	62.7	0.4
Humboldt County, Nevada	3.8	(D)	$80.8	41.6	58.4	1.6
Lander County, Nevada	2.3	(D)	$19.2	52.6	47.4	1.2
Lincoln County, Nevada	0.9	(D)	$16.6	54.3	45.7	0.5
Nye County, Nevada	3.1	(D)	$64.2	95.0	5.0	2.9
Pershing County, Nevada	7.7	(D)	$42.6	53.4	46.6	4.1
Washoe County, Nevada	0.0	(D)	$20.9	47.2	52.8	0.0
White Pine County, Nevada	1.6	(D)	$17.2	77.0	23.0	1.2
Socioeconomic Study Area	1.1	3.3	$612.6	57.4	42.6	0.6
California	1.2	0.5	$38,176.9	27.7	72.3	0.3
Nevada	0.2	0.0	$556.5	60.7	39.3	0.1

Sources: Headwaters Economics 2012; BEA 2012a. Values reported in 2001 dollars were converted to 2010 dollars using the Consumer Price Index (BLS 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]Indicates that the value is not released to the public by the Bureau of Economic Analysis to avoid disclosure of confidential information.
[3]Calculated by multiplying the share of farm earnings by the share of cash receipts from livestock.

Table 3-71
Active and Billed AUMs

Planning Unit	Active (2011)	Billed	Billed (Average 2000-2011)	Cattle (Percent)	Sheep (Percent)	Other (Percent)	Allotments	Acres per AUM	Gross Receipts ($Millions)
Alturas Field Office	51,918	58	30,185	100	0	0	138	8.8	$1.52
Black Rock Field Office	55,619	93	51,580	94	6	0	11	33.5	$2.59
Caliente Field Office	170,614	32	53,776	96	3	1	97	29.5	$2.70
Eagle Lake Field Office	51,958	63	32,531	90	10	0	53	19.2	$1.63
Egan Field Office	147,479	39	58,076	75	24	0	64	24.5	$2.92
Humboldt River Field Office	279,331	70	195,806	96	4	0	95	26.5	$9.84
Mount Lewis Field Office	250,371	73	182,630	89	11	0	60	17.3	$9.18
Schell Field Office	199,641	42	83,623	57	43	0	71	12.4	$4.20
Sierra Front Field Office	57,560	53	30,409	88	12	0	42	19.9	$1.53
Stillwater Field Office	101,117	60	60,925	99	0	0	36	38.6	$3.06
Surprise Field Office	87,857	74	64,828	95	5	0	49	16.5	$3.26
Tonopah Field Office	134,092	64	85,800	100	0	0	31	45.4	$4.31
Tuscarora Field Office	372,320	64	239,593	97	2	0	142	8.0	$12.04
Wells Field Office	320,578	67	216,229	92	8	1	97	13.1	$10.86
Humboldt-Toiyabe National Forest	276,191	85	234,786	79	21	0	N/A	N/A	$11.80
Total	**2,556,646**								**$81.43**

Sources: BLM 2012l; Forest Service 2012g, 2013d; Workman 1986; USDA ERS 2012

N/A—Not available
Gross receipts are calculated based on billed AUMs and ten-year average expenditures, as described in the text.

Note: For the Humboldt-Toiyabe National Forest, active AUMs are for 2013. Active and billed AUMs are estimates for the portion of the National Forest in the planning area and were estimated based on the share of total Humboldt-Toiyabe National Forest area that is in the planning area and were estimated based on the share of total Humboldt-Toiyabe National Forest area that is in the planning area.

Based on these calculations, the BLM estimates that ten-year average gross receipts in the socioeconomic study area come to $50.24 per AUM (2010 dollars), which is reflected in the table below. Because sheep are a small share of the livestock, any difference in gross receipts between cow and sheep operations have little impact on the overall receipt estimates.

The data in the table help to demonstrate the importance of livestock grazing throughout the socioeconomic study area, although there is more grazing on

federal lands in some counties than in others. For example, the importance of grazing on federal lands in Elko County (Tuscarora and Wells Field Offices) is supported by **Table 3-71** and existing studies (e.g., Alevy et al. 2007).

Between 2000 and 2011, billed AUMs decreased by approximately 20.4 percent on BLM-administered lands in the planning area and by approximately 3.6 percent on the portion of Humboldt-Toiyabe National Forest in the planning area. Billed AUMs fluctuate considerably, and grazing has actually increased in some areas during this period (e.g., Wells Field Office). It is also important to remember that the data are only for forage values on BLM-administered and National Forest System land; forage on other public lands and private lands contribute additional values to the socioeconomic study area, as well as fiscal revenues. 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 and compares impacts of the alternatives with one another.

In addition to contributing additional forage for raising livestock, making public lands available for grazing provides additional benefits to the holders of federal permits. Research has demonstrated that in most cases, grazing permits increase the property value of the ranch holding the permit.

Various factors have been explored to explain this effect. Significantly, the research has found that the added forage and relatively low permit fees for grazing on BLM-administered and National Forest System lands do not entirely explain the increase in property value associated with the permit itself. Research has found that the added acreage associated with a public land permit is perceived as adding semiprivate open space to the property and thus increases the value of the ranch. Examples of this research include Rimbey et al. (2007) and Torell et al. (2005). However, since the federal government administers the lands, note that any premium to property values is a result of amenity perception rather than ownership, since any public land grazing permit is associated with publicly, not privately, owned land.

Forestry and Wood Products

Timber-related industries in the socioeconomic study area employed over 655 people in 2010, approximately 0.3 percent of total employment, according to the US Census Bureau County Business Patterns. No county had more than 50 timber jobs, except for Washoe County, with 597, making up 90 percent of the socioeconomic study area's timber labor force. 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. The share of timber-related jobs in the socioeconomic study area (0.3 percent) was 0.5 percentage points lower than the national average of 0.7 percent (Headwaters Economics 2012).

Average annual earnings for timber-related jobs tend to be higher than for non-timber jobs. However, the average annual wage per timber-related job in the socioeconomic study area in 2010 was $39,532 (2010 dollars), compared to $41,840 for non-timber jobs.

Collecting wildlings (live transplants) and woody biomass, cutting Christmas trees, and using wood for posts are all allowed on BLM-administered lands with a permit or through purchase. Permits are also available on BLM-administered and National Forest System lands for collecting firewood. Collecting pinyon pine nuts and campfire wood are also allowed (BLM 2012o).

Renewable Energy Resources

There is one active solar energy project in the Battle Mountain portion of the planning area, in Nye County, with production of approximately 110 megawatts anticipated for 2014 (BLM 2011j). There is also a solar power plant in Churchill County, Nevada, which is forecasted to produce 43 million kilowatt-hours of energy per year (ENEL Green Power 2013).

There are four wind projects in the monitoring stage in the Battle Mountain portion of the planning area. Meteorological towers are in Nye County, Esmeralda County, and Lander County (BLM 2011j). At least eight project areas have been proposed for wind energy development in the Ely planning area, but these are still in the wind energy monitoring phase (BLM 2007d, 2013c).

There has been some interest in developing wind energy in the Winnemucca planning area. Current activity includes placing meteorological towers (BLM 2010d). The BLM deferred the final decision on a proposed commercial-scale wind energy project, located in part in Elko County, until the completion of the GRSG Proposed LUPA/Final EIS process (BLM 2012q).

As of April 2013, there were two wind testing projects authorized by the BLM in the Eagle Lake Field Office and a development project waiting for authorization. In the Surprise Field Office there were three wind testing projects authorized and one additional testing project waiting for authorization (BLM 2013c).

Geothermal resources in Nevada provide an important economic contributor to the state; by some estimates, the geothermal industry in Nevada could be worth up to $22.5 billion over the next 30 years; 86 planned or developing geothermal power plants in Nevada have the potential to add nearly 3,700 megawatts of power, enough to power 2.6 million homes (Geothermal Energy Association 2010). According to the Geothermal Energy Association (a trade association), 20 recipients in Nevada were awarded a combined $73.6 million in Department of Energy funding via the American Recovery and Reinvestment Act and other appropriations.

The Geothermal Energy Association reports that as of 2010, Nevada had generated over $44 million from BLM geothermal leasing activities and that the state and counties with geothermal resources should receive an additional $12.9 million from 2010 BLM leases. According to the trade association, this could create significant economic activity for rural counties with geothermal resources, as well as environmental benefits from corresponding reductions in carbon dioxide emissions (Geothermal Energy Association 2010).

Table 3-72 provides sales volume and sales value for geothermal resources managed by the BLM, using data from the DOI Office of Natural Resources Revenue (ONRR). The data underscore the importance of geothermal resources on BLM-administered resources in Churchill County, in particular.

Table 3-72
Geothermal Electrical Generation: Sales Volume and Sales Value from BLM-Administered Resources, FY2011

County	Sales Volume (kilowatt-hour)	Sales Value (Millions)
Churchill	734,107,309	$33.9
Eureka	3,131,249	$0.1
Humboldt	110,920,485	$8.7
Lander	54,289,404	$2.2
Pershing	27,597,213	$0
Washoe	89,784,995	$1.3
Total	**1,019,830,655**	**$46.2**

Source: ONRR 2012

There are six geothermal projects in Churchill County (NV Energy 2014):

- The 24-megawatt Brady Geothermal Power Plant started producing energy in 1992
- The 25-megawatt Desert Peak geothermal power station started producing energy in 2007
- The 51-megawatt Dixie Meadows geothermal power station is expected to start producing electricity in 2015
- The 23.6-megawatt Salt Wells Geothermal Plant started producing energy in 2009
- The 23.1-megawatt Soda Lake 1 and 2 Geothermal Plants starting producing energy in 1987 and 1991
- The 47.2-megawatt Stillwater 2 Geothermal Plant started producing energy in 2009
- A 22-megawatt solar field was added to the plant in 2012 (NV Energy 2014)

As of 2007, the Battle Mountain planning area had 86 authorized geothermal leases covering 97,005 acres, two pending geothermal applications covering 12,137 acres, one recently permitted plan of development for geothermal leasing, and one existing geothermal plant. About 20 percent of the lands in the Battle Mountain District are potentially valuable geothermal resource areas, mainly in Esmeralda and Lander Counties. Pending lease application sites cover less than one percent of the potentially valuable lands and are located in Nye and Lander Counties (BLM 2011j).

There are no known geothermal resource areas in the Ely planning area and only one active geothermal lease (BLM 2007d). In the Elko planning area, the Beowawe geothermal power station (Eureka County) started producing energy in 2006 (NV Energy 2013), and the 32-megawatt Tuscarora project (Elko County) was completed in 2012 (Ormat 2012).

Geothermal energy resource exploration and development has increased in the Winnemucca planning area. As of 2006, there were 109 geothermal leases, 5 pending geothermal applications, and 6 known geothermal resource areas in the planning area. Two large and one small geothermal exploration projects were permitted in 2006 and 2007. In addition, there were three power plants and two vegetable dehydration plants in operation in the planning area, ranging in generation capacity from 5.8 to 30 megawatts (BLM 2010d).

In the Eagle Lake planning area, the Honey Lake Power Plant in Lassen County, is using a combination of biomass resources and geothermal sources in the Wendel-Amadee Known Geothermal Resource Area to generate up to 30 megawatts of electrical power per year (Greenleaf Power 2013; BLM 2007e). In the near future, at least one other geothermal facility will likely be developed in the known geothermal resource area (BLM 2007e). Although geothermal leasing is encouraged, activity is sporadic to nonexistent in the Surprise planning area (BLM 2007f).

In many areas there are warm springs used for pools, spas, and space heating (Nevada Bureau of Mines and Geology 2000). Biomass technology is being used in the Ely planning area for heating one of the White Pine County schools (BLM 2007d). As previously noted, the Honey Lake Power Plant, in Lassen County, is a cogeneration biomass and geothermal plant (Greenleaf Power 2013; BLM 2007f). The BLM is cooperating with Modoc County on a biomass study area using juniper for biomass fuel (BLM 2012r), and other individual biomass projects are under development in Modoc County.

As previously mentioned, firewood collection is allowed on BLM-administered and National Forest System lands with a permit. Although wood for heating is relatively low among households (1.8 percent in California and 1.3 percent in Nevada; US Census Bureau 2011), its use can be much more important in rural areas. In Modoc County, 37.5 percent of households use wood as heating fuel, and in Lassen County, 30.1 percent do so (US Census Bureau 2011). Census

data show that wood for heating grew faster between 2000 and 2010 than other heating fuels, and low- and middle-income families are more likely to rely on it for heat (Alliance for Green Heat 2011).

Mining and Minerals

The overall value of mineral and energy production in Nevada reached an all-time high of $7.72 billion in 2010. Nevada led the nation in the production of gold, barite, and gypsum and was the only state that produced magnetite, lithium, and two types of specialty clays, sepiolite and saponite (Nevada Bureau of Mines and Geology 2010). Locatable minerals (such as gold and gypsum) may occur on private or public lands. Those under federal lands (and those owned by the federal government under private or state lands) require the establishment and maintenance of a mining claim and payment of maintenance fees.

In 2010, Nevada's production of gold, valued at $6.5 billion, was 73 percent of the total gold production in the United States, helping to make the United States the third largest gold producer in the world. Nevada alone accounted for 7 percent of world production of gold. Gold mining is heavily located in the northern and central part of the state, particularly Elko, Eureka, and Lander Counties. In 2010, Nevada's largest gold operations included Barrick Gold Corporation's mines (1.2 million ounces) and Newmont Mining Corporation's mines (0.9 million ounces) on the Carlin trend in Eureka and Elko Counties; Barrick Gold Corporation's Pipeline and Cortez Hills mines (1.1 million ounces) in Lander County; Newmont's Twin Creeks mine (0.45 million ounces) in Humboldt County; and the Kinross-Barrick Smoky Valley joint venture Round Mountain mine (0.4 million ounces) in Nye County. Combined, Barrick and Newmont accounted for 81 percent of Nevada gold production in 2010 (Nevada Bureau of Mines and Geology 2010).

In counties with relatively small populations (e.g., Eureka), smaller mines can be of particular importance due to the share of the labor force employed.

Nevada's silver production in 2010, which totaled 7.36 million ounces, was generally a co-product or byproduct of gold mining and was produced at a value of $149 million. Nevada's silver production in 2010 accounted for 18 percent of the US total and 1 percent of the world total. With a ratio of value (i.e., average price of gold to average price of silver) of 61:1 in 2010, only those deposits with more than 61 times as much silver as gold can be considered primary silver deposits. Only one such deposit, the Coeur Rochester Mine in Pershing County, was being mined in Nevada in 2010, with a silver-to-gold production ratio of 210:1 and total silver production of 2.0 million ounces. The Coeur Rochester Mine produced 27 percent of Nevada's silver in 2010 (Nevada Bureau of Mines and Geology 2010).

Other mineral production values in Nevada in 2010 were the following: copper, $438 million; barite, $49 million; gypsum, $12 million; and petroleum, $27

million (Natural Resource Industry Institute 2011; Nevada Bureau of Mines and Geology 2010).

In 2010, Nevada's copper production was dominated by the Robinson copper-gold-silver-molybdenum mine, operated by Quadra Mining Ltd. near Ely in White Pine County. Byproduct copper was also produced at Newmont's Phoenix project near Battle Mountain in Lander County. One major contributor to the production of molybdenum in Nevada in 2010 was the Golden Phoenix's Ashdown Mine in northwestern Humboldt County, producing approximately 350 thousand pounds valued at $5.6 million (Nevada Bureau of Mines and Geology 2010).

Table 3-73 provides sales volume and sales value for oil resources managed by the BLM, underscoring the importance of oil resources in Nye County in particular.

Table 3-74 provides data on the number of jobs in the mining sector by county in the socioeconomic study area.

Table 3-73
Oil Sales Volume and Sales Value from BLM-Administered Resources, Fiscal Year 2011

County	Sales Volume (Barrels)	Sales Value ($Millions)
Eureka	41,362	$3.6
Nye	369,908	$29.8
Total	**411,270**	**$33.4**

Source: ONRR 2012

Table 3-74
Mining Sector Employment by County

Geographic Area	Number of Jobs	Percentage of Total Employment
Lassen County, California	2	0.1
Modoc County, California	72	5.3
Churchill County, Nevada	75	1.4
Elko County, Nevada	4,203	22.2
Eureka County, Nevada	769	76.9
Humboldt County, Nevada	1,949	31.7
Lander County, Nevada	309	24.3
Lincoln County, Nevada	26	4.2
Nye County, Nevada	755	10.8
Pershing County, Nevada	226	24.5
Washoe County, Nevada	354	0.2
White Pine County, Nevada	880	35.1

Table 3-74
Mining Sector Employment by County

Geographic Area	Number of Jobs	Percentage of Total Employment
Socioeconomic Study Area	9,620	4.5
California	21,425	0.2
Nevada	10,922	1.1
United States	581,582	0.5

Source: Headwaters Economics 2012

Mineral production in the socioeconomic study area employed approximately 9,620 people in 2010, making up 4.5 percent of total employment, which is 4 percentage points higher than the national average of 0.5 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, metals mining, nonmetallic minerals mining, and other mining-related industries. The estimate includes both full- and part-time jobs. It is shown here because it has fewer data gaps (data not disclosed for confidentiality reasons, estimated here by Headwaters Economics 2012) than the data provided in **Appendix U,** Non-Market Valuation Methods.

Appendix U, **Table U-1**, shows Bureau of Economic Analysis data for comparison. Though the proportion of employment associated with mining industries varied by county, every county had some percentage of employment coming from a mining industry. The lowest percentages of mining employment were found in Lassen County (0.1 percent) and Washoe County (0.2 percent), and the highest percentages of mining employment were found in Eureka County (76.9 percent), White Pine County (35.1 percent), and Humboldt County (31.7 percent).

The percentage of mining employment on total employment in Eureka and Elko Counties does not appropriately capture the fact that many of those employed in the mining sector in Eureka County actually reside in Elko County, which is also an important service area for mining in nearby counties (Elko County 2003; Leaming 2010).

In 2010 in Nevada, the average annual earnings per mining-related job were substantially higher than the average annual earnings per non-mining job: $83,377 (2010 dollars) compared to $39,369 (Headwaters Economics 2012).

Other Values

Public 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 non-market component value to society. This section provides an overview of several non-market values described through a qualitative and quantitative economic valuation analysis.

The non-market values associated with public 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 GRSGs.

This section and the related appendix describe the use and non-use economic values associated with recreation, populations of GRSGs, and land that is 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 non-use non-market values. Note that these non-market 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 public lands, including GRSGs.

Analysis in **Chapter 4**, Environmental Consequences, addresses this issue for each of the management alternatives. This section documents baseline non-market values visitors 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 public lands for recreation are typically very low or nonexistent, so the value people place on public 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

National Forest System lands and lands managed by the BLM, 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 BLM RMIS database and the Forest Service NVUM for the study area.

Accounting for the value per day and the number of days, the total non-market value of recreation on BLM-administered and National Forest System lands in the study area was estimated to be about $285 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 non-market values are associated with hunting, camping, OHV touring, hiking, and pleasure driving. These categories omit downhill skiing, because there is little or no overlap between GRSG habitat and lands used for downhill skiing. Analysis in **Chapter 4**, Environmental Consequences, addresses how recreational visits and total non-market value for recreation may change under the alternatives being considered.

Established in 2012, the Nevada Sagebrush Ecosystem Program aims at protecting and enhancing the sagebrush landscape recognizing its economic and cultural value and the value of the plants, animals, and people that depend on it, including the GRSGs. As part of this program, the Nevada Conservation Credit System establishes a market-based mechanism for buying and selling conservation outcomes to compensate for harm done by human activities to the sagebrush ecosystem. Its near-term goal is to achieve no net unmitigated loss of GRSG habitat, meaning that at adverse impact on the GRSG habitat would be fully compensated for the benefit of the species (State of Nevada 2013)

Values Associated with Populations of GRSG

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 non-use 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 non-use 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 non-use 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 non-use value studies for GRSGs. No existing studies on valuation specific to GRSGs 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 GRSGs, 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 non-use values, but the non-use 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.

Established in 2012, the Nevada Sagebrush Ecosystem Program aims at protecting and enhancing the sagebrush landscape recognizing its economic and cultural value and the value of the plants, animals and people that depend on it, including GRSGs. As part of this program, the Nevada Conservation Credit System (CCS) establishes a market-based mechanism for buying and selling conservation outcomes to compensate for harm done by human activities to the sagebrush ecosystem. Its near-term goal is to achieve no net unmitigated loss of GRSG habitat, meaning that an adverse impact to the habitat would be fully compensated for the benefit of the species (State of Nevada 2013).

Values Associated with Grazing Land

Public land managed for livestock grazing provides both market values (e.g., forage for livestock) and non-market 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 non-using 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 non-market value associated with livestock grazing. On the other hand, some residents and visitors perceive non-market opportunity costs associated with livestock grazing. Although some scholars and policymakers have discussed non-market 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 next to public lands with historic leases or permits for grazing on public 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 non-market values associated with grazing.

Fiscal

Nevada has no corporate or personal income taxes and is a right-to-work state.[12] Sales and use taxes, imposed at a rate of two percent, make up 70 percent of Nevada's tax revenues (US Census Bureau 2010c). The next biggest source of revenue is the modified business tax, followed by the net proceeds of minerals tax. The tax proceeds of each mining operation is taxed at a maximum rate of five percent, and gold and silver accounted for almost 90 percent of total gross tax proceeds in fiscal year 2011 (Nevada Department of Taxation 2012).

California receives approximately 85 percent of its own-source revenue from four sources: personal income tax, sales and use tax, corporate tax, and major motor vehicle-related levies (California Legislative Analyst's Office 2007). Though California does not impose a statewide severance tax, there is a small statewide assessment on oil and gas produced in California. The assessment rate is established each year and is imposed on each barrel of oil and each 10,000 cubic feet of natural gas produced. The assessment rate for fiscal year 2010 was $0.0880312 (California Department of Conservation 2010).

Nevada's counties receive roughly a third of their revenues from local taxes, a third from intergovernmental transfers from the state government, and a third from charges for services and utility revenues. Transfers from the federal government contribute approximately 5 percent of county revenues. Property taxes account for roughly three-quarters of local tax receipts, with much of the rest collected through sales taxes (US Census Bureau 2010d).

Public elementary and secondary schools received, in 2008-2009, approximately 60 percent of their funding from local property and other taxes, 30 percent from the state, and 10 percent from federal funds (National Center for Education Statistics 2012).

In California, counties receive a little over 40 percent of their revenues from intergovernmental transfers (mostly from the state), 30 percent from local taxes, and the rest from charges for services and utility revenues. Transfers from federal governments contribute approximately 5 percent of county revenues. California

[12]States where employment may not require membership in labor unions or payment of fees to labor unions.

charges a property tax on possessory interests (private interests on public lands), such as grazing on public lands (California State Board of Equalization 2012).

In Nevada, property taxes account for roughly three-quarters of local tax receipts, with much of the rest being collected through sales taxes (US Census Bureau 2010d). Public elementary and secondary schools received funding for 2008-2009 from 57 percent state sources, 30 percent local sources (mostly property taxes), and 13 percent federal funds (National Center for Education Statistics 2012).

Federal payments to states, counties, and public schools associated with the presence of federal lands in Nevada and California include payments in lieu of taxes (PILT), Forest Service revenue transfers, federal mineral royalties and fees for grazing, recreation, and rents on ROWs. PILT are federal government payments based on the presence of all federal lands (not just BLM-administered lands) in each county. **Table 3-75** shows the PILT payments each county received in 2010. The nontaxable status of federal lands is of interest to local governments, which must provide public safety and other services to county residents. BLM revenue-sharing programs provide resources to local governments in lieu of property taxes because local governments cannot tax federally owned lands the way they would if the land were privately owned. PILT payments have been reauthorized by Congress since 1976, and values vary between authorization cycles (DOI 2012). Full funding of PILT depends on legislation (e.g., between fiscal years 2008 and 2013), without which it is an appropriated program that may be less than fully funded (NACO 2013).

Table 3-75
Payments in Lieu of Taxes Received in the Socioeconomic Study Area by County, 2010

Geographic Area	PILT ($Thousands)[1]
Lassen County, California	$1,092
Modoc County, California	$572
Churchill County, Nevada	$2,089
Elko County, Nevada	$2,649
Eureka County, Nevada	$275
Humboldt County, Nevada	$1,641
Lander County, Nevada	$806
Lincoln County, Nevada	$773
Nye County, Nevada	$2,810
Pershing County, Nevada	$906
Washoe County, Nevada	$3,198
White Pine County, Nevada	$1,108
Socioeconomic Study Area	$17,918

Source: DOI 2012
[1]Includes payments received from the BLM, Forest Service, Bureau of Reclamation, National Park Service, and USFWS.

Since 1908, the Forest Service pays 25 percent of its receipts to states for use on roads and schools in the counties where national forests are located. The decline in the sale of timber from federal lands over time has led to the decline in these payments. Although the Secure Rural Schools and Community Self-Determination Act of 2000 attempted to limit this decline (Congressional Research Service 2012), it expired in 2014. In fiscal year 2012, Nevada received approximately $3.6 million in Forest Service payments (Forest Service 2013e).

Federal mineral royalties are typically paid on leasable minerals, with a portion redistributed to states and counties. Locatable minerals do not require federal royalty payments. Extraction of locatable minerals from federal lands does pay state sales and use taxes. Nevada also charges a 5 percent net proceeds of mines tax on locatable minerals, which is distributed between the Nevada General Funds and the counties where the minerals were extracted (Nevada Mining Association 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 in 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. **Table 3-76** provides available information on the BLM and Forest Service expenditures, including both labor and non-labor expenditures.

Table 3-76
BLM Employment and Related Expenditures in the Socioeconomic Study Area

Agency	Office	Employment, 2011 (FTEs)	Non-labor Expenditures, 2011 (2010 dollars)
BLM	Alturas Field Office	27.9	$951,520
	Eagle Lake Field Office	47.1	$2,317,077
	Surprise Field Office	30.8	$764,032
	Battle Mountain District Office	39.7	$4,871,061
	Mountain Lewis Field Office	23.5	$6,116
	Tonopah Field Office	21.7	$2,887
	Carson City District Office	68.8	$6,499,975
	Sierra Front Field Office	21.6	$633,825
	Stillwater Field Office	20.3	$345,758
	Elko District Office	81.7	$5,079,293
	Tuscarora Field Office	21.8	$208,103
	Wells Field Office	18.7	$198,417
	Ely District Office	75.6	$8,681,938
	Caliente Field Office	13.8	$425,115

Table 3-76
BLM Employment and Related Expenditures in the Socioeconomic Study Area

Agency	Office	Employment, 2011 (FTEs)	Non-labor Expenditures, 2011 (2010 dollars)
	Egan Field Office	16.7	$666,103
	Schell Field Office	20.6	$326,489
	Winnemucca District Office	58.0	$5,743,305
	Black Rock Field Office	7.3	$1,163,939
	Humboldt River Field Office	34.8	$746,276
Forest Service	Humboldt -Toiyabe National Forest	238	$19,421,940

Sources: BLM 2012s; Forest Service 2013f, 2013g

Values reported in 2001 dollars (BLM) or 2011 dollars (Forest Service) were converted to 2010 dollars using the Consumer Price Index (BLS 2012a).

FTE = Full-time equivalent employees (hours worked in relation to hours in a full-time schedule)

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 2005a).

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 (BLM 2005a) reiterates BLM's commitment to environmental justice, both in providing meaningful opportunities for low-income, minority, and tribal populations to participate in decision-making and to identify and minimize any disproportionately high or adverse impacts on these populations.

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 onto 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 3-77 summarizes the percentage of the population made up of ethnic minority groups in each county of the socioeconomic study area, as well as Nevada, California, and the United States as a whole.

Each county in the socioeconomic study area has a lower minority population than California, Nevada, and the United States. All counties in the socioeconomic area have a higher Alaska Native or American Indian population than the United States as a whole. The minority population ranges from a low of 12.1 percent in Lincoln County, Nevada, to a high of 33.9 percent in Washoe County, Nevada.

Low-Income Populations

Table 3-78 summarizes the percentage of the population below poverty level in each county of the socioeconomic study area, as well as California, Nevada, and the United States 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 2012b).

In the economic study area, the percentage of the population below the poverty line ranges from a low of 7.1 percent in Elko County, Nevada, to a high of 18.9 in Nye County. Of the 10 Nevada counties in the socioeconomic study area, 7 have higher percentages of residents below the poverty line than Nevada overall (11.9 percent). Both California counties have a higher percentage of residents below the poverty line than California as a whole (13.7 percent). Both California and Nevada have a lower percentage of residents below the poverty line than the United States as a whole (13.8 percent).

Table 3-77
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 and Other Pacific Islander	Other Race	Two or More Races	Hispanic or Latino[1]	Total Minorities[2]
Lassen County, California	34,895	73.2	8.1	3.5	1.0	0.5	10.2	3.5	17.5	32.4
Modoc County, California	9,686	83.5	0.8	3.8	0.8	0.2	7.0	3.8	13.9	20.9
Churchill County, Nevada	24,877	82.0	1.6	4.5	2.7	0.2	4.8	4.2	12.1	23.4
Elko County, Nevada	48,818	79.4	0.8	5.3	0.9	0.1	10.3	3.2	22.9	30.9
Eureka County, Nevada	1,987	89.3	0.1	2.4	0.9	0.0	5.1	2.2	12.0	16.3
Humboldt County, Nevada	16,528	79.0	0.5	4.2	0.7	0.1	12.7	2.8	24.4	31.0
Lander County, Nevada	5,775	84.0	0.3	4.2	0.4	0.0	8.6	2.5	21.1	26.2
Lincoln County, Nevada	5,345	91.1	2.3	1.1	0.7	0.3	2.2	2.3	6.2	12.1
Nye County, Nevada	43,946	85.9	2.0	1.6	1.3	0.5	5.2	3.5	13.6	20.9
Pershing County, Nevada	6,753	81.9	3.7	3.2	1.3	0.1	6.7	3.1	22.3	31.7
Washoe County, Nevada	421,407	76.9	2.3	1.7	5.2	0.6	9.5	3.8	22.2	33.9
White Pine County, Nevada	10,030	85.5	3.9	4.2	1.0	0.1	2.8	2.5	13.2	23.7
Socioeconomic Study Area	630,047	78.3	2.4	2.4	3.9	0.5	8.9	3.6	20.6	31.4
California	37,253,956	57.6	6.2	1.0	13.0	0.4	17.0	4.9	37.6	59.5
Nevada	2,700,551	66.2	8.1	1.2	7.2	0.6	12.0	4.7	26.5	45.7
United States	308,745,538	72.4	12.6	0.9	4.8	0.2	6.2	2.9	16.3	36.0

Source: US Census Bureau 2010b

[1]Individuals who identify 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.

Table 3-78
Low-Income Populations, 2006-2010 Average

Geographic Unit Analyzed	Percent Population Below Poverty Level
Lassen County, California	14.2
Modoc County, California	18.4
Churchill County, Nevada	8.8
Elko County, Nevada	7.1
Eureka County, Nevada	16.2
Humboldt County, Nevada	12.0
Lander County, Nevada	12.2
Lincoln County, Nevada	10.6
Nye County, Nevada	18.9
Pershing County, Nevada	13.7
Washoe County, Nevada	12.6
White Pine County, Nevada	15.5
Socioeconomic Study Area	12.7
California	13.7
Nevada	11.9
United States	13.8

Source: US Census Bureau 2010d

To ascertain whether there are disproportionate effects of the alternatives on low-income populations, data on effects by each alternative have been reviewed and reported in **Chapter 4**.

Tribal Populations

In 2010, Nevada's Native American population was approximately 32,000, and Washoe County had the largest Native American population of all the counties in the socioeconomic study area (approximately 7,000 people; US Census Bureau 2010b). There are 32 reservations and colonies in Nevada belonging to the tribes listed in **Table 3-79**.

In California, Lassen County is home to the Susanville Indian Rancheria, and Modoc County is home to the Alturas Rancheria, Cedarville Rancheria, Fort Bidwell Reservation, and Pit River Tribe of California (BIA 2012). Several Native American tribes and groups in Nevada and California have historically used GRSGs as a food source, including at least the Achumawi, Western Shoshone, Northern Paiute, and Washoe (Heizer 1978; D'Azevedo 1986). See **Section 3.17**, Tribal Interests (including Native American Religious Concerns), for further details.

Table 3-79
Federally Recognized Tribes of Nevada[1]

Tribe	In Primary Study Area
Duck Valley Shoshone-Paiute Tribe	Yes
Duckwater Shoshone Tribe	Yes
Ely Shoshone Tribe	Yes
Fallon Paiute Shoshone Tribe	Yes
Ft. McDermitt Paiute-Shoshone Tribe	Yes
Ft. Mojave Tribe	No
Confederated Tribes of Goshute	Yes
Las Vegas Paiute Tribe	No
Lovelock Indian Colony	Yes
Moapa Band of Paiutes	No
Pyramid Lake Paiute Tribe	Yes
Reno Sparks Indian Colony	Yes
Hungry Valley Community	Yes
Summit Lake Paiute Tribe	Yes
Te-Moak Tribe of Western Shoshone	Yes
Battle Mountain Band	Yes
Elko Band	Yes
South Fork Band	Yes
Wells Band	Yes
Timbisha Shoshone Tribe	No
Walker River Paiute Tribe	No
Washoe Tribe of Nevada and California	No
Carson Indian Colony	No
Dresslerville Indian Colony	No
Stewart Indian Colony	No
Woodfords Indian Colony	No
Winnemucca Colony Council	Yes
Yerington Paiute Tribe	Yes
Yomba Shoshone Tribe	Yes

Source: Nevada Indian Territory 2012
[1]There are no additional state-recognized tribes in Nevada (NCSL 2013).

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Chapter 4
Environmental Consequences

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Changes to Chapter 4 between draft and final EIS:

- Analyzed separate BLM and Forest Service Proposed livestock grazing management decisions
- Added references, such as the USGS Open File Report 2014-1239 "Conservation Buffer Distance; Estimates for Greater Sage Grouse-A Review" (Mainer et al. 2014)
- Updated maps and habitat category acreages based on USGS-*A Spatially Explicit Modeling of Greater Sage-Grouse Habitat in Nevada and Northeastern California: A Decision Support Tool for Management (Coates et al. 2014)* (see Appendix A)
- Updated Alternative E analysis based on the State of Nevada's revised Greater Sage-Grouse Plan submitted during the public comment period
- Updated analysis in all alternatives, as appropriate, based on public comments received on the DEIS.

CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter presents the direct and indirect impacts on the human and natural environment anticipated to occur from implementing the alternatives presented in **Chapter 2**, Alternatives. 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. It is meant to aid in the decision of which LUPA, if any, to adopt.

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 seven alternatives that has been broken down by resources in each alternative
- A summary comparison of the alternatives

Management actions proposed in **Chapter 2** are planning-level decisions that do not result in direct on-the-ground changes. However, by planning for land uses on surface estate and federal mineral estate administered by the BLM and the Forest Service over the life of the plan, the analysis focuses on impacts that could eventually result in on-the-ground changes.

Some BLM and Forest Service management actions may affect only certain resources and alternatives. This impact analysis identifies impacts that may benefit, enhance, or improve a resource or resource use as a result of management actions, as well as those impacts that have the potential to impair a resource or resource use. 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 the best available science and/or professional judgment.

Resource and resource uses that were not carried forward for detailed review and the reasons they were not carried through are included in **Table 4-1**. In general, resources and resource uses are not carried forward for further analysis if management actions would not change across the alternatives or if the effect of GRSG management actions would have neutral or positive effects.

Table 4-1
Resources and Resource Uses Not Carried Forward for Detailed Analysis

Resource/Resource Use	Rationale for Not Analyzing Resource or Resource Use in Detail
Fish and Wildlife	Implementation of GRSG management actions would generally have a beneficial effect on fish and wildlife species (See **Section 4.7**, Special Status Species). Specific effects would depend on location, scale, and timing of projects. These elements of a project are identified during the design and planning of site-specific projects. Thus, any effect on fish and wildlife would be identified at the project design and implementation phase.
Visual Resources	The compliance with current LUPs' visual resource management would depend on location and scale of projects. The effects on visual resources would be analyzed during project planning.
Special Designations (Wilderness Areas, Wilderness Study Areas, National Conservation Areas, National Historic Trails, Byways, Wild and Scenic Rivers)	The LUPA would not change the designation of Wilderness Areas, WSAs, NCAs, NHTs, Byways or WSRs. Existing LUP direction would be implemented for these resources when implementing conservation management actions. The BLM and the Forest Service Wilderness Areas would continue to be managed to preserve the characteristics therein. The BLM and the Forest Service would continue to manage WSAs to not impair the suitability of such areas for the preservation of wilderness. In addition, where mineral withdrawal is recommended in two alternatives, this would further protect WSAs from impairment. The BLM would manage the Black Rock Desert – High Rock Canyon Emigrant Trails NCA for the purposes for which it was designated. The BLM would manage the California NHT and Pony Express NHT to safeguard the nature and purposes of the trails and in a manner that protects the values for which the trails were designated. The BLM and the Forest Service would manage WSR eligible river segments free-flowing condition, water quality, tentative classification, and any ORVs until Congress designates the river segment or releases it for other uses. Implementation of GRSG conservation management actions would generally have beneficial effects on these special designations.
Air Quality	The LUPA decision would not authorize implementation of activities that could impact air quality. Those impacts would be related to timing and location of any ground-disturbing activities. The effects on air quality would be analyzed in the implementation of projects.
Cultural Heritage Resources	The LUPA decision would not authorize ground-disturbing activities. Any potential future effects on cultural resources as a result of the implementation of activities in support of conservation actions for GRSG protection would be subject to NEPA analysis and compliance with Section 106 of the National Historic Preservation Act.

The BLM and the Forest Service manage public lands for multiple uses, in accordance with the FLPMA and NFMA. Land use decisions are made to protect the resources, while allowing for different uses of those resources, such as livestock grazing and oil and gas development. These decisions can result in trade-offs, which are disclosed in this chapter's analysis. 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 the Forest Service planning team's knowledge of resources and the project area,
- Reviews of existing literature,
- Information provided by experts in the BLM and the 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 LUPA/EIS process. At times, impacts are described using ranges of potential impacts or in qualitative terms.

4.2 MITIGATION

This chapter describes the environmental consequences associated with the impacts on GRSG and their habitat from activities carried out in conformance with this plan, coupled with the mitigation of those activities and the goal of a net conservation gain. To help implement this Nevada and Northeastern California GRSG Proposed LUPA/FEIS, a WAFWA Management Zone Regional Mitigation Strategy (per Appendix I) would be developed within one year of the issuance of the Record of Decision. The Regional Mitigation Strategy would elaborate on the components identified in Chapter 2 (avoidance, minimization, compensation, additionality, timeliness, and durability), and would be considered by the BLM and the Forest Service for BLM and Forest Service management actions and authorized land uses that may impact GRSG and their habitat. The implementation of a Regional Mitigation Strategy would 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.

4.3 ANALYTICAL ASSUMPTIONS

Several overarching assumptions have been made 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 resource- or resource use-specific assumptions are provided in the methods of analysis section for that resource or resource use.

- Sufficient funding, enforcement, and personnel would be available for implementing the final decision.
- Implementing actions from any of the LUPA alternatives would be in compliance with all valid existing rights, federal regulations, agency policies, and other requirements.
- Implementation-level actions necessary to execute the LUP-level decisions in this LUPA would be subject to further environmental review, including that under 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.
- Conditions would remain favorable for large wildfires due to warmer and dryer climatic patterns and fuel conditions.
- 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 or Forest Service may be required to reevaluate decisions made as part of this planning process and to adjust management accordingly. Refer to **Section 2.7.1**, Adaptive Management Plan, and Appendix E, Monitoring Framework.
- The BLM and the 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 and federal mineral

estate. There are approximately 16.5 million acres of BLM-administered and National Forest System lands in the decision area.

- Data from GIS have been used in developing acreage calculations and to generate the tables and figures. Calculations depend on the quality and availability of data. Acreages and other numbers are approximate projections for comparison and analytic purposes only. Readers should not infer that they reflect exact measurements or precise calculations. In the absence of quantitative data, the best available science and professional judgment was used. Impacts were sometimes described using ranges of potential impacts or qualitatively, when appropriate.

4.3.1 General Methodology for Analyzing Impacts

Potential impacts are described in terms of type, context, duration, and intensity, which are generally defined below. Required Design Features have been incorporated into the Forest Service Proposed Plan Amendment as planning-level Guidelines, which will be implemented during site-specific project analysis, or are existing standard operating procedures.

Type of impact—Impacts are characterized by using the indicators described at the beginning of each resource impact section. The presentation of impacts for key planning issues is intended to provide the BLM or Forest Service decision maker and reader with an understanding of the multiple use impacts 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 in the general vicinity of the action area; planning area-wide impacts would affect a greater portion of decision area lands in Nevada and Northeast California; and regional impacts would extend beyond the planning area boundaries.

Duration—This describes the duration of an effect, either short-term or long-term. Unless otherwise noted, 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—This refers to the severity of the impact (40 CFR, Part1508.27[b]). Rather than categorize severity of impact by qualitative descriptors (e.g., major, moderate, or minor), this analysis discusses impacts using quantitative data wherever possible.

Direct and indirect 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.

To properly and meaningfully evaluate the impacts under each alternative, the expected impacts are measured against the impacts projected to occur under Alternative A, the No Action alternative. This baseline provides a way to compare the alternatives to one another, as it represents what is anticipated should no plan amendments take place.

The end of **Chapter 4** contains a discussion of Unavoidable Adverse Impacts (**Section 4.21**), Irreversible and Irretrievable Commitment of Resources (**Section 4.22**), and the Relationship between Local Short-term Uses and Long-term Productivity (**Section 4.233**).

4.3.2 Incomplete or Unavailable Information

The CEQ established implementing regulations for NEPA, requiring that a federal agency identify relevant information that may be incomplete or unavailable for evaluating reasonably foreseeable significant adverse impacts in an EIS (40 CFR, Part1502.22). 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 the 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 the Forest Service themselves and from outside sources.

Under 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 include the following:

- GIS data used for disturbance calculations on private lands
- Site-specific surveys of cultural and paleontological resources

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 plan.

4.4 GREATER SAGE-GROUSE AND GREATER SAGE-GROUSE HABITAT

4.4.1 Methods and Assumptions

Indicators

Indicators of impacts on GRSG and their habitat are as follows:

- Direct habitat loss
- Habitat fragmentation
- Disruption to species life history requirements
- Population loss
- Habitat degradation
- Habitat restoration/improvement

Effects listed above may be characterized for each resource and alternative as appropriate, and, where available, quantified by the indicators described below:

- PHMA (PPH)/GHMA (PGH) – Designations include habitats considered vital to the persistence of GRSG populations at all scales. Acres impacted or improved by each resource is a general metric for direct habitat loss, habitat degradation, and habitat restoration/improvement. The metric provides a basis for a qualitative discussion of habitat fragmentation and species life history requirements.
- Modeled Nesting habitat – Metric is derived from a buffering of lek locations (Doherty et al. 2011) as a proxy for spatially describing nesting habitat in acres of PHMA and GHMA, and provides a specific quantitative measure of potential improvement and/or disruption of GRSG life history requirements for nesting with implications for populations. Habitats in the buffers are known to include areas supporting other seasonal life history requirements as well. Habitats outside lek buffers may also contain nesting habitat but primarily support other seasonal life history requirements such as brood-rearing, wintering, and transitional.

Table 4-2 relates individual resource programs to threats to GRSG and their habitat in order of priority in the sub-region. Impacts from each resource are assessed using the indicators described above.

Table 4-2
Resource Programs Impacting GRSG by Threat in the Sub-region

Threat/Issue	Resource Program
Wildfire	Wildland Fire, Fuels, and Vegetation Management
Invasive species	Wildland Fire, Fuels, and Vegetation Management
Conifer encroachment	Wildland Fire, Fuels, and Vegetation Management
Infrastructure	Lands and Realty (ROW/SUA avoidance/exclusion areas) and Special Designations (ACECs, Wilderness, and Wilderness Study Areas)
Climate change	Climate Change, Wildland Fire, Fuels, and Vegetation Management
Livestock grazing	Livestock Grazing (areas open/closed)
Mining	Minerals Materials (areas open/closed to locatable and salable minerals)
Energy development	Fluid Minerals (areas open/closed to exploration, leasing, and development)
Human uses	Lands and Realty (avoidance/exclusion areas), Special Designations (ACECs, Wilderness, and Wilderness Study Areas), and Travel Management (areas open, limited, or closed to motorized travel)

Assumptions

The analysis includes the following assumptions:

GRSG habitat for the sub-region was derived from a quantitative approach using "*A Spatially Explicit Modeling of Greater Sage-Grouse Habitat in Nevada and Northeastern California: A Decision Support Tool for Management*" (Coates et al. 2014). GRSG telemetry location data was compiled from multiple areas across Nevada and northeastern California. Telemetry data was then linked spatially with corresponding environmental covariates to enable calculations of population-level resource selection functions (Manly et al. 2002). Locations of active leks were also used as an additional dataset for map validation. The map reflects both the presence of GRSG and the presence of habitat features associated with GRSG occupancy, and can be used to prioritize areas for different management scenarios. The strength of the map is to account for characteristics that describe the quality of the environment for GRSG, as well as an index of population abundance (Coates et al. 2014) (See Chapter 3, Section 3.2.3-Management Zones for more details).

The three management categories derived from this mapping process for the Nevada and Northeastern California Sub-region includes: "Priority", "General" and "Other" Habitat Management Areas.

- This analysis uses PHMA and GHMA categories for Alternative A only to facilitate comparison across the other alternatives. There

are currently no public lands designated by the BLM or Forest Service as PHMA or GHMA in the planning area and Alternative A would neither result in the designation of PHMA or GHMA nor assign additional management actions to these areas.

- Nesting habitat is defined as the habitat within a 4-mile buffer around 25 and 50 percent of known GRSG breeding populations and a 5.2-mile buffer around 75 and 100 percent of known GRSG breeding populations (Doherty et al. 2011).
- Population and subpopulation boundaries (Connelly et al. 2004) are modified to include whole population management unit (PMU) (NDOW 2002) boundaries (see **Section 3.2**, Greater Sage-Grouse and Greater Sage-Grouse Habitat).

Habitat conditions and trends for each GRSG population were modeled using the Vegetation Dynamics Development Tool (VDDT). VDDT is a windows-based computer tool which provides a state and transition landscape modeling framework for examining the role of various disturbance agents and management actions in vegetation change. It allows users to create and test descriptions of vegetation dynamics, simulating them at the landscape level. VDDT captures acres of sagebrush overstory with an invasive plant species understory using Integrated Landscape Assessment Project (ILAP) data. Where invasive plant species occur in the first or second stages, the vegetation cover is not considered quality sagebrush habitat due to the functionality of the sagebrush and the likelihood of conversion during the next wildfire. VDDT was used to model general GRSG habitat trends based on a variety of primary habitat influences such as wildfire, succession, insects and disease, habitat restoration projects, prescribed fire, conifer encroachment and treatment, mechanical sagebrush treatment, and fuels reduction projects. Based on these inputs and the natural rates sagebrush systems transition between stable conditions, 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. VDDT modeling was completed for seven of the nine population/subpopulations in the Nevada and Northeastern California Sub-region. Northern Interior and Quinn Canyon Range were not modeled due to lack of mapped habitat. As additional data becomes available, GRSG habitat conditions and trends will be updated. Impacts on GRSG accrue over varying distances from origin depending on the type of development:

- Tall structures such as power lines, wind turbines, communication towers, agricultural, and urban development based on an avian predator foraging distance of 4.3 miles; Boarman and Heinrich 1999; Leu et al. 2008),
- Energy extraction such as oil and gas, geothermal, and plan of operation mining at 11.8 miles, based on direct impacts of field

development, including associated infrastructure, noise, lighting, and traffic (Johnson et al. 2011; Taylor et al. 2012),

- Interstate highways at 4.7 miles and paved roads and primary and secondary routes at 1.9 miles, based on indirect effects measured through road density studies (Connelly et al. 2004; Holloran 2005; Lyon 2000),
- Site-specific disturbances such as small-scale mining and mineral material sites at 1.6 miles, based on indirect influence distance from estimated spread of exotic plants (Bradley and Mustard 2006),
- Short-term impacts would accrue over a time frame of up to five years. Long-term impacts would accrue over time frames exceeding five years,
- Because GRSG are highly sensitive to habitat fragmentation, development, or changes in habitat conditions and require large, intact habitat patches to complete their annual life-cycle requirements, alternatives proposing to protect the most GRSG habitat from disturbance are considered of greatest beneficial impact. These impacts can be described both qualitatively and quantitatively,
- Seasonal ranges of migratory and non-migratory GRSG are included in PHMA, GHMA and OHMA, but are not mapped to provide direct impact assessments at the sub-regional scale,
- PHMA, GHMA and OHMA encompass habitat for providing connectivity in populations and subpopulations. Connectivity would be considered by incorporating PMU-scale information in the design and implementation of restoration projects.

4.4.2 Nature and Type of Effects

Riparian Areas and Wetlands

See Livestock Grazing Management, below.

Water Resources Management

See Livestock Grazing Management, below.

Vegetation and Habitat Restoration

Current treatments and active vegetation management typically focus on vegetation composition and structure for fuels management, habitat management, and productivity manipulation for protecting and improving the habitat and forage conditions for ungulates and other grazers (Knick et al. 2011). The distribution of these treatments can affect the distribution of GRSG and sagebrush habitats by affecting the distribution of suitable cover and forage (Manier et al. 2013, p. 169).

GRSG require high-quality habitat conditions, including a diversity of herbaceous species, vegetation and reproductive health of native grasses, and an abundance of sagebrush (Manier et al. 2013, p. 169). Residual vegetation cover, especially grass and litter, has often been noted as essential for GRSG for concealment during nesting and brood-rearing (Sveum et al. 1998; Kirol et al. 2012). Passive restoration efforts such as adjustments in management practices, grazing systems and seasonal restriction or closures in GRSG seasonal habitats have a reasonable chance to improve degraded or altered habitats (Manier et al. 2013, p. 170; Connelly et al. 2004).

Some areas in the Nevada and Northeastern California Sub-region are experiencing severe habitat degradation such that the establishment of "undesirable" species has displaced native species, making passive management approaches unsuitable and requiring direct manipulation (Connelly et al. 2004). In parts of the sub-region, invasive species such as cheatgrass or native species such as pinyon-juniper have replaced desirable dominant species. These areas require active removal and seeding of native species for successful restoration (Pyke 2011). Active treatments in the sub-region include manual and mechanical pinyon and/or juniper removal and planting of native grass and shrub seed and seedlings.

Invasive plants are thought to alter plant community structure and composition, productivity, nutrient cycling, and hydrology, and may competitively exclude native plant populations. Cheatgrass competes with native grasses and forbs that are important components of GRSG habitat. Cheatgrass abundance is negatively correlated with habitat selection by GRSG (Kirol et al. 2012), indicating that changes in composition and structure associated with cheatgrass, specifically degrade GRSG habitat. Invasion by medusahead (*Taeniatherum caput-medusae*) may be even worse than cheatgrass, as it also reduces perennial productivity, degrades wildlife habitat, supports high-frequency wild fire intervals, and requires intensive treatment for restoration (Davies 2010). Expansion of pinyon and/or juniper also threatens GRSG populations because they do not provide suitable habitat and trees displace shrubs, grasses, and forbs that are required by GRSG. Pinyon and/or juniper expansion is also associated with increased bare ground and the potential for erosion, as well as an increase in perch sites for raptors. Pinyon and/or juniper encroachment may represent expansion of raptor predation threats. Invasive species cause direct degradation of sagebrush habitats, resulting in effects on local GRSG populations by affecting forage, cover quality and composition, and increased wildfire frequency and intensity, with the potential to cause complete avoidance (Manier et al. 2013, p. 135).

Livestock Grazing Management

Livestock grazing is the most widespread land use across the sagebrush biome (Connelly et al. 2004, pp. 7-29). Grazing livestock can affect soils, vegetation, water, and nutrient availability by consuming or altering vegetation, redistributing nutrients and plant seeds, trampling soils and vegetation, and

disrupting microbial composition (Connelly et al. 2004). Livestock may also trample nests (Jensen et al. 1990), cause nest abandonment, and disturb GRSG behavior (Danvir 2002; NTT 2011, p. 14).

Livestock grazing is a "diffuse" form of biotic disturbance that exerts repeated pressure over many years on a system (Connelly et al. 2004). Unlike point sources of disturbance (e.g., fires), gazing effects are not likely to be detected as disruptions but as differences in the processes and functioning of the sagebrush system. Grazing effects are not distributed evenly because historic practices, management, and animal behavior all lead to differential use of the range (Manier et al. 2013, pp. 157-168).

At unsustainable levels of grazing, impacts can lead to loss of vegetation cover, reduced water infiltration rates, decreased plant litter, increased bare ground, reduced nutrient cycling, decreased water quality, increased soil erosion, and reduced overall habitat quality for wildlife, including GRSG (Manier et al. 2013, pp. 157-159). Properly managed grazing, however, may protect GRSG by providing adequate cover. (NTT 2011, p. 14).

The relationship between GRSG late summer brood-rearing habitat and livestock grazing is not clear cut. Studies from Nevada have shown a preference for grazed meadows or grazed areas in meadows over ungrazed meadows (Neel 1980; Evans 1986; Klebenow 1982; Oakleaf 1971). In these studies, GRSG were attracted to regrowth of grazed forbs or to the presence of selected food forbs common on grazed meadows. However, GRSG avoided heavily grazed meadows or meadows downcut to gullies (Klebenow 1982; Neel 1980; Savage 1969).

The attraction to grazed meadows may be explained by GRSG having adapted from a primary dependence on forbs in sagebrush communities to forbs in grazing-impacted meadows (Howell 2014). The forbs preferred by GRSG in brood-rearing habitats are primarily composites, with some mustards, clover, and milkvetches (Klebenow and Gray 1968, Savage 1969, Evans 1986). These forbs are generally tap-rooted, high-seed-producing plants that increase with disturbance (Howell 2014). Plants such as yarrow, false dandelion, western aster, milkvetch, and mustards are common in sagebrush communities (Lavin et al. 2013).

The plant species that would normally occupy meadows tend to be deep, rhizomatous or fibrous-rooted, cold-tolerant, perennial grasses and grass-like species suited to higher water tables (Dwire et al. 2006; Weixelman et al. 1997). Unsustainable grazing practices, development, and dewatering have altered many meadows; over time, these habitats have come to support plant species more adapted to adjacent uplands. Thus, GRSG would benefit most from properly managed grazing, which results in good ecological conditions in both uplands and riparian areas.

Structural range improvements, such as fences (especially woven-wire fences), represent potential movement barriers, predator perches, and travel corridors and are a potential cause of direct mortality to GRSG (Manier et al. 2013, p. 89). Grazing restrictions that protect sagebrush ecosystem health would enhance habitat for GRSG populations.

Fire and Fuels Management

Fire is the primary threat to GRSG populations and habitat in the western half of their distribution. In the Great Basin, fire has been increasing in size and frequency (Baker 2011). Short- and long-term plant community response following fire is highly variable across plant communities and ecological sites in the Great Basin. Ecological response and successional trajectories following fire are a function of fire severity and ecological site characteristics, including disturbance history, climate, and vegetation present at the time of the fire (Miller et al. 2013).

Increasing exotic annual grasses, primarily cheatgrass, are resulting in sagebrush loss and degradation (USFWS 2010a, p. 25). Cheatgrass can more easily invade and create its own feedback loop in areas that are: 1) dry with understory vegetation cover that is not substantial, or 2) experiencing surface-disturbing activities (e.g., road construction). 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 exclude sagebrush seedlings from establishing. With fire, areas can be converted to annual grasslands. A loss of shrubs and 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 (*Artemisia tridentata* Nutt. ssp. w*yomingensis)* particularly in areas where there is ground disturbance or bare ground (e.g., recently burned areas). Ground disturbance, such as roads, facilitates the establishment and spread of cheatgrass and other invasive weeds (Gelbard and Belnap 2003). While fires do occur in higher elevation mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) habitats, they are typically 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/or juniper trees from higher elevations down slope into sagebrush habitats (Baker 2011; Balch et al. 2012). Under suitable conditions, wildfires that start in pinyon and/or juniper stands can move into Wyoming big sagebrush

stands. In the absence of cheatgrass, Wyoming big 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 the Nevada and Northeastern California Sub-region, five of seven VDDT modeled populations/subpopulations and both unmodeled populations are experiencing declining habitat trends directly attributable to fire and cheatgrass invasion. Depending on the amount of habitat available to GRSG, a single fire can influence a local GRSG population's distribution, migratory patterns, and overall habitat availability (Fischer et al. 1997, p. 89). 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 would result in lower chick survival. As GRSG habitats become smaller and less connected to adjacent populations, they become increasingly susceptible to stochastic events and local extirpation (Knick and Hanser 2011; Wisdom et al. 2011). In addition, genetically isolated GRSG populations could suffer from a decrease in fitness known as inbreeding depression.

The cheatgrass fire-cycle causes GRSG habitat loss and degradation on an annual basis. Research and management efforts are focused on developing means of controlling cheatgrass on a large scale. A strategic multi-scale approach has recently been implemented throughout the sub-region which uses the resistance and resilience concepts found in Chambers et al. (2014) to reduce impacts of invasive annual grasses and altered fire regimes on sagebrush ecosystems. Following the recent guidance in IM-WO-2014-134 issued on September 03, 2014, *Current Management for Wildland Fire*, includes minimization of human and/or lightning fire ignitions or the extent of wildland fire in GRSG habitat through fuels management treatments (e.g., construction of fuel breaks or green strips, biological and prescribed fire), pre-suppression planning, and effective fire suppression geared toward protecting GRSG habitat using the resistance and resilience concepts in Appendix G. Facilitating the spread of cheatgrass and the likelihood of ignition through BLM- and Forest Service-authorized programs is further discussed under **Sections 4.13**, Lands and Realty; **4.15**, Minerals; and **4.11**, Recreation.

Wild Horse and Burro Management

While not as widespread as livestock grazing, wild horse and burro management is still a major land use across the sagebrush biome. HMAs and WHBTs overlap VDDT modeled populations by 0 to 100 percent depending on the subpopulation in the sub-region. Impacts from wild horse and burro, however, are somewhat different than impacts from livestock grazing (USFWS 2013a, p. 46). According to the COT report (USFWS 2013a, p. 46):

> "On a per capita body mass, wild horses and burros consume more forage than cattle or sheep and remove more of the plant which limits or delays vegetation recovery (Menard et al. 2002), and wild horses and burros can range further between water sources than livestock, thereby making them more difficult to manage. Wild horse and burro grazing results in a reduction of shrub cover and more fragmented shrub canopies, which can negatively affect GRSG habitat (Beever and Aldridge 2011). Additionally, sites grazed by wild horses and burros have a greater abundance of annual invasive grasses, reduced native plant diversity and reduced grass density (Beever and Aldridge 2011)".

Effects of wild horse and burro on habitats may also be more pronounced during periods of drought or vegetation stress (NTT 2011, p. 18). Wild horses and burros require that water be available year-round in HMAs and WHBTs (The Wild and Free-Roaming Horses and Burros Act of 1971). This often leads to riparian areas receiving yearlong use by wild horses and burros or riparian areas being modified with additional fencing and troughs in order to accommodate yearlong wild horse and burro use. These range improvements result in increased potential for raptor perch sites and less water available on the ground, and have negative effects on GRSG riparian habitat depending on how each facility is constructed and increase GRSG vulnerability to predation. According to Berger (1986), one measure of habitat quality for wild horses is the presence of meadows. Horse bands that spent more time foraging in meadows had higher reproductive success, and meadows received the highest use in proportion to their availability. At levels higher than established AMLs, impacts can lead to loss of vegetation cover, decreased water quantity and quality, increased soil erosion, and reduced overall habitat quality for wildlife, including GRSG.

Locatable, Leasable, and Salable Minerals Management

Minerals development within the sub-region consists of locatable mineral resources at various scales that require a notice when disturbance related to exploration is 5 acres or less, or Plans of Operation for all non-casual use mining operations are when exploration disturbance will exceed 5 acres, or if the proposed operations meet one or more of the criteria requiring a Plan of Operations (43 CFR 3809.21). Locatable minerals exploration and mining is primarily for gold, silver, and copper. Leasable minerals in Nevada include commodities such as potassium, phosphate, and sodium. Fluid minerals include oil, gas, and geothermal development. Oil and gas development is in limited production, occurring only in the far southeastern portion of the sub-region. Oil and gas leasing occurs over a larger footprint in eastern Nevada. Geothermal potential in the sub-region is widespread. Impacts on GRSG associated with geothermal development would be similar to fossil fuel-fired power plants. This is because the resources are exploited in a highly centralized fashion, including the footprint of the power plant itself, access roads, and transmission lines. Development of locatable and leasable mineral resources typically requires

significant infrastructure and human activity for construction, operation, and maintenance.

Mineral extraction of all types, including locatable, leasable, and salable extraction, in GRSG habitat results in habitat loss caused by construction of infrastructure, the footprint of the surface or subsurface operation, and other associated facilities. Sagebrush communities that are lost or modified in locations where reclamation is not compromised by the presence or introduction of invasive grasses may not regain sagebrush cover suitable for GRSG use for 20 to 30 years or longer following interim or final reclamation. Population re-establishment may take upwards of 30 years (Braun 1998). Where compromised, reclamation may only be minimally effective. Necessary infrastructure causes additional direct and indirect impacts on GRSG and their habitat from location, construction, and use of ancillary facilities, staging areas, roads, railroad tracks, and structures such as buildings and power lines.

The industrial activity associated with energy and mineral development produces noise and human activity that disrupt the habitat and life-cycle requirements of GRSG. All studies which assess impacts of energy development on GRSG have found negative effects on populations and habitats (Naugle et al. 2011). Recent research has demonstrated that noise from natural gas development negatively impacts GRSG abundance, stress levels, and behaviors (Patricelli et al. 2013). Noise from natural gas development is primarily produced by drilling rigs, compressors, generators, and traffic on access roads. All of these noise sources are loudest in frequencies (i.e., pitch) less than 2.0 kilohertz (Patricelli et al. 2013). Male GRSG produce acoustic signals in a similar frequency range, between 0.2 and 2.0 kilohertz, so the potential exists for industrial noise to mask GRSG communication and, thus, interfere with the ability of females to find and choose mates (Patricelli et al. 2013). Blickley et al. (2013) found immediate and sustained declines in male attendance on noise leks (29 percent decline on drilling noise leks and 73 percent decline on traffic noise leks relative to control leks) and evidence of similar declines in female attendance. These results suggest a strong noise avoidance in male and, possibly, female GRSG (Blickley et al. 2013). Blickley et al. (2013) also found elevated levels of corticosterone metabolites in fecal samples collected from noise leks compared with samples collected from control leks. Because elevated corticosterone levels are associated with increased physiological stress (Wasser et al. 2000; Wingfield 2005; Bonier et al. 2009), these results suggest that even males that do not abandon noisy leks are physiologically impacted (Blickley et al. 2013). Amstrup and Phillips (1977) found that the low-frequency mining noise in their study area was continuous across days and seasons and did not diminish quickly as it traveled from its source. Noise associated with oil and gas development may play a factor in habitat selection (Holloran 2005) and Patricielli and Blickley (2012) found that the continuous noise levels, and even intermittent road traffic, reduce lek attendance. For a prey species such as GRSG, noise may also increase predation risk by masking the sounds of

approaching predators and increase stress levels by increasing the perception of predation risk (Quinn et al. 2006; Rabin et al. 2006).

Infrastructure for mining is similar to that required for oil and gas but is more localized in extent. As revealed by studies on oil and gas development, the interaction and intensity of effects of habitat loss could cumulatively or individually lead to habitat fragmentation in the long term (Connelly et al. 2004; Holloran 2005) with negative impacts of fragmentation as a result of development and associated infrastructure on lek persistence, lek attendance, winter habitat use, recruitment, yearling annual survival rate, and female nest site selection (Holloran 2005; Aldridge and Boyce 2007; Walker et al. 2007; Doherty et al. 2008).

Land Uses and Realty Management

Transmission lines and major power lines are widespread throughout the range of GRSG. GRSG generally respond negatively to increased human infrastructure in sagebrush habitats, including roads, power lines, and communication towers (Manier et al. 2013, p. 71-74). Although transmission and power line construction does not generally result in substantial direct habitat loss, it would temporarily disturb individual GRSG and their habitat along a ROW. Roads associated with energy transmission facilities can contribute to habitat fragmentation by reducing the extent of contiguous blocks of habitat and reduce the amount and quality of GRSG habitat. The effects of vertical structures on GRSG may include avoidance of leks near structures (Lyon and Anderson 2003; Holloran 2005), decreased adult survival rates (Kaiser 2006; Aldridge and Boyce 2007), decreased nest survival (Braun 1998), lower lek attendance (Harju et al. 2010) and displacement of nests (Braun et al. 2002). In addition, following construction of power lines, GRSG avoidance of vertical structures potentially due to increased avian predation (Ellis 1984; Braun 1998), may result in habitat exclusion via behavioral response. One study reported that the frequency of raptor and GRSG interactions during the breeding season increased 65 percent and golden eagle interactions alone increased 47 percent in an area in pre- and post-transmission line comparisons (Manier et al. 2013, p. 81-82). Power lines may also cause direct mortality due to the tendency of GRSG to fly relatively low, and in low light or when harried, putting them at a high risk for collisions (Manier et al. 2013, p. 81-82).

ROW and SUA exclusion areas would prohibit all development of ROWs, with some exceptions provided, while ROW and SUA avoidance areas would be considered on a case-by case basis. This flexibility may be advantageous where federal and private land-ownership areas are mixed and exclusion areas may result in development on non-GRSG habitat private lands if government managed lands could not be used. Land tenure adjustments or withdrawals made in GRSG habitat could reduce the habitat available to sustain GRSG populations, unless provisions were made to ensure that GRSG conservation remained a priority under the new land management regime. Land exchanges

designed to decrease fragmentation of GRSG habitat would help GRSG populations (NTT 2011, p. 12).

Renewable Energy

The Southern Great Basin and Northern Great Basin WAFWA GRSG Management Zones include over 850 square miles leased for wind energy; second only behind the heavily developed Wyoming Basin (Knick et al. 2011). Geothermal production provides 17 percent of the renewable electricity generation in the United States, most of which is in California, outside of sagebrush habitat (Knick et al. 2011). Geothermal production in the current range of GRSG is primarily in the Great Basin (Knick et al. 2011). There is some speculation about the immediate or long-term effects from renewable energy development on GRSG as scientific studies have had difficulty keeping pace with the rapidly changing industry and associated technologies.

Because grouse species have evolved in habitats with a limited amount of vertical structures, tall vertical structures such as wind turbines could displace GRSG from their normally used habitat (Johnson and Stephens 2011).

Because large-scale development of renewable energy resources is recent compared with oil and gas, many of the long-term impacts of renewable energy are still being studied and results have not been published in scientific literature. However, potential infrastructure development impacts on GRSG and their habitat can be anticipated from oil and gas development on the species (Becker et al. 2009).

Impacts from energy development accrue both locally and at the landscape scale. Accumulated evidence across landscape-scale studies show that GRSG populations typically decline following oil and gas development (Holloran 2005; Walker et al. 2007; Doherty et al. 2008). Oil and gas infrastructure and associated human activity have been shown to adversely affect GRSG populations collectively and in some instances, impacts have been directly attributed to certain human features (e.g., roads, power lines, noise, associated infrastructure Walker et al. 2007; Doherty et al. 2008; Lyon and Anderson 2003; Holloran 2005; Kaiser 2006; Aldridge and Boyce 2007).

Renewable energy development and its infrastructure similar to oil and gas (e.g., power lines, roads, and construction activities) may negatively affect GRSG populations via several different mechanisms. Mechanisms responsible for cumulative impacts that lead to population declines depend on the magnitude, frequency, and duration of human disturbance. GRSG may abandon leks if repeatedly disturbed by raptors perching on power lines or other tall vertical structures near leks (Ellis 1984), by vehicular traffic on roads (Lyon and Anderson 2003; Patricelli et al. 2013) or by noise and human activity associated with energy development (Braun et al. 2002; Holloran 2005; Kaiser 2006). Collisions with power lines, vehicles, fences, and increased predation by raptors may increase mortality of GRSG at leks (Connelly et al. 2000a; Lammers and

Collopy 2007). Roads and power lines may also indirectly affect lek persistence by altering productivity of local populations or survival at other times of the year. GRSG mortality associated with power lines and roads occurs year round (Aldridge and Boyce 2007) and artificial ponds created by development (Zou et al. 2006) that support breeding mosquitoes known to vector West Nile virus (Walker et al. 2007) elevate risk of mortality from disease in late summer (Walker and Naugle 2011). GRSG may also avoid otherwise suitable habitats as development increases (Lyon and Anderson 2003; Holloran 2005; Kaiser 2006; Doherty et al. 2008).

Avoidance of development areas should not be considered a simple shift in habitat use, but rather a reduction in the distribution of GRSG (Walker et al. 2007) because avoidance is likely to result in true population declines when density dependence, competition, or displacement of GRSG into poor quality adjacent habitat lowers survival or reproduction (Holloran and Anderson 2005; Aldridge and Boyce 2007; Holloran et al. 2010). GRSG exhibit extremely high site fidelity which strongly suggests that unfamiliarity with new habitats may also reduce survival (Baxter et al. 2008), as evidenced in other grouse species (Yoder et al. 2004). Grouse species avoid other human features such as roads, power lines, oil and gas wells, and buildings (Lyon and Anderson 2003; Pruett et al. 2009) and augmentation of dwindling GRSG populations, via introduction of translocated birds or supplementing existing populations is often unsuccessful (Naugle et al. 2011; Baxter et al. 2008).

Comprehensive Travel and Transportation Management

The CTTM program is principally focused on road networks in the GRSG range. Though roads can range from state or interstate highways to gravel and two-track roads, BLM and the Forest Service travel management primarily involves the level of access allowed to the public in travel management zones identified as closed, limited (to existing or designated roads and trails), or open. Use of roads is predominately associated with recreational pursuits on public lands. Areas currently open to cross-country motorized use would have greater impacts than those areas where travel is limited to existing roads and trails or closed to motorized use.

Road densities have been directly correlated with GRSG persistence. In the GRSG range, 95 percent of the mapped sagebrush habitats are within 1.6 miles of a mapped road; density of secondary roads exceeds 3.1 miles per 247 acres in some regions (Knick et al. 2011). Roads have multiple impacts on wildlife in terrestrial ecosystems, including, increased mortality from collision with vehicles, changes in behavior, loss, fragmentation, and alteration of habitat, spread of exotic species, and increased human access, resulting in facilitation of additional alteration and use of habitats by humans (Formann and Alexander 1998; Jackson 2000; Trombulak and Frissel 2000). The effect of roads can be expressed directly through changes in habitat and GRSG populations and indirectly through avoidance behavior because of noise created by vehicle traffic

(Lyon and Anderson 2003; Patricelli et al. 2013; USFWS 2010a; See Assumptions and Indicators regarding interstates and primary routes).

While the direct habitat loss from roads is not known to be substantial, roads 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; allow for increased human noise disturbance which can result in GRSG habitat use avoidance (i.e., functional habitat loss); and increase mammalian and avian predator abundance (Formann and Alexander 1998, p. 207-231). Connelly et al. (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 et al 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 (See the discussion of Interstate 80 in Nevada in **Section 3.2**, Greater Sage-Grouse and Greater Sage-Grouse Habitat). In Montana and southern Canada, as the length of roads within 2 miles of a lek increased, the likelihood of lek persistence decreased (Manier et al. 2013).

Motorized activities are expected to have a larger footprint on the landscape than non-motorized users. Cross-country motorized travel would result in increased potential for soil compaction, loss of perennial grasses and forbs, and reduced canopy cover of sagebrush (Payne et al. 1983). Long-term losses in sagebrush canopy would likely be the result of repeated, high frequency, long duration use by cross-country OHV use. 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. Noise and increased human presence associated with construction, use, and maintenance of roads may change GRSG behavior based on the proximity, magnitude, intensity, and duration.

Other Resources

Implementing management for the following resources would have negligible or no impact on GRSG and are therefore not discussed in detail: recreation use excluding CTTM and ACECs.

4.4.3 Impacts Common to All Alternatives

Impacts from Climate Change

The impacts of climate change are common to all alternatives. Maximum seasonal temperatures and altered rainfall patterns exacerbate the fire cycle such that large-scale fires are not only driven by the annual cheatgrass flush of fine fuels, but are also fueled by historically low moisture ratings in larger fuels

in the shrub community. As temperatures and levels of rainfall change, the climate envelopes supporting the sagebrush ecosystem will shift. The adjacent Mojave ecosystem will expand northward. Low elevation sagebrush habitats will convert to desert scrub and forest sage ecotones will shift toward sagebrush. Some of these shifts, particularly in the southern half of the range, will likely occur at rates that challenge the ability of GRSG to adapt, requiring an adaptive management strategy regardless of alternative features in land use planning.

Impacts from Renewable Energy Management

Under all of the alternatives, no acres of GRSG habitat in the planning area would be managed for Solar Energy Zones. The magnitude of impacts is different for all alternatives as the acreages of lands managed for ROWs, SUAs, and zoning designations (e.g., Solar PEIS and Wind Energy EIS) vary across the alternatives (see **Table 2-3**, Comparative Allocation Summary of Alternatives, in **Chapter 2**). However, industrial solar construction and infrastructure are expected to have similar effects on GRSG and, therefore, effects caused by duration and frequencies are expected to be similar across all alternatives.

4.4.4 Alternative A

Impacts from Vegetation and Soils Management

Under Alternative A, current management implements the Integrated Vegetation Management Handbook policies (BLM 2008j), Land Health Standards, Vegetation Treatments Using Herbicides Programmatic EIS (BLM 2007a) and the Sage Steppe Ecosystem Restoration Strategy Final EIS (BLM 2008f), as well as other policies and plans. The Integrated Vegetation Management Handbook requires an interdisciplinary and collaborative process to plan and implement vegetation treatments that improve biological diversity and ecosystem function while promoting and maintaining native plant communities that are resilient to disturbance and invasive species. Land Health Standards are ecologically based goal statements which include watershed function, ecological processes, water quality, and habitat quality for threatened and endangered and special status species (43 CFR, Part4180.1). Land Health Standards Assessments are used to establish program priorities, determine the status of current conditions and set the stage for evaluations that are used to determine achievement or non-achievement of land health standards. The Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement (2007a) was created to reduce the risk of catastrophic wildfires by reducing fuels, restoring fire-damaged lands and improving ecosystem health by controlling weeds and invasive species and manipulating vegetation to benefit fish and wildlife habitat, improve riparian and wetland areas, and improve water quality in priority watersheds. While the Sage Steppe Ecosystem Restoration Strategy Final EIS, which is specific to northeastern California, focuses on the restoration of sage steppe ecosystems and associated vegetation communities that have become dominated by western juniper.

Implementation of the above policies and plans would improve vegetation management by decreasing invasive species, provide for native vegetation establishment in sagebrush habitat, reduce the risk of wildfire, restore fire-adapted ecosystems and repair lands damaged by fire. These policies also recognize the need to improve the diversity, resiliency and productivity of native vegetation health and persistence (BLM 2008f).

Mechanical pinyon and/or juniper treatments would result in short-term disturbances of soils and sagebrush due to heavy equipment, skid trails, landings and temporary roads. Mechanical and manual treatments would increase noise, vehicular traffic and human presence. However, once the site potential is restored there would be a long-term increase in forage, cover quality and composition, reduction in predator perches, decrease in fire spread and intensity and a potential increase in water availability (Roundy et al. 2014).

Pinyon and/or juniper expansion is predominant in mountain sagebrush but also occurs in Wyoming and low sagebrush. Seral classes which include substantial pinyon and/or juniper are dominate in three of the seven VDDT modeled subpopulations including southeastern Nevada where conifer is a significant component on 42 percent of mountain sagebrush habitats and 21 percent of Wyoming sagebrush habitats. Under current treatment rates, trends are stable to slightly improving. In northwestern Nevada and northeastern California, pinyon and/or juniper is a significant component on 21 percent of mountain sagebrush habitats. Under Alternative A, current management of pinyon and/or juniper removal shows a slight decrease in encroachment. In the Central Nevada GRSG subpopulation, pinyon and/or juniper encroachment is a significant component on 18 percent and 6 percent of mountain and Wyoming sagebrush habitats, respectively, with encroachment rates continuing to decline under current management. The Quinn Canyon Range GRSG population is an un-modeled population where pinyon and/or juniper encroachment impacts are high.

Under Alternative A, annual grass expansion in low-elevation sagebrush habitat is outpacing existing treatment rates in five of the seven VDDT modeled GRSG population/subpopulations and the remaining two un-modeled populations. Under current management, treatment rates are maintaining or reducing annual grass in the Northeastern Nevada and Central Nevada GRSG subpopulations.

Impacts from Livestock Grazing Management

Under Alternative A, 16,438,000 acres of PHMA and GHMA combined (9,507,300 acres of PHMA, 6,930,700 acres of GHMA) are available for livestock grazing and 36,000 acres of PHMA and GHMA are unavailable (11,900 acres of PHMA, 24,100 acres of GHMA). This affects approximately 68 percent of the modeled GRSG nesting habitat in the decision area.

Livestock grazing would continue to be managed through existing grazing management plans, following the methods and guidelines from the existing

management plans. This is to maintain ecological conditions according to Standards for Rangeland Health, which call for maintaining healthy, productive, and diverse populations of native plants and animals. Currently, most Nevada LUPs do not contain specific language in regard to GRSG conservation and livestock management; however, many offices have adopted various PMU conservation strategies for GRSG. Recent California LUPs have specific language on the management of livestock and its relation to locally developed GRSG conservation strategies. In the sub-region, national and in some cases local drought policies are in place and would be followed to minimize impacts on rangelands under drought conditions.

Continuation of these policies would provide both short- and long-term indirect benefits through preservation and improvement of existing upland and riparian habitats. Short-term benefits would be limits on forage use in the uplands and in riparian areas that would benefit both nesting and brood-rearing GRSG habitats. Long-term benefits would be the continuation of sagebrush habitats and soil stability. Direct impacts on GRSG would be reduced in some areas due to the GRSG specific management actions found in some PMU conservation strategies, such as limits on turnout areas and duration of grazing, as well as placement of livestock facilities.

According to national BLM policy, riparian habitats are managed to achieve PFC. On National Forest System lands, riparian areas are managed through a combination of utilization standards and design features discussed and documented each year in the Forest Service's Annual Operating Instructions.

Functional condition of riparian areas and wetlands are considered in the development of riparian utilization standards. In some cases this management requires livestock removal or restrictions in riparian areas to reduce livestock impacts, such as trampling and overuse. Managing for PFC helps to improve riparian vegetation health through increased production and diversity of vegetation and helps to improve water retention on those sites. As a result, brood-rearing habitats for GRSG would be improved or preserved where they are applied.

Range improvements are designed to meet both wildlife and range objectives and include the following:

- Building or modifying fences to permit passage of wildlife and reduce the chance of bird strikes
- Using off-site water facilities
- In some cases, modifying or removing improvements not meeting resource needs

Modifications may involve moving troughs, adding or modifying wildlife escape ramps, or ensuring water is available on the ground for various wildlife species.

Although not directly created to protect GRSG, these approaches would protect and enhance GRSG habitat by reducing the likelihood of surface disturbance in sensitive areas and ensuring brood-rearing habitat is available to GRSG.

Impacts from Fire and Fuels Management

In the planning area, all LUPs address fire suppression and fuels management. However, most plans do not include direction for these activities that are specifically focused on GRSG and their habitat. The more recent LUPs contain specific objectives and management action for suppression and management of fires in sagebrush vegetation communities and GRSG habitat in accordance with local PMU conservation strategies. Each LUP supports the development and adherence to a more detailed FMP that outlines priorities and levels of suppression for particular vegetation classes, or resource protection. Most plans support objectives of re-introducing fire into fire-dependent ecosystems and use the Fire Regime Condition Class (FRCC) framework to aid in prioritizing response to wildfires and determining where fire can be used to meet land management plan objectives. Plans place priority for suppression on the protection of life and property followed by important resource values.

In general, fire suppression activities, fuels management, post-fire emergency stabilization and fire restoration efforts are not specifically focused on GRSG, but GRSG would benefit from reduced fire size, post-fire site stabilization, or rehabilitation of diverse native vegetation communities. Some LUPs promote the use of native seed for stabilization and restoration, which may help increase native plant diversity and thereby benefit GRSG. However, this guidance is not consistently applied across the decision area. More direction for the BLM has been provided in Instruction Memorandum 2013-128, which provides habitat maps, guidelines and BMPs for wildland fire suppression and fuels management in GRSG habitat.

Under Alternative A, wildfires would likely continue to increase in size and frequency in the sub-region. GRSG habitat would subsequently continue to be degraded or lost. Small and heavily disturbed populations with dominance of invasive annual grass understory would be particularly susceptible to these impacts. Additionally, there may be some direct and indirect effects on individual GRSG from direct mortality or disturbance due to fire suppression or fuels treatment activities.

Impacts from Wild Horse and Burro Management

Under Alternative A, overall management direction is to manage populations of wild horses and burros to achieve a thriving natural ecological balance with respect to wildlife and other uses. Management would not be based specifically on the habitat needs of GRSG. Wild horses and burros would be managed to achieve and maintain AMLs with gathers based on gather schedules, budgets, or other priorities, such as emergency gathers during drought periods. Keeping

wild horses and burros at AML would reduce overall impacts on vegetation, especially nesting cover and riparian brood-rearing habitats during periods of drought. HMAs and WHBTs in PHMA and GHMA would receive priority for removal of excess wild horses and burros per Washington Office Instruction Memorandum 2012-043. However, negative impacts on riparian habitats from concentrated winter use by wild horses and burros would continue.

Impacts from Leasable Minerals Management

In the sub-region, most public lands are open to fluid mineral leasing. Fluid minerals include oil, gas and geothermal (See **Section 4.3.2,** Nature and Types of Effects).

Impacts from Oil and Gas

Currently, 14,642,300 acres of PHMA and GHMA are managed as open to fluid minerals leasing with standard stipulations and 1,884,300 acres of PHMA and GHMA are closed to fluid minerals leasing for Wilderness Areas and Wilderness Study Areas. In modeled GRSG nesting habitat, there are approximately one million acres of PHMA and GHMA combined, which are closed to fluid mineral leasing under Alternative A. Closed areas provide an increased level of protection to modeled GRSG nesting habitat as described above in See Section 4.4.2, Nature and Types of Effects.

Impacts from Geothermal

Currently, 14,642,300 acres of PHMA and GHMA are managed as open to geothermal leasing with standard stipulations and 1,884,300 acres of PHMA and GHMA are closed to geothermal leasing for Wilderness Areas and Wilderness Study Areas. In modeled GRSG nesting habitat, there are approximately one million acres of PHMA and GHMA combined, which are closed to geothermal leasing under Alternative A. Closed areas provide an increased level of protection to approximately one million acres of modeled GRSG nesting habitat and effects as described above in Section 4.4.2, Nature and Types of Effects.

Impacts from Locatable Minerals Management

Lands in the sub-region are generally open to mineral location. There are specific locatable mineral withdrawals to protect other uses and resources, but none specific to protecting GRSG habitat. All locatable mineral activities are managed under the Surface Management Regulations for BLM at 43 CFR, Part 3809 and for Forest Service at 36 CFR, Part 228. Mitigation of effects on GRSG and their habitat are identified through the NEPA process approving plans of operation. Goals and objectives for locatable minerals are to provide opportunities to develop the resource while preventing undue or unnecessary degradation of public lands.

Lands withdrawn from locatable mineral entry comprise 521,600 acres of PHMA and GHMA (230,700 acres of PHMA and 290,900 acres of GHMA). Current withdrawals restrict minerals development in modeled GRSG nesting habitat including approximately 380,000 acres of PHMA and GHMA and provide an

increased level of protection to modeled nesting habitat. See Section 4.4.2, Nature and Types of Effects.

Impacts from Salable Minerals Management

In the sub-region, most public lands are open to mineral material disposal. Specific closures of areas to salable mineral materials such as Wilderness Areas or crucial or essential wildlife habitat exist throughout the sub-region.

Currently, there are 14,642,300 acres open to material disposal and 1,884,300 acres closed in PHMA and GHMA. Lands closed to mineral material disposal comprise 1,336,900 acres of PHMA and 547,400 acres of GHMA respectively. Closed areas provide an increased level of protection to modeled GRSG nesting habitat in approximately one million acres of PHMA and GHMA and effects on GRSG and their habitat and as described in Section 4.4.2, Nature and Types of Effects.

Impacts from Land Uses and Realty Management

Under Alternative A, all BLM-administered and National Forest System lands are held in retention unless identified for disposal. Disposal criteria typically include considerations of sensitive or crucial resources such as wildlife habitat. While most LUPs in the sub-region do not have specific goals related to GRSG, some newer plans, such as those in California and the Ely District Office in Nevada, do have specific avoidance and exclusion areas, seasonal buffer and seasonal timing restrictions related to GRSG disturbance and habitat. Land tenure adjustments would be subject to current disposal/exchange/acquisition criteria, which include retaining lands with threatened or endangered species, high quality riparian habitat, or plant and animal populations or natural communities of high interest. While not explicitly stated in some existing LUPs, particularly those in Nevada, this would likely include retention of areas with GRSG, and would thus retain occupied GRSG habitats under the BLM administration. This would reduce the likelihood of habitat conversion to agriculture, urbanization, or other uses that would remove sagebrush habitats. Mitigation is typically developed under the NEPA process, and most ROW and surface developments are subject to limited operation periods or other stipulations in local GRSG conservation strategies.

Alternative A, stipulates 14,642,300 acres in PHMA and GHMA as open where certain actions would be considered on a case-by-case basis and 1,884,300 acres of PHMA and GHMA as ROW/SUA exclusion where all development would be prohibited. Acres identified as available for disposal in PHMA and GHMA total 766,300 under Alternative A. Under this alternative, exclusion areas provide an increased level of protection to modeled GRSG nesting habitat. The management actions under Alternative A would reduce both direct impacts such as noise and traffic and indirect impacts such as new facilities on GRSG and their habitats. Most benefits would be realized as long-term benefits to GRSG populations.

Impacts from Renewable Energy Management

Impacts from Solar Energy Development

In the sub-region, most public lands are excluded from solar development. Areas potentially available to solar development include designated Solar Energy Zones, which are considered open. The Final Solar Programmatic EIS states that occupied GRSG habitat and Solar Energy Zones do not overlap (BLM 2012h). Some areas, termed Solar Variance Areas, in PHMA and GHMA remain available for application for solar development.

Under Alternative A, 630,100 acres of PHMA and GHMA would be designated as Solar Variance and would remain open to application for solar development in the sub-region. This alternative leaves the remaining 13,957,800 acres as exclusion and 1,938,700 acres of avoidance in PHMA and GHMA. Exclusion areas provide greater protection from human disturbance to over 10 million acres of modeled GRSG nesting in PHMA and GHMA.

Impacts from Wind Energy Development

In the sub-region, most areas of public land would remain open for wind energy development. Under Alternative A, 14,642,300 acres of PHMA and GHMA are open to wind energy development and 1,884,300 acres of PHMA and GHMA are managed for wind energy exclusion. Outside these areas, there would be more impacts on GRSG and their habitat than inside the exclusion areas. Impacts on GRSG and their habitat from construction and operation of wind energy facilities are discussed under Nature and Type of Effects, above. Alternative A allows for high use of GRSG habitat for wind energy. Alternative A excludes 11 percent of PHMA and GHMA in the decision area from wind energy development and provides an increased level of protection to approximately one million acres of PHMA and GHMA in modeled GRSG nesting habitat.

Impacts from Comprehensive Travel and Transportation Management

Under current management, travel management areas have not been consistently identified in LUPs beyond the basic allocations of open, closed, and limited. Closed areas are comprised of congressionally designated areas, WSA, and as directed, by some ACECs. These closed areas are retained through all alternatives. Areas limited to existing/designated roads include National Forest System lands, non-wilderness portions of the Black Rock/High Rock NCA, and all non-wilderness portions of the recently completed California BLM LUPs (BLM 2008a; BLM 2008b, BLM 2008c), which includes northeastern California and northwestern Nevada.

Impacts on GRSG from recreation are well documented (See **Section 4.4.2,** Nature and Types of Effects). Comprehensive Travel and Transportation involves the regulation of off-road use by motorized vehicles. Off-road motorized vehicle use can impact GRSG habitat by causing habitat loss and

fragmentation, invasive plant spread, induced displacement or avoidance behavior, creation of movement barriers, noise, and direct encounters (Knick et al. 2011). Reducing the extent and influence of roads and trails, and the areal extent of off-road use would reduce impacts associated with these activities. Cross-country vehicle travel is most prevalent after wet conditions have abated, particularly during the late summer/fall hunting seasons. Juvenile GRSG become increasingly mobile during late summer through the winter and are less impacted by random vehicle disturbance during this period. The effect of limiting vehicular access to existing roads is minor, but of note during these time periods. For comparison of impacts, the acreage designated closed, limited, or open can provide a direct comparison among alternatives.

Under current management, 521,600 acres of PHMA and GHMA are closed to motorized vehicles, 3,859,600 acres of PHMA and GHMA are limited to existing routes for motorized vehicles, and 12,145,400 acres of PHMA and GHMA are open to all modes of cross country travel (see **Table 4-3**).

Table 4-3
Alternative A: Acres of GRSG Habitat and Modeled Nesting Habitat in Travel Management Designations

Allocation	PHMA	GHMA	Modeled Nesting Habitat
		(acres)	
Closed	230,700	290,900	383,100
Limited	2,382,200	1,454,100	2,905,000
Open	6,939,500	5,205,900	8,964,200

Source: BLM and Forest Service 2015

Impacts from Areas of Critical Environmental Concern

Under Alternative A, there are 237,000 acres in 29 existing ACECs which contain GRSG habitat. Current management in 22 of the existing ACECs provide some level of protection to 114,700 acres of PHMA and GHMA increasing protection to GRSG and their habitat in those acres.

4.4.5 Alternative B

Impacts from Vegetation and Soils Management

Under Alternative B, restoration projects would be prioritized in seasonal GRSG habitats thought to be limiting the distribution and abundance of GRSG. Re-establishment of sagebrush cover and desirable understory plants would be the highest priority for restoration efforts. Restoration treatments would incorporate habitat parameters defined by Connelly et al. 2000, Hagen et al. 2007, and state GRSG conservation plans. Native seed would be required for restoration treatments and the establishment of designated seed harvest areas for sagebrush seed collection in fire prone areas. Climate change would be a consideration when proposing native seed collection. In addition, post-

restoration management plans would be implemented to ensure long-term persistence of vegetation treatments.

Alternative B management prescriptions for vegetation and soil applied to PHMA (9,573,300 acres) and GHMA (6,953,300 acres) would provide greater protection and restoration efforts for GRSG habitat compared with those under Alternative A.

Alternative B would ensure the long-term availability and resiliency of native seed for restoration treatments by establishing native seed harvest areas which incorporate climate change effects. This and post- treatment management plans would provide long-term beneficial impacts by improving the success of restoration treatments and the future persistence of GRSG and their habitat.

Vegetation treatment rates would be greater than under Alternative A and would further reduce the impacts of invasive grasses, affecting seven of the nine GRSG population/subpopulations where invasive grasses are a substantial threat. Treatment rates under Alternative B would further reduce the impacts of pinyon and/or juniper encroachment on four of the nine GRSG population/subpopulations where pinyon and/or juniper encroachment is a substantial threat. VDDT modeled trends for GRSG habitat projected at 10 and 50 years would improve under Alternative B compared with Alternative A.

Impacts from Livestock Grazing Management

Under Alternative B, the same number of acres would be available for livestock grazing as under Alternative A; the same number of acres of modeled GRSG nesting habitat would be affected in the sub-region. Agencies, in coordination with permittees, would prioritize a number of management actions in PHMA. These would incorporate GRSG habitat objectives and management considerations into livestock grazing management; however, there would be no change to the acreage available for grazing or available AUMs, unless an allotment were being retired from grazing.

Management actions would include developing specific vegetation objectives based on ESDs to conserve, enhance, or restore PHMA, and riparian areas would be managed to achieve PFC. Vegetation treatments to increase livestock forage would be allowed only if they would conserve, enhance, or restore GRSG habitat. This alternative would also modify season of use, number of livestock, or livestock types to meet seasonal GRSG habitat objectives.

New water developments would be authorized only when they would benefit GRSG in PHMA. In PHMA, older developments would also be analyzed to determine if system modification is necessary to maintain the integrity of the riparian area. These management strategies for water developments would yield large improvements in brood-rearing habitats for GRSG, as well as the structural integrity of riparian systems. Removing, modifying, or marking fences would be considered under Alternative B.

Alternative B would provide long-term enhancement and restoration of GRSG habitat by implementing management actions. These actions would improve both upland and riparian GRSG habitats and both short- and long-term impacts on GRSG seasonal ranges. In addition, the focus would be in PHMA and GHMA, which would accelerate enhancement and restoration of GRSG habitats, compared to Alternative A. Also compared to Alternative A, management actions proposed in Alternative B would further reduce but not eliminate impacts from livestock grazing on GRSG and their habitat.

Impacts from Fire and Fuels Management

Under Alternative B, impacts on GRSG from fire suppression activities would be largely the same as Alternative A. On BLM and National Forest Service-administered lands, 9,573,300 acres of GRSG habitat would be designated as PHMA and 6,953,300 acres would be designated as GHMA. With regard to fuels management projects, GRSG would benefit from the direction provided to protect important aspects of habitat in PHMA (e.g., canopy cover). Fuels projects focused on protecting GRSG habitat would be prioritized in these areas. Any fuels treatment in sagebrush would carefully consider if there would be a net benefit to GRSG and their habitat prior to implementation Prescribed fire in low precipitation areas (less than 12 inches) would generally not be permitted. Post-fire rehabilitation would be conducted using primarily native species, based on availability and adaptation. Rest from grazing would be required for two full growing seasons, unless vegetation recovery dictates otherwise. These activities may decrease the likelihood for fire in GRSG habitats and would help restore GRSG habitat in fire-affected areas. Relative to the amount of GRSG habitat that is expected to burn based on current trends; these actions may provide localized but minimal protections and improvements to seven of the nine GRSG populations/subpopulations in the sub-region where fire contributes significantly to declining GRSG populations compared with Alternative A.

Impacts from Wild Horse and Burro Management

Under Alternative B, wild horses and burros would be managed to achieve and maintain AMLs on the same number of acres as Alternative A, with gathers and removals of excess animals prioritized in PHMA and other areas to prevent catastrophic environmental issues, including herd health impacts. HMA plans when developed or updated would incorporate GRSG habitat objectives derived from Connelly et al. (2000), Hagen et al. (2007), or if available, state conservation plans and the ability to incorporate appropriate local information in habitat restoration objectives, which is similar to Alternative A. Implementation of any range improvements would follow the same guidance as identified for livestock grazing in this alternative including designing and locating new improvements only where they "conserve, enhance, or restore GRSG habitat through improved grazing management". Design features could include developing or modifying water impoundments to mitigate for West Nile virus, removing or modifying fences to reduce bird strikes, or monitoring and treating

invasive species associated with range improvements. Additional range improvements would specifically address the habitat requirements of GRSG. Compared with Alternative A, Alternative B would prioritize GRSG habitat objectives in HMA plans and base assessment of AMLs on achieving or maintaining GRSG seasonal habitat needs. Compared with Alternative A, Alternative B provides more focused management of wild horses and burros which would provide localized, long-term improvements to grass cover and forb availability for nesting and both early and late brood-rearing habitats. Effects would be greatest where wild horse and burro gathers have been implemented and for the duration of herd numbers which are appreciably reduced toward AML.

Impacts from Leasable Minerals Management

Impacts from Oil, Gas and Geothermal Development

Alternative B would close 9,573,300 acres of PHMA and 547,400 acres of GHMA to leasing. Alternative B would close 8,236,400 additional acres of PHMA and GHMA compared to Alternative A. Closure to leasable minerals would result in long-term beneficial impacts on GRSG and their habitat associated with all seasonal life history requirements. Alternative B would reduce disturbance to both GRSG habitat and individuals at leks, during nesting, brood-rearing, and on winter ranges; reducing direct disturbance to approximately 9 million acres of PHMA and GHMA in modeled GRSG nesting habitat.

Impacts from Locatable Minerals Management

Alternative B would be more protective than under Alternative A. In addition to withdrawals and processes for management, PHMA would be proposed for withdrawal from mineral entry and existing mining claims would be subject to validity exams. Proposed withdrawal under Alternative B would include approximately 9,342,600 additional acres of PHMA than Alternative A. Withdrawal from locatable mineral entry would result in long-term beneficial impacts on GRSG habitats associated with all seasonal life history requirements. Alternative B would reduce disturbance to both GRSG habitat and individuals at leks, during nesting, brood-rearing, and on winter ranges; reducing direct disturbance to over 8 million acres of PHMA in modeled GRSG nesting habitat.

Impacts from Salable Minerals Management

Alternative B would be more protective than Alternative A and would close PHMA to mineral material sales.

Alternative B provides closure of an additional 8,236,400 acres of PHMA as compared to Alternative A and would provide a long-term reduction in disturbance to both GRSG habitat and individuals at leks, during nesting, brood-rearing, and on winter ranges. Alternative B would reduce disturbances from new mineral material sales on GRSG and their habitat in PHMA. However,

disturbances from new mineral material sales in GHMA would continue to remove, fragment, and degrade GRSG habitat and cause direct disturbance to GRSG during all seasonal life-cycles including breeding, nesting and brood-rearing.

Impacts from Land Uses and Realty Management

Under Alternative B, more GRSG habitats would be managed as ROW/SUA avoidance (6,470,600 acres of GHMA) and exclusion (9,573,300 acres of PHMA) than under Alternative A. PHMA would be designated as exclusion areas, with some exceptions, for new ROWs and special use authorizations. Mitigation and restoration efforts would take place related to existing ROWs in PHMA. In GHMA, avoidance areas would be established in relation to new ROWs, collocating ROWs as much as possible. Under Alternative B, PHMA would be retained unless mitigation or land exchange would better benefit GRSG and their habitat. In relation to Alternative A, management under Alternative B would provide fewer direct impacts on GRSG and their habitat by greatly increasing acreage subject to ROW/SUA avoidance and exclusion (16,043,900 acres combined), and by protection and acquisition of GRSG habitats. ROW/SUA exclusion and avoidance would result in long-term beneficial impacts on GRSG and their habitat. Alternative B would reduce disturbance to both GRSG seasonal habitats and individuals, during nesting and brood-rearing, and on winter ranges.

Impacts from Renewable Energy Development

Impacts from Wind Energy Development

In the sub-region, most areas of public land would remain open for wind energy development. 10,120,700 acres of PHMA and GHMA would be excluded and 6,405,900 acres of GHMA would be managed as ROW/SUA avoidance for wind energy development.

In the sub-region, in modeled nesting habitat there are 983,600 of exclusion and 89,200 of avoidance acres of PHMA and GHMA, respectively. Proposed ROW/SUA exclusion and avoidance areas would provide an increased level of protection to modeled GRSG nesting habitat.

Impacts from Solar Energy Development

In the sub-region, most public lands are excluded from solar development. Areas potentially available to solar development include designated Solar Energy Zones, which are considered open. The Final Solar Programmatic EIS states that occupied GRSG habitat and Solar Energy Zones do not overlap (BLM 2012h). Some areas, termed Variance Areas, in PHMA and GHMA remain available for application for solar development. Solar Energy Variance Areas are considered as avoidance.

Under Alternative B, 604,600 acres of PHMA and GHMA would be designated as Solar Variance and would remain open to application for solar development

in the sub-region. This alternative leaves the remaining PHMA and GHMA (15,922,000 acres) closed or limited to solar development.

There are 13,957,800 acres of PHMA and GHMA identified for exclusion and 1,964,200 acres that would be designated as Solar Variance (avoidance) in modeled GRSG nesting habitat.

Impacts from Comprehensive Travel and Transportation Management

Under Alternative B, areas designated as open to cross-country travel in PHMA would be managed as limited for motorized travel with the exception of existing closed areas in PHMA or GHMA.

Under Alternative B, 521,600 acres of PHMA and GHMA would be subject to existing closures to motorized vehicles. 9,599,100 acres of PHMA and GHMA would be limited to existing roads, and 6,405,900 acres of GHMA (0 acres would be open in PHMA) would be open to all modes of cross-country travel (See **Table 4-4**).

Table 4-4
Alternative B: Acres of GRSG Habitat and Modeled Nesting Habitat in Travel Management Designations

Allocation	PHMA	GHMA	Modeled Nesting Habitat
	(acres)		
Closed	230,700	290,900	383,100
Limited	9,342,600	256,500	9,359,300
Open	0	6,405,900	2,449,300

Source: BLM and Forest Service GIS 2015

Alternative B would reduce the potential for random vehicle disturbance to GRSG and their habitat in PHMA during all phases of their seasonal life history. Disturbance to GRSG during lekking, and secondarily during nesting, would be the most detrimental direct impact on GRSG but is naturally limited by weather conditions during late winter and early spring. The effect on GRSG of limiting vehicular access to existing roads is minor but of note. Cross-country vehicle travel is most prevalent after wet conditions have abated and particularly during the late summer and fall hunting seasons. Juvenile GRSG become increasingly mobile during late summer through winter and are less impacted by random vehicle disturbance during this period.

Impacts from Areas of Critical Environmental Concern

Under Alternative B, approximately 114,700 acres of PHMA and GHMA in 22 existing ACECs, approximately 80,400 acres of PHMA and 34,300 acres of GHMA would be recommended for Withdrawal of locatable minerals, Exclusion or Avoidance to Avoidance or Exclusion of Solar, Wind and other ROWs. The recommendation for Withdrawal of locatable minerals in PHMA would also

extend to WSAs. This would increase protection of PHMA and GHMA, reduce impacts on GRSG and their habitat and provide an increased level of protection to all GRSG life history requirements.

4.4.6 Alternative C

Impacts from Vegetation and Soils Management

Under Alternative C, vegetation management would prioritize the restoration of crested wheat seedings back to native vegetation communities and focus fuels treatments in areas of urban interface and significant existing disturbances, establish monitoring sites, require "Risk Assessments," minimize or eliminate the use of herbicides, address vectors of weed infestations, and require the use of mowers to remove thatch from meadows and to manage existing fuel breaks.

Management prescriptions under Alternative C would focus vegetation treatments in unoccupied GRSG habitats (e.g., crested wheat grass seeding, urban interface, areas where livestock management infrastructure is removed, and other areas of significant disturbances). Broad-scale treatment of invasive grasses would be achieved through natural recovery following the removal of livestock. Pinyon and/or juniper removal projects would be limited as well.

Given the limited current distribution of suitable GRSG habitat, management plans that strategically protect intact sagebrush and restore impacted areas to enhance existing habitats have the best chance of increasing the amount and quality of GRSG habitat (Manier et al. 2013, p. 171). Alternative C would not prioritize restoration treatments in occupied GRSG habitats; therefore, it would decrease the potential for restoring and protecting GRSG habitat as compared with Alternative A. Alternative C would also rely on the removal of livestock and a presumption that vegetation would recover over the long term in the absence of large-scale vegetation treatments. VDDT modeling projected GRSG habitat trends for 10 and 50 years under Alternative C and indicated a slight decline in invasive grasses but a continued dominance of pinyon and/or juniper in GRSG populations and subpopulations throughout the sub-region as compared with Alternative A.

Impacts from Livestock Grazing Management

Under Alternative C, 16,526,600 acres of PHMA would not be available for livestock grazing. Maintaining a 6-inch stubble height throughout the livestock grazing season in riparian areas and a 9-inch stubble height on the uplands would be mandated as part of this alternative. As needed, livestock would be reduced rather than moved into other sagebrush habitats. Both passive and active restoration would be used; it would remove livestock, roads, water developments, fences, and other range infrastructure that may contribute to GRSG predators or increase habitat for mosquitoes carrying the West Nile virus. Additional restoration would reseed roads and crested wheatgrass with native shrubs and grasses.

Under Alternative C, grazing impacts on GRSG would be reduced compared to Alternative A. Potential nest trampling would be eliminated since no grazing would allowed during the GRSG nesting season. Also, the potential for direct impacts from livestock turnouts would also be reduced or eliminated. Removing livestock grazing in PHMA under this alternative would result in greater amounts of residual upland cover, both in the short and long term, compared to Alternative A. Removing fences would reduce the potential of GRSG direct strikes and reduce the potential for predation. However, fence removal would increase negative impacts on brood-rearing habitats from wild horses and burros having access to more riparian sites.

Where current range developments are negatively impacting riparian habitats, removing troughs and other artificial watering devices would make more water available on the ground for GRSG and other wildlife using riparian habitats. It would do this by limiting the volume of water removed from riparian areas and improving the long-term holding capacity of riparian habitats.

Impacts from Fire and Fuels Management

Under Alternative C, impacts on GRSG from management actions related to wildfire and fuels management would be similar to, but slightly greater than Alternative A. This is due to two key differences. First, Alternative C adopts a passive restoration approach, relying on long-term improvements of habitat conditions by closing PHMA to livestock grazing. Further, the alternative does not rely on pre-suppression infrastructure, such as fuels treatments. Fuels treatments are restricted in GRSG habitat, except for in existing disturbances and along the human habitation interface. This restriction of fuel treatments would increase the chance of wildfire, which may reduce GRSG habitat and impact individual GRSG. The second key difference is that with the restriction of livestock grazing and decrease in grass utilization, there would be an increase in the fine fuels available, which may increase the risk for wildfire and the potential numbers of the acres burned in a given year. This increased fire risk has the potential to reduce GRSG habitat.

Impacts from Wild Horse and Burro Management

Under Alternative C, wild horses and burros would be managed on the same HMA/WHBT acreage as under Alternative A. Wild horse and burro populations would likely thrive due to the removal of livestock grazing, which would result in reduced forage and water competition in the planning area. Wild horses and burros would be managed to achieve and maintain AML. However, existing AMLs would be evaluated and analyzed in conjunction with Rangeland Land Health Assessments to determine attainment of GRSG habitat objectives. Use of population growth suppression methods to manage wild horse and burro numbers would be similar to actions under Alternative A. Alternative C would not allow the use of helicopters for gathers and would lead to decreased gather efficiency, resulting in wild horse and burro populations remaining in excess of established AMLs. Combined with the removal of some fences during active

restoration processes related to removal of livestock grazing, wild horses and burros would range over a larger area than under Alternative A and may necessitate the need for increased gather activities outside of HMA/WHBT boundaries. The increase in access to riparian and upland habitats that are currently protected by fences, and expected continuance of wild horse and burro populations being over AML due to decreased gather efficiencies, would likely result in no to slight improvement of GRSG habitat over time when compared with Alternative A.

Impacts from Leasable Minerals Management

Impacts from Oil, Gas and Geothermal Development

Alternative C would afford the highest level of protection of all alternatives. Mineral leasing would be precluded for all ACECs, including all PHMA, under this alternative. Closed acreage would include all PMUs in the sub-region, protecting all occupied or potentially occupied GRSG habitat and increasing the level of protection to all associated populations and sub-populations.

Impacts from Locatable Minerals Management

Alternative C would afford the highest level of protection of all alternatives. Mineral entry withdrawal would be recommended for all ACECs and all PHMA, protecting all occupied or potentially occupied GRSG habitat.

Alternative C would withdraw all PHMA (16,527,400 acres) from locatable mineral entry. All PHMA Withdrawal would increase protection of all acres of PHMA in modeled GRSG nesting habitat.

Impacts from Salable Minerals Management

Alternative C would close all PHMA to mineral materials sales, providing the highest level of protection among all of the alternatives.

Alternative C would close 16,526,600 acres of PHMA to mineral material disposal. Closure would increase protection of all acres of PHMA in modeled GRSG nesting habitat.

Impacts from Land Uses and Realty Management

Under Alternative C, ROW/SUA avoidance acres would be the same as under Alternative A. In PHMA, there are more acres managed as ROW/SUA exclusion under Alternative C (16,526,600 acres) than under Alternative A (1,884,300 acres). This difference would provide protections to more acres of the modeled GRSG nesting habitat than Alternative A. This difference is due to resource use restrictions in all PHMA, as well as potential ACECs. Acres identified for disposal are less than Alternative A. Under Alternative C, all PHMA and identified restoration and rehabilitation lands would be retained in public ownership. New corridors or facilities including communication towers would only be allowed in nonhabitat areas with existing towers undergoing reviews for adverse effects. All existing transmission or pipeline corridors would be

assessed under this alternative and ROWs or SUAs would be amended to require features that enhance GRSG habitat security. Alternative C would result in fewer direct and indirect impacts on GRSG and their habitat compared with Alternative A. This is due to the majority of effects associated with the Lands and Realty program occurring outside of GRSG habitats and effects in current ROWs being minimized over time. Additionally, this alternative would prioritize more areas for acquisition when they benefit GRSG and their habitats compared with Alternative A.

Impacts from Renewable Energy Management

Impacts from Solar and Wind Energy Development
Alternative C would prohibit development in all PHMA. Alternative C would close all PHMA to large-scale solar development and wind energy. Alternative C provides the highest level of protection for GRSG and their habitat of all of the alternatives, with 16,526,600 acres of exclusion for solar and wind development in PHMA.

Closure would increase protection of all acres of PHMA in modeled GRSG nesting habitat associated with leks. This alternative further buffers wind development outside of PHMA by 5 to 10 miles, affording additional protection to potential and unoccupied habitats adjacent to PHMA. This alternative eliminates the impacts from renewable energy development on GRSG and their habitat in all seasonal ranges.

Impacts from Comprehensive Travel and Transportation Management
Under Alternative C, PHMA would be managed as limited to motorized travel with the exception of existing closed areas. Alternative C would minimize cross-country vehicle travel, which would reduce disturbance to GRSG and their habitat during all seasons, compared with Alternative A.

Impacts from Areas of Critical Environmental Concern
Alternative C would expand ACEC management to include 9,262,900 acres of PHMA in 19 proposed ACECs specifically for the protection and management of GRSG and their habitat. GRSG would be recognized as the Relevance and Importance Values in these proposed ACECs. Alternative C would recommend Withdrawal of locatable minerals development in PHMA which would also include WSAs which are currently open to locatable materials. Alternative C would reduce disturbance to GRSG and their habitat during all seasons, compared with Alternative A.

4.4.7 Alternative D

Impacts from Vegetation and Soils Management
Alternative D would focus on vegetation management in PHMA, GHMA and OHMA with a goal of maintaining a resilient sagebrush vegetation community, restoring sagebrush communities to reduce habitat fragmentation, and

maintaining and re-establishing habitat connectivity over the long term. Management actions include vegetation effectiveness research; region-specific GRSG habitat objectives (Table 2-2) that consider life requisite, habitat indicators and objectives to be incorporated in proposed vegetation treatments across all resource programs; management of lotic and lentic riparian areas; seeding and seedling treatments for areas affected by wildfire; use of native seed; evaluation of treatments at a landscape scale; use of fire resistant species for fuel breaks; resting of grazing allotments pre- and post-treatment; monitoring and control of invasive species; prioritizing treatments in winter habitat by enhancing or reducing wildfire risk; and increasing edge habitat adjacent to riparian areas.

Alternative D would provide for specific on the ground management objectives for vegetation treatments which are categorized by GRSG seasonal habitat requirements. This would allow for attainment of the appropriate treatments to be applied on the ground and a set of common goals and objectives being met throughout the sub-region. Alternative D would require two growing seasons of rest from cattle grazing (which is included in some newer LUPs) following vegetation treatments. This requirement coupled with vegetation effectiveness research and meeting specific seasonal GRSG habitat objectives would increase the success of treatments being implemented compared with Alternative A (see **Table 2-11**, Habitat Objectives for Greater Sage-Grouse). VDDT modeling projects that GRSG habitat trends projected for 10 and 50 years would improve under Alternative D, compared with Alternative A, and would be similar to Alternative B.

Impacts from Livestock Grazing Management

Management actions under Alternative D would be greater than Alternative A. Alternative D considers grazing management based on GRSG habitat objectives (**Table 2-11**). Actions under this alternative would provide both short-term (less disturbance, such as grazing limitations in nesting areas and post-drought management) and long-term (habitat assessments during permit renewals specifically for seasonal GRSG habitat condition). Alternative D would make more cover available for GRSG nesting and brood-rearing habitats than Alternative A.

Impacts from Fire and Fuels Management

Effects on GRSG from wildfire and fuels management under Alternative D would be less than Alternative A and similar to, but also less than Alternative B. Direct impacts on GRSG are expected to be slightly less due to an increase in fuels management treatments and post-fire rehabilitation projects in PHMA, which are focused on maximizing benefits to GRSG habitat. Fuel breaks would be implemented to better contain wildfires, and during firefighting operations sagebrush habitat would be protected to the extent possible as a valuable resource. See discussion under Alternative B, *Impacts from Fire and Fuels Management*.

Relative to the amount of GRSG habitat that is expected to burn based on current modeled GRSG habitat trends; Alternative D may provide localized but minimal protections and improvements to seven of the nine GRSG populations/subpopulations in the sub-region where fire contributes significantly to current declining GRSG habitat and populations.

Impacts from Wild Horse and Burro Management

Under Alternative D, gathers would be prioritized in both PHMA and GHMA. Wild horses and burros would be managed to maintain and enhance GRSG habitats. Alternative D would provide greater beneficial effects than under Alternative A. Beneficial effects on GRSG would accrue more quickly due to the prioritization of gathers based on GRSG habitats.

Overall, Alternative D provides both short- and long-term improvements to grass cover and forb availability in PHMA and GHMA. This would affect nesting and both early and late brood-rearing habitats where wild horse and burro gathers have been implemented and for the duration of which wild horse and burro populations are appreciably reduced toward AML.

Impacts from Leasable Minerals Management

Impacts from Oil and Gas Leasing

Alternative D would allow leasing on all lands with federal fluid mineral estate. In PHMA and GHMA, leasing would only be allowed with NSO stipulations. Waivers, exceptions, or modifications would not be considered in PHMA and would be considered in GHMA. OHMA would be open to leasing with standard stipulations.

Alternative D would include 1,884,300 acres as closed to oil and gas development in PHMA and GHMA. 8,684,400 acres of PHMA are managed as NSO without any waivers, exceptions, or modifications. and 5,957,900 acres of GHMA would be managed as NSO, but would allow waivers, exceptions, or modifications and 6,709,100 acres of OHMA would be managed as open with standard stipulations. NSO stipulations would prohibit occupancy and all surface-disturbing activities on all or part of the lease, for the life of the lease. The NSO would protect more acres of PHMA and GHMA than under Alternative A. Direct and indirect impacts on GRSG individuals, populations and their habitat in the NSO buffer would be reduced under Alternative D. This alternative affords increased protection of all seasonal GRSG habitat from disturbance, decreases fragmentation and reduces disturbance from structures and noise as compared to Alternative A.

Impacts from Geothermal Leasing

The allocations for geothermal development under Alternative D would be the same for oil and gas as identified above.

The NSO restriction would protect more acres of PHMA and GHMA than under Alternative A. Direct and indirect impacts on GRSG individuals, populations and their habitat in the NSO buffer would be reduced under Alternative D. This alternative affords increased protection of all seasonal GRSG habitat from disturbance, decreases fragmentation and reduces disturbance from structures and noise as compared to Alternative A. In addition, on expiration or termination of existing undeveloped geothermal leases in PHMA, those lands would be managed as NSO, with no exceptions, modifications, or waivers.

Impacts from Locatable Minerals Management

Impacts would be the same as Alternative A.

Impacts from Salable Minerals Management

Impacts would be the same as Alternative C.

Impacts from Land Uses and Realty Management

PHMA and GHMA would be managed to reduce fragmentation and enhance connectivity under Alternative D. Under this alternative, more acres would be managed as ROW/SUA avoidance than under Alternative A. PHMA and GHMA would be managed as ROW/SUA exclusion areas for large-scale wind and solar energy development, and ROW/SUA avoidance for all other major and minor land use authorizations. Road ROWs would be authorized based on public safety or administrative needs. Development could occur in avoidance areas with appropriate RDFs consistent with applicable law. Similar to Alternative A, in PHMA and GHMA; new utilities would be collocated with existing surface ROWs. PHMA and GHMA would be managed as ROW/SUA avoidance for new communication site ROWs or SUAs. ROW/SUA avoidance acreage provides an increased level of protection for over 70 percent of modeled GRSG nesting habitat.

Fewer acres would be identified for disposal under Alternative D than under Alternative A, which would result in a greater number of acres of GRSG habitat retained in either PHMA or GHMA.

Impacts from Renewable Energy Management

Impact from Wind Energy Development

Under Alternative D, all PHMA (10,021,300 acres) and all GHMA (6,505,300 acres) would be managed as ROW/SUA exclusion for wind energy facilities. This alternative would have fewer impacts on GRSG than Alternative A. This level of closure provides the maximum preservation of sagebrush habitat and protection of GRSG and their habitat. All of the 16,526,600 acres of PHMA and GHMA in the decision area would be managed as ROW/SUA exclusion and 0 acres would be managed as ROW/SUA avoidance under Alternative D. The exclusion of wind energy developments in PHMA and GHMA eliminates the impact of tall structures, which GRSG avoid during all phases of their seasonal life history.

Exclusion also eliminates the need for additional infrastructure development, which further degrades and fragments GRSG habitat.

Impacts from Solar Energy Development
Under Alternative D, PHMA and GHMA would be managed as ROW/SUA exclusion for new solar energy facilities. This would provide a high level of protection of GRSG and their habitat; excluding all sagebrush habitat in PHMA and GHMA (16,526,600 acres) from new development. Impacts under Alternative D on GRSG would be similar to those described above for wind energy development under Alternative D.

Impacts from Comprehensive Travel and Transportation Management
Under Alternative D, areas designated as open to cross-country travel in PHMA and GHMA from Alternative A would be managed as limited to motorized travel, making it the most limiting to travel management designations.

Under Alternative D, 818,500 acres in PHMA and GHMA would be closed to motorized vehicles. Alternative D limits vehicular travel to existing roads on 16,005,000 acres (PHMA and GHMA) and retains 6,412,200 acres of OHMA open to all modes of cross-country travel (see **Table 4-5**).

Table 4-5
Alternative D: GRSG Habitat in Travel Management Designations

Allocation	PHMA	GHMA
	(acres)	
Closed	521,600	0
Limited	9,514,300	6,490,700
Open	0	0

Source: BLM and Forest Service GIS 2015 and USGS 2014

Alternative D would reduce the potential for random vehicle disturbance to GRSG and their habitat in all mapped GRSG habitats during all phases of their seasonal life history compared with Alternative A. Disturbance to GRSG during lekking, and secondarily during nesting, would be the most detrimental impact, but it is naturally limited by vehicle travel conditions during late winter/early spring. Cross-country vehicle travel is most prevalent after wet conditions have abated and particularly during the late summer/fall hunting seasons. Juvenile GRSG become increasingly mobile during late summer through winter and are less impacted by random vehicle disturbance during this period. The effect of limiting vehicular access to existing roads is minor but of note during these times.

Impacts from Areas of Critical Environmental Concern
Alternative D would have similar to, but slightly less impacts on GRSG and their habitat as under Alternative B due to an additional 45,700 acres of OHMA included for protective management action under Alternative D.

Impacts from Adaptive Management

Applying an adaptive management strategy that allows for an adjustment of up to plus or minus (+/-) ten (10) percent in habitat category changes provides for flexibility of applying a science based process for adjusting GRSG habitat maps in a timely manner..

Under this alternative, up to 2,323,600 acres could be either added to or deleted from PHMA, GHMA and/or OHMA, based off of the adjustment protocol. If deleted from PHMA, the acres may be re-located into GHMA or into OHMA, a combination of both, or some acres may be found to be nonhabitat. If added to PHMA, it is expected that the majority of added habitat would be from GHMA or OHMA, but could incorporate habitat that is currently not identified as such based off of the protocol.

If deleted from GHMA, it may be re-located into PHMA, OHMA, or found to be nonhabitat. If added to GHMA, it is expected that the addition would primarily be from PHMA and OHMA, but also could incorporate habitat that is currently not identified as habitat.

If deleted from OHMA, it may be re-located into PHMA, GHMA, or found to be nonhabitat. If added to OHMA, it is expected that the addition would primarily be from PHMA, GHMA, but could also incorporate habitat that is currently not identified as habitat.

If additional acres are added or removed to PHMA, GHMA, or OHMA, it is projected that the same effects that were analyzed for impacts on PHMA, GHMA, and OHMA would be similar, just at a larger or smaller scale in terms of acres.

The plus or minus 10 percent change in habitat delineation is anticipated to be considered over a multi-year time frame, and is not expected to occur at any one time.

4.4.8 Alternative E

This alternative proposes to reduce the effects on GRSG habitat (core, Priority, and General) by applying "avoid," "minimize," and "mitigate" strategies, with the addition of the Conservation Credit System managed by the State of Nevada.

Alternative E establishes an SGMA from the Strategic Plan for Conservation of GRSG in Nevada (State of Nevada 2014). In SGMA, core, Priority, General, and nonhabitat has been identified. The Nevada Governor's Sagebrush Ecosystem Council would work to achieve conservation in SGMA through a net conservation gain. This is defined as the State's objective to maintain the current quantity and quality of GRSG habitat in SGMA at the state-wide level by protecting existing GRSG habitat or by mitigating for loss due to human disturbances.

Alternative E proposes a hierarchical decision-making process for considering planned disturbance or development. It would relocate disturbance and development wherever possible; would minimize them through permit conditions to lessen effects; and would mitigate them by implementing additional actions that would replace an asset (mainly habitat) that would be lost through development. Mitigation requirements would be determined in coordination with the SETT under the Nevada Conservation Credit System. SGMA applies only to lands in Nevada.

SGMA includes 21.1 million acres of core, Priority, and General GRSG habitat (equivalent to PHMA, GHMA, and OHMA) in Nevada; this breaks down to 9.2 million acres of core, 6.6 million acres of Priority, and 6.4 million acres of General habitat.

Alternative E does not provide fixed exclusion or avoidance areas, leaving all management subject to an avoid, minimize, and mitigate approach. This provides a lower level of certainty than other alternatives that have fixed exclusion and avoidance land allocations based on PHMA, GHMA, and OHMA designations.

Impacts from Vegetation and Soils Management

Under Alternative E, BLM-administered lands in California would be managed as they are now under Alternative A; BLM-administered lands in Nevada would be managed similar to Alternative D. Restoration would be based on data-driven models that incorporate ecological site potential and identify the highest priority sites with high success potential.

Evaluating and adjusting GRSG habitat and management boundaries would also be required under Alternative E, based on continuing inventory and monitoring results. Alternative E would ensure that disturbances in SGMA are sited in the least suitable GRSG habitats.

This alternative guides the application of on- and off-site mitigation and restoration by identifying the most limiting seasonal GRSG habitat. It would ensure that mitigation and restoration are applied in areas that would provide the most benefit to GRSG. Fragmentation threats would be reduced through a focused mitigation strategy under Alternative E.

Restoration would also include GRSG habitat objectives shown in **Table 2-13**. The habitat objectives would be used to evaluate management actions that are proposed in GRSG habitat. These actions are to ensure that habitat conditions are maintained if they are currently meeting objectives or that habitat conditions move or are making progress toward these objectives if they currently do not. Vegetation management would be similar to that under Alternatives B and D. The coordination processes between the State and land management agencies ensures consistency in all vegetation management actions, and also establishes, monitors, and implements a net conservation gain.

Alternative E would provide for more vegetation treatments in core, Priority, and General GRSG habitats (PHMA, GHMA, and OHMA) than under Alternative A. Its impacts are similar to those under Alternatives B and D. In addition, 10- and 50-year GRSG vegetation habitat trends as modeled in VDDT would improve, compared with Alternative A, and would be similar to Alternatives B and D.

Impacts from Livestock Grazing Management

Under Alternative E, there would be no change in acres from existing areas available for grazing. Alternative E would emphasize cooperative implementation of appropriate prescribed grazing conservation actions, at scales sufficient to influence a positive response in GRSG habitat acres (NRCS 2011). An example of this is NRCS conservation Practice Standard 528 for prescribed grazing. Core, Priority, and General GRSG habitats (PHMA, GHMA, and OHMA) would be managed to retain attributes necessary for GRSG. Potential upland habitats would be managed for habitat enhancement and restoration to expand or restore GRSG habitats.

Overall, impacts on GRSG and their habitats under Alternative E would be similar to Alternatives B and D. Enhancing potential habitats under Alternative E may improve GRSG habitats that are currently unoccupied. However, treatments under Alternative E would take longer to provide benefits to GRSG than other alternatives. This is due to greater flexibility given to the permittee/operator and no reductions in AUMs. The impact of improvements in unoccupied habitats is difficult to characterize but could provide some additional habitat for GRSG. Building new developments away from active leks and springs and moving turnout areas away from leks would directly benefit GRSG by reducing disturbance and use by potential avian predators.

Uplands would be managed by ensuring that existing grazing permits maintain or enhance GRSG habitats. Livestock grazing would be used as a tool, when appropriate, to improve GRSG habitat quantity and quality or to reduce wildfire threats. Land management agencies would be encouraged to cooperate on timely, seasonal range management decisions with livestock operators. This would be to respond to vegetation management objectives, including fuels reduction, based on the flexibility of livestock operators. Drought management would be addressed on a case-by-case basis.

Riparian areas would be managed, at a minimum, for PFC. Alternative E would promote riparian grazing improvements, along with additional infrastructure (e.g., fences and troughs). These steps would control season, duration, and degree of use to promote vegetation removal at acceptable limits. These improvements would be beneficial to late summer brood-rearing habitat for GRSG.

Impacts from Fire and Fuels Management

Under Alternative E, the effects on GRSG from wildfire suppression and fuels management would be similar to the effects described under Alternative D. With respect to fuels treatments, this alternative sets a goal of supporting incentives for developing a beneficial use for biomass. Additionally, it seeks to expedite fuels reduction projects to protect GRSG habitat and to improve fire pre-suppression and suppression efforts. This would be accomplished by maintaining an ecologically healthy and intact sagebrush ecosystem that is resistant to the invasion of nonnative species and improving the resiliency of GRSG habitat after disturbances, such as wildfire. Alternative E would decrease the likelihood for large fires in GRSG habitats. However, relative to the amount of GRSG habitat that would continue to burn outside the control of the BLM or Forest Service, these actions may provide localized but minimal protections and improvements to GRSG habitat.

Impacts from Wild Horse and Burro Management

While similar to Alternatives B and D, Alternative E would focus on managing at or below AML; it would require meeting AMLs in all HMAs and WHBTs in 5 years. In addition it would modify LUPs to reduce threats of wild horses and burros to GRSG habitats. These actions, more than under any of the alternatives, would expedite improvements to GRSG habitats currently being impacted by wild horses and burros.

Impacts from Leasable Minerals Management

Impacts from Oil and Gas Leasing

Alternative E would allow leasing in SGMA on all lands with federal fluid mineral estate. The goal would be to achieve no net unmitigated loss of GRSG habitat due to human disturbances in SGMA and to apply the avoid, minimize, and mitigate strategy. This process would include the Nevada Conservation Credit System.

Under Alternative E, only designated WAs and WSAs would continue to be closed to oil and gas leasing. Core and Priority habitats (8,236,400 acres of core/PHMA and 6,405,900 acres of Priority/GHMA) would be open to leasing with CSU and TL stipulations. General habitat (OHMA) would be open to oil and gas leasing with standard stipulations applied and includes 6,084,000 acres.

Under Alternative E, impacts on GRSG and their habitat would be less than Alternative A but greater than Alternatives B, C, D, and F and the Proposed Plan. Compared to Alternative A, Alternative E would more than double the acreage closed to oil and gas leasing and would apply more restrictive stipulations on areas open to oil and gas leasing. A CSU would allow for the relocation of a proposed facility or surface disturbance greater than 0.12 miles from its proposed location; this would allow for relocation into the least suitable GRSG habitats.

In addition, TL restrictions would limit an activity from occurring during sensitive seasonal GRSG periods throughout the year, such as during the breeding season. Compared to Alternative A, CSU and TL restrictions and the strategy to avoid, minimize, and mitigate impacts, coupled with the Conservation Credit System, would reduce impacts on GRSG from noise disturbance, direct habitat loss, disturbance to individuals and populations, and fragmentation.

Impacts from Geothermal Leasing

Impacts from geothermal leasing under Alternative E would be the same as those for oil and gas leasing above.

Impacts from Locatable Minerals Management

Under Alternative E, GRSG habitat would be open to mineral location. There are specific locatable mineral withdrawals for particular ROWs, designated wilderness areas, ACECs, and other administrative needs, but none are specific to protecting GRSG habitat.

Under Alternative E, 521,600 acres would be withdrawn as under current management in SGMA. Effects on GRSG and their habitat would be less than under Alternative A. This would be due to applying the net conservation gain objective, the strategy to avoid, minimize, and mitigate impacts, and the Conservation Credit System. These objectives and strategies would site disturbances in SGMA in the least suitable GRSG habitats. Compared to Alternative A, they would reduce impacts on GRSG from noise disturbance, direct habitat loss, disturbance to individuals and populations, and fragmentation.

Impacts from Salable Minerals Management

Alternative E for salable minerals would be the same as in *Impacts from Locatable Minerals Management* above.

Impacts from Land Uses and Realty Management

Under Alternative E, human disturbances would be subject to the strategy to avoid, minimize, and mitigate in SGMA, along with a net conservation gain of GRSG habitat and the Nevada Conservation Credit System. On federal lands in Nevada with pre-approved activities, no new mitigation would take place beyond that previously approved in plans of development, ROWs, and drilling plans. Alternative E would also emphasize fire prevention, reclamation, invasive weed control, and predator control to benefit GRSG. Compared to Alternative A, this alternative would provide fewer regulatory mechanisms to reduce direct and indirect impacts on GRSG and their habitat.

Impacts from Renewable Energy Management

Impacts from Wind Energy Development

Under Alternative E lands in SGMA would be managed as avoidance areas for wind energy development. Management would include the strategy to avoid,

minimize, mitigate impacts to ensure a net conservation gain objective of GRSG habitat in SGMA. This includes applying the Site-Specific Consultation Based Design Features (Appendix D) to minimize impacts and to mitigate impacts through the Nevada Conservation Credit System. However, the strategy to avoid, minimize, and mitigate impacts would not preclude solar energy development in or next to SGMA. Compared to Alternative A, Alternative E could increase disturbance to GRSG and their habitat from wind energy development; however, this is not quantifiable.

Impacts from Solar Energy Development

Under Alternative E, BLM-administered lands would continue to be managed as exclusion for solar energy development under the Solar PEIS. National Forest Systems lands would be managed as avoidance areas and include the strategy avoid, minimize, and mitigate impacts to ensure a net conservation gain objective of GRSG habitat in SGMA. This includes applying the Site-Specific Consultation Based Design Features (Appendix D) to minimize and mitigate impacts through the Nevada Conservation Credit System. However, the strategy to avoid, minimize, and mitigate impacts would not preclude solar energy development in or next to SGMA. Compared to Alternative A, Alternative E could increase disturbance to GRSG and their habitats from solar energy development; however, this is not quantifiable.

Impacts from Comprehensive Travel and Transportation Management

Impacts would be the same as Alternative D.

Impacts from Areas of Critical Environmental Concern

Impacts would be the similar to Alternative D, which also applies management prescriptions specific to GRSG and their habitat to an additional 45,700 acres of GHMA.

Impact from Adaptive Management

Adaptive management would assist in identifying if GRSG conservation measures proposed under Alternative E contain the needed level of certainty for effectiveness. Principles of adaptive management would be incorporated into the conservation measures to lessen threats to GRSG and their habitat, thereby increasing the likelihood that the conservation measures under Alternative E would be effective in reducing threats to GRSG.

When a hard trigger is reached, more restrictive management actions would be required in the affected GRSG population area or habitat.

Under Alternative E, adaptive management responses in core habitat and PHMA would immediately decrease impacts on the affected GRSG populations or habitats and would eliminate any additional impacts.

Evaluation and adjustment of GRSG habitat would also be evaluated under adaptive management, based on the continuing inventory and monitoring of GRSG populations, in coordination with state wildlife agencies and the SETT.

4.4.9 Alternative F

Impacts from Vegetation and Soils Management

Under Alternative F, management generally would be the same as described under Alternative B with exceptions such as reduced treatment of invasive pinyon and/or juniper.

Alternative F would provide about the same level of protection as Alternative B or slightly less. VDDT modeling projects that GRSG habitat trends projected for 10 and 50 years would decrease the threat from invasive species in GRSG habitat compared with Alternative A and would be similar to Alternative B.

Impacts from Livestock Grazing Management

Alternative F would retain the same number of acres available and unavailable for livestock grazing as found under Alternative A. All management prescriptions related to livestock management would apply to all PHMA and GHMA. However, management under Alternative F would be more restrictive than Alternative A; it would rest 25 percent of PHMA and GHMA annually and would keep utilization levels at or below 25 percent. Alternative F would restrict the use of new water developments using spring or seep sources from PHMA and GHMA. Alternative F would also require that water developments be analyzed and if necessary modified or removed if they are found to be impacting a riparian area. Similar modification or removal standards would be applied to other existing range developments such as fences.

Measures to ensure that riparian areas are at PFC would be the same as those for Alternative A. Compared with Alternative A, management under Alternative F would provide more indirect benefits to GRSG due to increases in both upland and riparian GRSG habitats. The amount and quality of GRSG nesting and brood-rearing habitat would increase under Alternative F. Management would increase the number of direct impacts on nesting GRSG, when compared to Alternative A, by not applying timing restrictions to livestock during GRSG nesting periods. This would likely be offset by making 25 percent of PHMA and GHMA unavailable for livestock grazing each year and removing certain livestock-related structures, such as fences and water developments.

Impacts from Fire and Fuels Management

Impacts would be the same as Alternative B.

Impacts from Wild Horse and Burro Management

Under Alternative F, AML for wild horses and burros would be reduced by 25 percent in all HMAs and WHTs in PHMA and GHMA. All other management would be the same as under Alternative B. In comparing wild horse-removed

sites to occupied sites, researchers have documented reduced total vegetation and grass abundance and cover, lower sagebrush canopy cover, increased fragmentation of shrub canopies, lower species richness, increased compaction in surface soil horizons, and increased dominance of unpalatable forbs (Manier et al. 2013).

Wild horse and burro use of the range is different from livestock use because wild horses typically use higher elevations and steeper slopes; this is where the 25 percent reduction under Alternative F would be the most pronounced (Connelly et al. 2004). A 25 percent reduction in AML in PHMA and GHMA would improve upland sites and water sources that wild horses and burros tend to be associated with. These sites also correspond to early and late GRSG brood-rearing habitats.

HMA plans, when developed or updated, would incorporate GRSG habitat objectives (**Table 2-2**). Implementing any range improvements would follow the same guidance as identified for livestock grazing under Alternative B. This includes designing and locating new improvements only where they conserve, enhance, or restore GRSG habitat through improved grazing management. Design features could include developing or modifying waters to mitigate for West Nile virus, removing or modifying fences to reduce the chance of bird strikes, and monitoring and treating invasive species associated with range improvements. Additional range improvements would specifically address the seasonal life history requirements of GRSG and their habitat.

Leasable minerals management under Alternative F would close PHMA and GHMA to fluid mineral leasing, and impacts on GRSG would be the same as salable mineral materials under Alternative C.

Impacts from Locatable and Salable Minerals Management

Impacts from locatable minerals management under Alternative F would be the same as impacts on GRSG and their habitat under Alternative B. Impacts from salable minerals management under Alternative F would be the same as for Alternative A.

Impacts from Land Uses and Realty Management

Under Alternative F, all GHMA would be managed as avoidance areas for new ROWs and all PHMA habitats would be managed as ROW/SUA exclusion for new permits. There would be exceptions for collocating projects in existing footprints and valid existing rights. ROW/SUA avoidance areas and acreage would impact about the same amount of modeled sub-regional GRSG populations as Alternative A. Under Alternative F, 10,056,000 acres would be managed as ROW/SUA exclusion. ROW/SUA exclusion would protect about 8,171,700 more acres of PHMA habitat than under Alternative A.

Alternative F would also include actions to reclaim or modify existing ROWs that may impact GRSG directly (e.g., fences) or indirectly benefit their habitat (e.g., restoring an unused road). Alternative F would retain public ownership of PHMA where it would benefit overall GRSG habitat and would propose PHMA for mineral withdrawal.

Alternative F would provide greater direct protections to GRSG and their habitat than under Alternative A due to the increased acreage proposed for exclusion of ROW and SUAs. Impacts on GRSG and their habitat would also be less under Alternative F compared with Alternative A.

Impacts from Renewable Energy Management

Under Alternative F, wind energy projects would not be sited in PHMA or GHMA, within 4 miles of the perimeter of GRSG winter habitat, or within 5 miles of an active lek. This would increase the acres of PHMA and GHMA managed as ROW/SUA exclusion for wind energy development, compared to Alternative A.

Impacts from Wind Energy Development

Impacts would be the same as Alternative D.

Impacts from Solar Energy Development

Under Alternative F, solar development would have the same nature and scope of impacts on GRSG and their habitat as Alternative A.

Impacts from Comprehensive Travel and Transportation Management

Impacts would be similar to those described for Alternative B. Alternative F also prohibits camping within 4 miles of active leks, which is the only recreation-specific management action outside travel management in any of the action alternatives. People do not typically go camping during the lekking season (March 1 to May 15) due to weather and ground and road conditions. Camping within 4 miles of a lek during other seasons would not disturb GRSG or their habitat; this is because GRSG disperse to nesting habitats and later into brood-rearing and winter habitats. With respect to travel management, impacts from Alternative F would not differ appreciably from Alternative B.

Impacts from Areas of Critical Environmental Concern

Alternative F would expand ACEC management to include 1,459,000 acres of PHMA in nine proposed ACECs, specifically to protect and manage GRSG. GRSG would be recognized as the relevant and importance values in these proposed ACECs. The recommendation to withdraw locatable minerals in PHMA would extend to WSAs, which are currently open to locatable materials. Direct impacts on GRSG and their habitat during all life cycle requirements would be reduced under Alternative F as compared to Alternative A.

4.4.10 Proposed Plan

The Proposed Plan would require a 3 percent disturbance cap on surface-disturbing activities in PHMA (see **Appendix F**). The Proposed Plan would incorporate RDFs consistent with applicable law in PHMA, GHMA, and OHMA and would also require all human disturbances to result in a net conservation gain for GRSG and their habitat. Lek buffers would also be required (see **Appendix B**).

Collectively, these GRSG conservation management actions would increase mitigation requirements for land use authorizations; this would result in more complex project designs, could exclude infrastructure placement in the most cost-effective locations, and would result in overall greater development costs. An indirect effect could be a reduction in the number of authorization applications received for activities in PHMA and longer, more complicated review periods for those that are proposed in PHMA.

Impacts from Vegetation and Soils Management

Impacts under the Proposed Plan would be less than under Alternative A. All vegetation and soils management activities would be prioritized in PHMA and GHMA, with an emphasis in improving or restoring GRSG seasonal habitat objectives, as described in **Table 2-2**.

Under the Proposed Plan, the most limiting seasonal habitat of an individual lek or population would be identified and would be given priority for vegetation treatments. Treatments would use native seed and would establish appropriate sagebrush species and subspecies.

The Proposed Plan incorporates with the FIAT assessments the concepts from Chambers et al. (2014) *Using the Resistance and Resilience Concepts to Reduce Impacts of Invasive Annual Grasses and Altered Fire Regimes on the Sagebrush Ecosystem and Greater Sage-grouse: A Strategic Multi-scale Approach*. The purpose of the concepts and assessments is to identify GRSG habitats and management strategies to reduce the threats to GRSG resulting from changes in invasive annual grasses, wildfires, and conifer expansion. These concepts would reduce impacts of invasive annual grasses and altered fire regimes on the sagebrush ecosystem. They also would reduce the rate of conifer encroachment in order to reduce GRSG habitat fragmentation and maintain or reestablish habitat connectivity over the long term and at a landscape scale.

Vegetation treatments would be rested from livestock for two growing seasons or until vegetation or GRSG habitat objectives are meeting or making progress toward objectives. Management actions under the Proposed Plan would increase the extent and quality of GRSG habitat in PHMA and GHMA, compared to Alternative A, for all GRSG seasonal life-cycle requirements, including breeding, nesting, brood-rearing, and wintering.

The acres of treatment proposed in each of the analysis areas are necessary to improve or maintain habitat conditions. The proposed plan provides treatment acres by decade sufficient to meet desired habitat conditions (70 percent of the analysis area meeting 10 to 30 percent sagebrush cover; NTT 2011). **Table 4-6** displays the combined BLM and Forest Service treatment acres by analysis areas; **Table 4-7** displays the trends as a result of the combined treatment acres in both BLM and Forest Service Proposed Plans when compared to the treatment rates and types occurring currently under Alternative A.

Table 4-6
BLM and Forest Service Acres Treated

Analysis Area	Mechanical Treatment	Prescribed Fire	Grass Restoration
15	70,600	0	1,102,000
26	83,000	40,000	856,600
30	10,000	0	9,000
31	64,000	77,000	260,000

Source: BLM and Forest Service GIS 2015

Table 4-7
Trend on BLM-Administered and National Forest System Lands

Analysis Area	No Action Modeled[1] Habitat Condition and Trend[2]			Proposed Plan Modeled[1] Habitat Condition and Trend[2]		
	Initial Condition	10-Year Condition	50-Year Condition	Initial Condition	10-Year Condition	50-Year Condition
15	77%	72%	55%	77%	74%	71%
26	73%	70%	62%	73%	72%	70%
30	79%	73%	53%	79%	76%	71%
31	87%	81%	58%	87%	83%	71%

Source: BLM and Forest Service GIS 2015

[1]The outputs are not absolutes and are bound by the assumptions and limitations of the data.
[2]Habitat condition percentages are the amount of the analysis area that meets 10 to 30 percent sagebrush cover.

For Alternative A, the model results show a declining trend in all of the analysis areas. At 50 years, all areas would be below desired conditions, meaning less suitable habitat would be available for GRSG than now, which would result in GRSG population declines in those areas.

The Proposed Plan would result in all areas meeting or exceeding desired conditions, based on the vegetation treatment objectives. For all areas GRSG populations should remain stable or improved, without other factors that may not have been accounted for in the model.

Impacts from Livestock Grazing Management

The Proposed Plan would retain the same number of acres available and unavailable for livestock grazing in PHMA and GHMA as under Alternative A. However, the Proposed Plan would impose additional restrictions on specific livestock activities in upland and riparian habitats used by GRSG. This would provide more protection to GRSG and their habitat than under Alternative A.

Under the Proposed Plan, upland and riparian habitats would be managed according to the GRSG habitat objectives (**Table 2-2** on BLM-administered lands and **Tables 2-5** and **2-6** on National Forest System lands). It would restrict setting up salting locations, erecting fences, and constructing range facilities. These activities would be sited 1 mile from GRSG brood-rearing habitats in PHMA and GHMA. Grazing periods would be more restrictive, concentrated at times when GRSG habitats would benefit more from grazing instead of being grazed every year during critical growth periods. This would occur through rest, deferment of use, and greater limits on utilization. This would provide long-term benefits to both upland and riparian habitats by providing a greater diversity and volume of GRSG seasonal habitats. Compared to Alternative A, results would be seen sooner due to a decrease in livestock grazing.

Higher quality GRSG seasonal habitats would improve overall GRSG production due to increased habitat quality in GRSG brood-rearing habitats and to a reduction in predation of GRSG by increasing the vegetation as hiding cover. Direct impacts on breeding and nesting GRSG individuals and habitats would also be reduced. This would be due to the use of various herd management actions (e.g., seasonal timing restrictions) applied during the GRSG breeding and nesting season.

The Proposed Plan may require a reduction in AUMs in pastures where short-term utilization limits are not met. The reduction in AUMs would be applied the following year and could include utilization and seasonal timing limits in allotments and pastures not meeting Land Health Standards. These management actions would speed recovery of negatively impacted GRSG habitats, as compared to Alternative A.

Removing livestock ponds outside of perennial waterways and requiring salting locations and range facilities to be moved farther away from riparian areas, springs, and meadows would reduce long-term negative impacts on riparian brood-rearing habitats. It would do this by reducing long-term grazing use during critical vegetation growth periods. It also would reduce short-term impacts from hoof packing and shearing, which change water flow patterns and increase soil compaction on sensitive riparian soils.

Impacts from Fire and Fuels Management

Under the Proposed Plan, impacts on GRSG and their habitat are expected to be less than under Alternative A. This would be due to increased coordination

and collaboration with federal, tribal, state, and local governments, as well as sanctioned associations that meet fire standards for effective and efficient wildfire responses. Pre-suppression activities and other conservation and suppression efforts would identify and prioritize GRSG habitats that are vulnerable to wildfires and would prescribe actions important to their protection.

Fuels management treatments and post-fire rehabilitation projects in PHMA would focus on maximizing benefits on GRSG habitats. Management would make use of 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. They also would reduce the rate of conifer encroachment in order to reduce GRSG habitat fragmentation and maintain or reestablish habitat connectivity over the long term and at a landscape scale. Fuel breaks would also be implemented to better contain wildfires. During firefighting operations, sagebrush habitat would be protected to the extent possible, as a valuable resource.

In the Nevada and Northeastern California Sub-region, fire contributes significantly to the decline in GRSG populations and habitats. The management actions under the Proposed Plan would provide GRSG and their habitat with the greatest protection from wildland fire and GRSG habitat improvements compared to all alternatives.

Impacts from Wild Horse and Burro Management

Under the Proposed Plan, upland and riparian habitats in HMAs and WHBTs would be managed according to the habitat needs of GRSG. This would require in some instances that AMLs be reevaluated and possibly reduced where wild horses and burros are found to be negatively impacting GRSG habitats. In PHMA and GHMA, AMLs would be maintained at their lower levels. As with livestock grazing, these reductions would provide long-term benefits to GRSG and their habitat by increasing the overall quality of riparian and upland habitats. This would be accomplished through increasing diversity and availability of vegetation and by reducing potential direct impacts on GRSG from wild horses and burros, compared to Alternative A.

Similar to livestock grazing, providing new water sites to increase dispersal of wild horses and burros would have both positive and negative effects on GRSG and their habitat. While the dispersal of wild horses and burros would decrease localized negative impacts on GRSG and their habitat, it would also spread those effects on other seasonal GRSG habitats not currently being impacted, thereby reducing the quality of those sites.

Impacts from Leasable Minerals Management

Impacts from Oil and Gas Leasing

Under the Proposed Plan 8,888,300 acres of PHMA would be subject to NSO with extremely limited exceptions and would require a 3 percent disturbance cap on surface-disturbing activities. The BLM and the Forest Service would manage 2,797,400 acres in SFA as NSO with no exceptions; 6,010,700 acres of GHMA would include CSU and TL stipulations. OHMA would be open to leasing, exploration, and development with standard stipulations.

COAs and RDFs to conserve and maintain the quality and distribution of GRSG habitat would be applicable in all GRSG habitats consistent with applicable law. The RDFs would minimize or eliminate impacts on GRSG and their habitat from surface disturbance, noise, West Nile virus, and habitat fragmentation consistent with applicable law. RDFs (consistent with applicable law) would also ensure that disturbed GRSG habitat is appropriately reclaimed. Disturbance in all GRSG habitats would also require avoidance, minimization, and mitigation, with an objective of a net conservation gain of GRSG and their habitat.

NSO stipulations in PHMA and SFA would prohibit occupancy and all surface-disturbing activities on all or part of the lease for the life of the lease. The NSO would protect more acres of PHMA than under Alternative A. Direct and indirect impacts on GRSG individuals, populations and GRSG habitat in the NSO buffer would be reduced under the Proposed Plan.

CSU and TL stipulations decrease impacts on GRSG and their habitats in GHMA, as compared to Alternative A. Although not as protective as an NSO stipulation, a CSU would allow a proposed facility or surface disturbance greater than 0.12 mile from its proposed location to be moved into the least suitable GRSG habitats A TL restriction would limit an activity from occurring during a specified period of the year, such as the breeding season. This alternative increases the protection of all seasonal GRSG habitats from disturbance, decreases fragmentation, and reduces disturbance from structures and noise, compared to Alternative A.

Under the Proposed Plan, in PHMA and GHMA on leases not yet developed, proposed surface disturbances must achieve a net conservation gain of GRSG habitat. This requirement would ensure that GRSG habitats are restored to meet GRSG habitat objectives (**Table 2-2**) and may create additional GRSG habitats. A 3 percent disturbance cap would also be applied in PHMA.

Seasonal restrictions would be applied to exploratory drilling in PHMA and GHMA minimizing or eliminating direct impacts on individual GRSG populations and habitat. In PHMA, a full reclamation bond would be required specific to the site. New compressor stations would be located outside PHMA and GHMA and designed to reduce noise that may be directed toward PHMA and GHMA. This

would minimize or eliminate noise impacts on GRSG populations in all seasonal habitats.

Impacts from Geothermal Leasing

Under the Proposed Plan, 8,888,300 acres of PHMA would be subject to NSO restrictions, with extremely limited exceptions, and would require a 3 percent disturbance cap for all surface-disturbing activities. The BLM and the Forest Service would manage 2,797,400 acres in SFA as NSO without any waivers, exceptions, or modifications; 6,010,700 acres of GHMA would include CSU and TL stipulations.

OHMA would be open to leasing, exploration, and development, with standard stipulations. COAs and RDFs consistent with applicable law to conserve and maintain the quality and distribution of GRSG habitat would be applicable in all GRSG habitats. The RDFs would minimize or eliminate disturbance to GRSG and their habitat from surface disturbance, noise impacts, West Nile virus, and habitat fragmentation consistent with applicable law. RDFs (consistent with applicable law) would also ensure disturbed GRSG habitats is appropriately reclaimed. Disturbance in all GRSG habitats would also require avoidance, minimization, and mitigation, with an objective of a net conservation gain of GRSG habitat.

In PHMA and GHMA, geophysical exploration would be permitted that does not crush sagebrush or create new or additional surface disturbance. All human disturbances would be subject to a net conservation gain of GRSG habitat. This requirement would ensure that GRSG habitats in or outside of PHMA and GHMA are restored to meet GRSG habitat objectives (**Table 2-2**). It also could provide for the creation of additional GRSG habitats. Seasonal timing restrictions, CSUs, and RDFs established for GRSG consistent with applicable law would be applied in PHMA and GHMA. In addition, all surface-disturbing activities would be subject to a 3 percent disturbance cap in PHMA. These requirements would minimize or eliminate impacts on GRSG and their habitat from surface disturbance and noise.

Impacts from Unleased Fluid Minerals

Under the Proposed Plan, NSO stipulations would be applied to unleased federal fluid mineral estates in PHMA and SFA. SFA exclude waivers, exceptions, and modifications. In PHMA outside of SFA, management would consider exceptions under the following circumstances:

- If the lease were determined to be in unsuitable GRSG habitat
- If the area were not used by GRSG
- If the lease would not have direct, indirect, or cumulative effects on GRSG or their habitat

A 3 percent disturbance cap would be applied in PHMA and SFA.

In GHMA, under the Proposed Plan, NSO stipulations would also be applied to unleased federal fluid mineral estate and allow for waivers, exceptions, or modifications.

Impacts from Locatable Minerals Management

Under the Proposed Plan, SFA would be recommended for withdrawal. PHMA outside of SFA, GHMA, and OHMA would be managed as open to locatable minerals.

The Proposed Plan is similar to Alternatives D and E but includes additional management actions and RDFs consistent with applicable law. Some of these actions and RDFs would apply a buffer around active leks and would require seasonal timing and noise restrictions consistent with applicable law. The Proposed Plan would decrease direct and indirect impacts on GRSG and their habitat by eliminating noise during the breeding season, which could increase attendance at leks and could decrease predation. In addition, the application of a buffer around active leks during the breeding season would protect approximately 70 to 80 percent of nesting GRSG associated with the lek, depending on the size of the buffer.

Impacts from Salable Minerals Management

The Proposed Plan would close PHMA to new material disposal. GHMA and OHMA would remain open to new material disposal. RDFs to conserve and maintain the quality and distribution of GRSG habitat would be applicable consistent with applicable law in all GRSG habitats. The RDFs would minimize or eliminate impacts on GRSG and their habitat from surface disturbance, noise, West Nile virus, and habitat fragmentation, consistent with applicable law. RDFs would also ensure that disturbed GRSG habitats are appropriately reclaimed, consistent with applicable law. Disturbance in all GRSG habitats would also require avoidance, minimization, and mitigation, with an objective of a net conservation gain of GRSG habitat.

On existing mineral material disposal sites, the management goal would be to conserve and maintain the quality and distribution of GRSG habitat. This would be to achieve a net conservation gain in PHMA and GHMA or to enhance those habitats. This would be achieved through on-site and off-site mitigation, such as the Nevada Conservation Credit system. Fragmentation threats to GRSG habitat would be reduced, increasing connectivity of GRSG populations through a focused mitigation strategy.

Impacts from Land Uses and Realty Management

Under the Proposed Plan, major and minor ROWs and SUAs would be managed as avoidance areas in PHMA with a disturbance cap of 3 percent for all surface-disturbing activities. Major ROWs and SUAs would be designated as avoidance areas and minor ones as open in GHMA. Major and minor ROWs and SUAs in OHMA would be designated as open. The proposed TransWest

Express Transmission Project is not subject to the Proposed Plan decision to designate PHMA and GHMA as an avoidance area (see **Section 4.13.1**).

Disturbance in all GRSG habitats would require avoidance, minimization, and mitigation, with an objective of a net conservation gain for GRSG and their habitat. RDFs would also be applicable to all GRSG habitats to conserve and maintain the quality and distribution of GRSG habitat consistent with applicable law. The RDFs would minimize or eliminate impacts on GRSG and their habitat from surface disturbance, noise, West Nile virus, and habitat fragmentation, consistent with applicable law. RDFs would also ensure that disturbed GRSG habitats are appropriately reclaimed, consistent with applicable law.

New power and communication lines would be buried when feasible, and the priority for both power and fluid lines would be to locate them in existing ROW corridors. Additionally, power lines within 4 miles of an active or pending lek would be required to be retrofitted with nesting and perch deterrents. This would be to minimize predation on GRSG in areas where predation is identified as a limiting factor to GRSG populations.

The management actions under the Proposed Plan would provide various benefits to GRSG and their habitat. Many would be direct benefits to GRSG and their habitat by reducing the real and perceived threat of avian predators. This would be realized by adding perch and nesting deterrents and reducing the number of tall structures near leks and other seasonal habitats where GRSG are most susceptible to avian predators. Burying power and communication lines also reduces future and perceived threats to GRSG by reducing new potential nesting and perching platforms. Collocating power and communication lines or siting them in nonhabitat would decrease direct disturbance to GRSG habitat. Noise and seasonal restrictions would reduce disturbance during the breeding season. As with other wildlife species, reducing noise disturbance would improve reproductive success (Patricelli et al. 2013).

Reducing the number of developments permitted in buffered distances of seasonal GRSG habitats and applying a 3 percent disturbance cap in PHMA also reduces direct loss of GRSG habitat. Focusing development outside of seasonal GRSG habitats or in the least suitable habitats would equate to fewer short- and long-term impacts on GRSG and their habitat. This would come about by providing needed protections during critical seasonal periods and by keeping habitat available for longer periods without the need to wait for rehabilitation or reclamation to become established. The Proposed Plan would have less impact on GRSG and their habitat than Alternative A.

Impacts from Renewable Energy Management

Impacts from Wind Energy Development

Under the Proposed Plan, PHMA would be managed as exclusion areas for wind energy facilities. GHMA would be managed as avoidance areas, and OHMA would be managed as open to wind energy development.

Designated as exclusion would be 8,888,300 acres of PHMA and designated as avoidance would be 6,010,700 acres of GHMA. This represents approximately 8.7 million fewer acres open to wind energy development than under Alternative A.

Disturbance in all GRSG habitats would require avoidance, minimization, and mitigation, with an objective of a net conservation gain for GRSG and their habitat. RDFs would also be applicable to all GRSG habitats to conserve and maintain the quality and distribution of GRSG habitat consistent with applicable law. The RDFs would minimize or eliminate disturbance to GRSG and their habitat from surface disturbance, noise impacts, and habitat fragmentation, consistent with applicable law. RDFs would also ensure the appropriate reclamation of disturbed GRSG habitats is implemented, consistent with applicable law. Fewer impacts on GRSG and its seasonal habitats would be afforded under the Proposed Plan than under Alternative A.

Impacts from Solar Energy Development

Under the Proposed Plan, PHMA and GHMA would be managed as exclusion areas for utility-scale commercial solar energy facilities (i.e., facilities that generate 20 megawatts or more); 16,812,800 acres of PHMA and GHMA would be managed as exclusion areas. This represents approximately 14.8 million fewer acres open to solar energy development than under Alternative A. Less direct and indirect impacts on GRSG and all of its seasonal habitats would be afforded under the Proposed Plan than under Alternative A. Note that solar energy zones identified in the Solar PEIS are outside of the planning area for this effort.

Impacts from Comprehensive Travel and Transportation Management

Under the Proposed Plan, no acres would be open to motorized travel, and the BLM would manage 16,264,800 acres as limited to existing or designated routes. No new roads or upgrades of existing routes would be allowed in PHMA, except if required for resource protection or public safety. Seasonal time restrictions could also be applied to roads near leks.

The Proposed Plan would have fewer impacts on GRSG and their habitat than under Alternative A. The Proposed Plan would protect individual GRSG from vehicle and human noise, increased stress, vulnerability to predation, and decrease the potential of habitat fragmentation caused by roads.

Impacts from Areas of Critical Environmental Concern

Under the Proposed Plan, no additional proposed ACECs would be designated. Similar to Alternatives D and E, GRSG management prescriptions would be extended over 160,400 acres of PHMA, GHMA, and OHMA in 29 ACECs. In addition, the recommendation to withdraw locatable minerals in PHMA and SFA would include some WSAs that are currently open to locatable materials. Direct and indirect impacts on GRSG and their habitat would be less than under Alternative A.

Impact from Adaptive Management

The proposed plan includes principles of adaptive management, including soft and hard triggers and associated response, thereby increasing likelihood that conservation measures would be effective in reducing threats. **Table 2-9** in **Section 2.7** identifies adaptive management responses for specific resources if a proposed management action (or allocation) were to trip a hard trigger in GRSG populations or GRSG habitat. When a hard trigger is reached, more restrictive management actions would be required in the affected GRSG population area or GRSG habitat impacted.

Under the Proposed Plan, if a land use authorization for an existing corridor is determined to be the cause for tripping a hard trigger, the response would be to increase management from an open area to an avoidance area. If oil and gas leasing is identified as tripping a hard trigger, the adaptive management response would be to manage an NSO with no waivers, exceptions, or modifications, as opposed to an NSO with two exceptions. Adaptive management responses under all resources in PHMA or GHMA would immediately decrease impacts on the affected GRSG populations or habitats and would eliminate any additional impacts.

Evaluation and adjustment of GRSG habitat would also be evaluated under adaptive management based on the continuing inventory and monitoring of GRSG populations, in coordination with state wildlife agencies and the SETT.

4.5 VEGETATION AND SOILS

4.5.1 Methods and Assumptions

Indicators

Indicators of impacts on vegetation are as follows:

Upland Vegetation

- Acres and condition of native vegetation communities; and
- Change in the estimated acres of conifer encroachment

Noxious Weeds and Invasive Species

- Change in the likelihood for noxious weed or invasive annual grass introduction or spread
- Change in the amount or density of noxious weed or invasive annual grasses

Note that impacts on riparian and wetland vegetation are discussed in **Section 4.6**, Riparian Areas and Wetlands

Assumptions

The analysis includes the following assumptions:

- 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.
- New invasions of noxious and invasive weeds would continue to occur and spread as a result 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.
- Since the effects of climate change are complex and not yet well known or understood, the analysis was conducted assuming hotter, dryer conditions, leading to plant stress. Plant adaptations to climate stress are not known.
- Ecological health and ecosystem functioning depend on a number of factors, including vegetation cover, species diversity, nutrient cycling and availability, water infiltration and availability, percent cover of weeds and climatic trends.
- Short-term effects on upland vegetation would occur over a time frame of up to ten years and long-term effects would occur over longer than ten years.

4.5.2 Nature and Type of Effects

Vegetation

Management actions could affect vegetation resources by changing species composition, distribution, density and condition. Vegetation communities could change from one state to another state through transitions commonly referred to as state-and-transition models (Bestelmeyer et al. 2003). Management actions could improve, protect, maintain, increase or decrease GRSG habitat. GRSG depend on the vegetation resources for cover and feed, primarily sagebrush species. Natural change agents could also alter the vegetation communities

through wildfires and drought conditions. Drought conditions can alter plant vigor and seed production.

Historically, sagebrush-dominated vegetation was one of the most widespread habitats in the country, but its expanse has been fragmented, lost, or altered by invasive plants and human disturbance (NTT 2011). Protection of GRSG habitat would involve restrictions and limitations on activities that contribute to the spread of invasive species, fire, and other surface disturbance, and management of vegetation to promote healthy sagebrush and understory vegetation to support GRSG. Management of vegetation resources to improve GRSG habitat would alter vegetation communities by promoting increases in sagebrush height and herbaceous cover and vegetation productivity, in order to improve rangeland health and enhance sagebrush ecosystems. Treatments to protect GRSG habitat include designs to prevent encroachment of shrubs and nonnative species or woody vegetation as these would alter the condition of native vegetation communities by changing the density, composition, and frequency of species in plant communities (Connelly et al. 2004).

Invasive Weeds

Management actions could reduce invasive weed populations through control methods such as chemical, biological, mechanical, and manual removal. Management actions could also increase invasive species and help weed populations be established by disturbance factors such as road construction, fence construction, vegetation removal, vehicle traffic, wildlife, and livestock grazing and movement. Vegetation treatments would cause short-term disturbance to vegetation from vegetation removal, but would result in long-term improvements to habitat quality and rangeland health.

Soils

Management actions could affect soil resources by removing soils due to mechanized equipment, vehicle traffic and natural means. Erosion of soils could be experienced by wind or water (overland runoff). Vegetation removal or the presence of invasive annual vegetation could likely cause increased soil erosion.

Surface-disturbing activities and surface occupancy can impact soil resources by compacting soil. In some cases, soil compaction aids in water retention and thus 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. This is because the resulting increase in soil strength and change in soil structure (loss of porosity) inhibit root system growth and reduce water infiltration. As vegetation cover, water infiltration, and soil stabilizing crusts are diminished or disrupted, the surface water runoff rates increase, further accelerating rates of soil erosion.

Travel across land by any means can result in vegetation loss, loss of biotic crusts, soil compaction, or soil erosion. Management approaches that designate travel to specified routes can result in more predictable, localized and manageable impacts. Selectively locating travel routes away from areas of sensitive soil conditions can minimize the extent of these effects, ideally limiting them to the footprint of the trail itself.

Habitat Restoration

Habitat restoration projects typically have multiple objectives: increasing forage and cover for wildlife, reducing nonnative or weedy species, reducing pinyon-juniper encroachment, reducing canopy coverage of woody species, replenishing seed banks, and creating a mosaic of vegetation age classes. While these projects typically result in short-term vegetation removal, much like fuels projects, they are typically designed to improve habitat and result in a more diverse, vigorous, healthy plant community.

Emergency Stabilization and Rehabilitation in burned areas is part of a holistic approach to addressing post-wildfire issues and also includes suppression activity damage repair and long-term restoration (more than three years). Emergency Stabilization includes planned actions performed by burned area emergency response teams within one year of wildfire containment to stabilize and prevent unacceptable degradation of natural and cultural resources, to minimize threats to life or property from the impacts of a fire, or to repair, replace, or construct physical improvements to prevent degradation of land or resources. Burned area rehabilitation is undertaken within three years of wildfire containment to repair or improve fire-damaged lands unlikely to recover naturally to management approved conditions, or to repair or replace minor facilities damaged by fire (DOI 2006). Following a wildfire, ESR stabilizes and prevents unacceptable degradation of natural and cultural resources. Post-wildfire ESR assists in stabilizing soils, replenishing the seed bank, and addressing weed threats. These activities are typically designed to restore the vegetation cover and to assist post-fire recovery. Post wildfire cheatgrass conversion is one of the biggest challenges across the planning area. If successful, ESR will reduce erosion, aid in reducing cheatgrass invasion, and maintain appropriate fire return intervals. ESR benefits both upland and riparian vegetation communities.

Fire and Fuels Management

In most of the planning area, fuel conditions have changed from historic conditions because of management practices and the spread of nonnative species. Fire exclusion, in the form of fire suppression, has affected fuel conditions. In pinyon-juniper systems, this management practice results in increased fuel loadings because fires are less frequent than historic fire-return intervals. Sagebrush in this habitat is also transitioning to an older age class that is more decadent; with high fuels loading that can support large severe wildfires. Increased fuel loadings combined with other factors (e.g. climate change) are leading to higher severity fires that require more post-fire rehabilitation. The

main structural change in what were historically sagebrush shrublands is the encroachment of pinyon and juniper, other conifers, and other woody shrubs into the sagebrush. Over time the encroachment will increase the fuels loading, causing an upward shift in fire behavior. This increases the resistance to control, decreasing the effectiveness of firefighting efforts. Fuels management has both short- and long-term impacts on vegetation. In the short term, vegetation will be lost, but in the long term, fuels management would improve vegetation health, composition, and productivity. Additionally, in the long term, fuels treatments would prevent uncharacteristically large or intense wildfires that could damage large expanses of vegetation. If fuels treatments are unsuccessful, habitat may be converted to exotic annuals and other weedy species. Assuming all fuels projects would be designed and managed to meet the Healthy Forest Initiative (HFI) and Healthy Forests Restoration Act of 2003 (HFRA) (P.L. 108-148) and Land Health Standards, negative impacts on uplands and riparian areas would not be anticipated. Fuels projects would be designed and managed to meet GRSG habitat objectives (see **Table 2-2**). Since the Forest Service does not have an equivalent to Land Health Standards, fuels projects would be designed to meet GRSG habitat objectives (see **Table 2-2**).

Fire management practices include the control of wildfires in some areas, the use of fire either through prescribed burning or the management of wildfires in order to meet land management goals, and the treatment of vegetation so that fires are more controllable where values at risk are higher. Wildland fire management on BLM-administered lands is guided by a FMP that considers the three elements mentioned above, as well as firefighter and public safety and cost effectiveness. 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. Control of fires and other land use practices during the last century has changed plant communities by altering the frequency, size, and severity of wildfires. Indicators of wildland fire ecology and management is 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 Euro-American settlement and are calculated and classified by analyzing natural vegetation, known fire cycles, and fire history data. Condition class indicates the degree of departure from the historic fire regime (Hann and Bunnell 2001; see **Table 3-23**, Condition Classes in PPH and PGH [acres]). 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). Depending on size, location, severity, intensity, and vegetation, wildfire would have short-term impacts on vegetation, resulting in vegetation removal and soil disturbance from suppression actions. Fire can also lead to the proliferation of cheatgrass in lower precipitation zones and subsequent habitat degradation. In the long term, wildfire can be beneficial, resulting in a mixed serial stage, greater vegetation diversity, and habitat restoration.

4.5.3 Impacts Common to All Alternatives

Vegetation

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; NTT 2011). Grazing may reduce herbaceous understory cover for nesting GRSG, but also may enhance rangeland health by limiting the growth of introduced annual plants.

Changes in livestock management could affect vegetation by reducing grazing pressure on forage species where livestock numbers are reduced, or duration of grazing period is reduced, or if the season of use is during dormancy. Changes in livestock management could affect vegetation by increasing grazing pressure on forage species if livestock numbers are increased, or duration of grazing period is increased, or if the season of use is during hot season.

Invasive Weeds

Livestock grazing is one of the vectors to introduce and or increase the spread of invasive weeds. Multiple factors can influence an area's susceptibility to cheatgrass invasion, including livestock grazing, surface disturbance, perennial grass cover and biological soil crusts (Reisner et al. 2013).

Impacts from Fire and Fuels Management

Short- and long-term plant community response following fire is highly variable across plant communities and ecological sites in the Great Basin Region. Ecological response and successional trajectories following fire are a function of fire severity and ecological site characteristics, including disturbance history, climate, and vegetation present at the time of the fire, as well as post-fire disturbance and pre- and post-fire weather. (Miller et. al. 2013) Depending on the species and the size of a burn, sagebrush can reestablish within five years of a burn, but a return to a full pre-burn community cover can take 13 to 100 years (Connelly et al. 2004). Fire is a principal mean of renewal for decadent stands of big sagebrush and establishes after fire from the seedbank and from seed produced by remnant plants that lived and from plants adjacent to the burn that reseed by wind. Fires in Wyoming big sagebrush are usually not continuous, and remnant plants are the principal means of post-fire reproduction. Fire does

not generally stimulate germination of soil-stored big sagebrush seed, but neither does it inhibit its germination. Fire suppression may be used to maintain habitat for GRSG (NTT 2011), but these policies alter the successional pattern of vegetation in the landscape. When management reduces wildland fire frequency by controlling natural ignitions, the indirect impact is that vegetation ages, and early successional vegetation communities are diminished. Fire suppression may preserve condition of some sagebrush communities, as well as habitat connectivity. This is particularly important in areas where fire frequency has increased as a result of weed invasion, or where landscapes are highly fragmented. However, fire suppression can also lead to increased fuel loads, which can lead to more damaging or larger-scale fires in the long term. Selective siting of fuels management treatments may allow for fire suppression actions to use suppression tactics protect sagebrush communities from wildfires.

Impacts from Wild Horse and Burro Management

Impacts from wild horse and burro populations and management to vegetation resources would be the same as identified in the individual Resource Management Plan NEPA analysis for all alternatives except Alternative F, which calls for a 25 percent reduction in AML in GRSG habitat that should reduce grazing pressure on the vegetation communities.

4.5.4 Alternative A

Impacts from GRSG Management

Vegetation

Under Alternative A, the impacts on vegetation resources would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Vegetation treatments would continue on BLM-administered lands. Post fire stabilization and rehabilitation treatments would re-establish sagebrush/perennial grass communities in response to wildfire impacts. Other restoration projects implemented would improve sagebrush habitats, including conifer removal where encroaching into GRSG habitats. Vegetation management includes efforts to control invasive species, increase native species, replace vegetation burned in wildfires and reduce hazardous fuels risk in GRSG habitat.

Invasive Weeds

Under Alternative A, the impacts on invasive weeds would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Treatments to control nonnative, invasive species would continue, reducing invasive species populations. As invasive species populations are decreased, desired plant communities would likely improve. An integrated vegetation management program would continue to use chemical, mechanical, manual, biological, and preventative measures to reduce noxious and/or invasive weed populations in GRSG habitat.

Soils

Under Alternative A, the impacts on soils would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Temporary soil disturbance would occur where mechanical vegetation methods are implemented, using heavy equipment, skid trails, and temporary roads.

Impacts from Riparian Areas and Wetlands Management

Riparian and water resources management would continue to operate as guided by individual LUPs, land health standards, and applicable agency policy or guidance. Continued construction of water developments on BLM-administered lands would be implemented in accordance with Land Health Assessments that would lead to an improvement in vegetation conditions through proper grazing management. Under this alternative PHMA and GHMA prioritization do not apply; therefore water resource management would not be focused on these areas. However, PHMA and GHMA areas would be managed in accordance with BLM policy. Management of riparian areas, wetlands, and water resources would gradually improve GRSG habitat conditions.

Vegetation

Under Alternative A, the impacts on vegetation resources would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Restoration efforts, including resource management changes to meet land health standards, conducted in riparian areas would likely improve vegetation conditions.

Invasive Weeds

Under Alternative A, the impacts on invasive weeds would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Treatments to control nonnative, invasive species would continue, reducing invasive species populations. As invasive species populations are decreased, desired plant communities would likely improve. Invasive vegetation would continue to be controlled in riparian areas and wetlands to meet riparian land health standards.

Soils

Under Alternative A, the impacts on soils would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Under this alternative, soils resources could gradually improve, when managed to meet land health standards.

Impacts from Vegetation and Soils Management

Under Alternative A, PHMA and GHMA restrictions do not apply. However, PHMA and GHMA areas would be managed in accordance with BLM policy. Post fire rehabilitation, invasive species management, and restoration activities would be guided by individual field office's fire management plans, LUPs, and current agency policy and guidance. Vegetation treatments would continue on

BLM-administered lands. Post-fire stabilization and rehabilitation treatments would re-establish sagebrush/perennial grass communities in response to wildfire impacts. Other restoration projects implemented would improve sagebrush habitats, including conifer removal where encroaching into GRSG habitats. Treatments to control nonnative, invasive species would continue, reducing invasive species populations. As invasive species populations are decreased, desired plant communities would likely improve. The Integrated Vegetation Management Handbook (H-1740-2) policies would be followed and would provide guidance on which treatments and chemicals can be used. Application of these policies would improve vegetation management in sagebrush habitat thereby likely improving vegetation and soils conditions in these areas.

Impacts from Livestock Grazing Management

Vegetation

Under Alternative A, the impacts on vegetation resources would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Management actions would be prioritized to meet land health and riparian standards and to control invasive plants and noxious weeds under the direction of current LUPs. Range improvement projects, including seedings would be designed to maintain or improve GRSG habitats. Vegetation conditions could be improved or maintained when grazing permits and leases are required to meet or make significant progress toward meeting rangeland health standards defined in the applicable RAC developed Standards for Rangeland Health and Guidelines for Livestock Grazing Management (BLM 1997d).

Invasive Weeds

Under Alternative A, the impacts on invasive weeds would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Management actions would be prioritized to meet land health and riparian standards and to control invasive plants and noxious weeds under the direction of current LUPs, land health standards, and applicable agency policy or guidance. Invasive weeds would continue to be treated as part of grazing plans or permits to meet, or make significant progress toward meeting, Land Health Standards. Removing invasive weeds would help to improve desired vegetation communities. Existing grazing strategies that include rest and rotation would help to reduce invasive species populations.

Soils

Under Alternative A, the impacts on soils would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. On BLM-administered lands, all permits and leases are required to meet or make progress toward meeting rangeland

health standards, as defined in the applicable RAC developed Standards for Rangeland Health and Guidelines for Livestock Grazing Management (BLM 1997d). Soils conditions would improve gradually.

Impacts from Fire and Fuels Management

Vegetation

Fire suppression would be guided by individual field office's FMPs, LUP, and applicable agency or policy and guidance. As a result, a greater loss of vegetation could occur in sagebrush habitats under Alternative A. This would result in an increased risk of annual grass and noxious weeds invasion due to the disturbance.

Fuels reductions projects would also be guided by the individual field office's FMPs or LUPs, land health standards, and applicable agency or policy or guidance. Project design would be limited by site-specific NEPA compliance. Habitat improvement and restoration projects would be implemented for livestock, wildlife, and fuels reduction. Alternative A would have the fewest restrictions for fuels treatments, the greatest number of acres would be available for treatment with the potential for larger areas being disturbed for fuel treatments. Alternative A may result in the largest amount of short-term vegetation loss and increased potential for establishment and spread annual invasive species. Long-term impacts include increases in vegetation composition and health.

Vegetation

Under Alternative A, the impacts on vegetation resources would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Vegetation treatments would continue on BLM-administered lands. Post fire stabilization and rehabilitation treatments would re-establish sagebrush/perennial grass communities in response to wildfire impacts. Other restoration projects implemented would improve sagebrush habitats, including conifer removal where encroaching into GRSG habitats.

Invasive Weeds

Under Alternative A, the impacts on invasive weeds would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Treatments to control nonnative, invasive species would continue, reducing invasive species populations. As invasive species populations are decreased, desired plant communities would likely improve.

Impacts from Wild Horse and Burro Management

Vegetation

Under Alternative A, impacts on vegetation resources would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. In those areas where AML is exceeded, vegetation cover and or composition would be decreased. Also, invasive species distribution or spread may be increased as a result of removal of sagebrush/perennial grass cover.

Invasive Weeds

Under Alternative A, the impacts on invasive weeds would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Where AML is exceeded, the distribution and or spread of invasive species may be increased due to the decrease of sagebrush/perennial grass communities.

Soils

Under Alternative A, the impacts on soils may be increased where AML is exceeded. If the desired, perennial vegetation is decreased, soil holding capability would be lowered, leading to an increase in water and wind erosion.

Impacts from Climate Change Management

Vegetation

The impacts of climate change are common to all alternatives. Maximum seasonal temperatures and altered rainfall patterns exacerbate the fire cycle such that large-scale fires are not only driven by the annual cheatgrass flush of fine fuels but are also fueled by historically low moisture ratings in larger fuels in the shrub community. As temperatures and levels of rainfall change, the climate envelopes supporting the sagebrush ecosystem will shift. The adjacent Mojave ecosystem expands northward. Low elevation sagebrush habitats convert to desert scrub. Forest/sage ecotones shift toward sagebrush. Some of these shifts, particularly in the southern half of the range, will likely occur at rates that challenge the ability of GRSG to adapt, requiring an adaptive management strategy regardless of alternative features in the individual LUP documents, land health standards, and applicable agency policy or guidance.

Invasive Weeds

Under Alternative A, the impacts on invasive weeds would be the same as those identified in **Section 4.5.3**, Impacts Common to all Alternatives.

Soils under Alternative A, the impacts on soils would be the same as those identified in **Section 4.5.3**.

Impacts from Leasable Minerals Management

Vegetation
Under Alternative A, the impacts on vegetation resources would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Impacts would be the same as those identified in **Section 4.5.2**, Nature and Types of Effects.

Invasive Weeds
Under Alternative A, the impacts on invasive weeds would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Impacts would be the same as those identified in **Section 4.5.2**, Nature and Types of Effects.

Soils
Under Alternative A, the impacts on soils would continue to be the same as those identified in the individual LUP documents land health standards, and applicable agency policy or guidance. Impacts would be the same as those identified in **Section 4.5.2**, Nature and Types of Effects.

Impacts from Locatable Minerals Management

Vegetation
Under Alternative A, the impacts on vegetation resources would continue to be the same as those identified in the individual LUP documents land health standards, and applicable agency policy or guidance. Impacts would be the same as those identified in **Section 4.5.2**, Nature and Types of Effects.

Invasive Weeds
Under Alternative A, the impacts on invasive weeds would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Impacts would be the same as those identified in **Section 4.5.2**, Nature and Types of Effects.

Soils
Under Alternative A, the impacts on soils would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Impacts would be the same as those identified in **Section 4.5.2**, Nature and Types of Effects.

Impacts from Salable Minerals Management

Vegetation
Under Alternative A, the impacts on vegetation resources would continue to be the same as those identified in the individual LUP documents land health standards, and applicable agency policy or guidance. Impacts would be the same as those identified in **Section 4.5.2**, Nature and Types of Effects.

Invasive Weeds

Under Alternative A, the impacts on invasive weeds would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Impacts would be the same as those identified in **Section 4.5.2**, Nature and Types of Effects.

Soils

Under Alternative A, the impacts on soils would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Impacts would be the same as those identified in **Section 4.5.2**, Nature and Types of Effects.

Impacts from Land Uses and Realty Management

Vegetation

Under Alternative A, the impacts on vegetation resources would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Impacts would be the same as those identified in **Section 4.5.2**, Nature and Types of Effects.

Invasive Weeds

Under Alternative A, the impacts on invasive weeds would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Impacts would be the same as those identified in **Section 4.5.2**, Nature and Types of Effects.

Soils

Under Alternative A, the impacts on soils would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Impacts would be the same as those identified in **Section 4.5.2**, Nature and Types of Effects.

Impacts from Renewable Energy Management

Vegetation

Under Alternative A, the impacts on vegetation resources would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Impacts would be the same as those identified in **Section 4.5.2**, Nature and Types of Effects.

Invasive Weeds

Under Alternative A, the impacts on invasive weeds would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Impacts would be the same as those identified in **Section 4.5.2**, Nature and Types of Effects.

Soils

Under Alternative A, the impacts on soils would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Impacts would be the same as those identified in **Section 4.5.2**, Nature and Types of Effects.

Impacts from Comprehensive Travel and Transportation Management

Vegetation

Under Alternative A, the impacts on vegetation resources would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Impacts would be the same as those identified in **Section 4.3.2**, Nature and Types of Effects.

Invasive Weeds

Under Alternative A, the impacts on invasive weeds would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Impacts would be the same as those identified in **Section 4.5.2**, Nature and Types of Effects.

Soils

Under Alternative A, the impacts on soils would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Impacts would be the same as those identified in **Section 4.5.2**, Nature and Types of Effects.

Impacts from Recreation Management

Vegetation

Under Alternative A, the impacts on vegetation resources would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Impacts would be the same as those identified in **Section 4.5.2**, Nature and Types of Effects.

Invasive Weeds

Under Alternative A, the impacts on invasive weeds would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Impacts would be the same as those identified in **Section 4.5.2**, Nature and Types of Effects.

Soils

Under Alternative A, the impacts on soils would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Impacts would be the same as those identified in **Section 4.5.2**, Nature and Types of Effects.

4.5.5 Alternative B

Impacts from GRSG Management

Under Alternative B, large scale disturbances in PHMA would not be permitted and small scale disturbances would be limited to 3 percent surface disturbance in PHMA. This would minimize disturbance to vegetation and soils. Although lands may be limited to a disturbance threshold, there may not be a resultant change in vegetation or soil conditions.

Impacts from Riparian Areas and Wetlands Management

Riparian and Water Resources management actions under Alternative B would allow new water developments only to occur if PHMA would benefit. Most water developments are implemented in association with livestock grazing management, with focus on alleviating or excluding riparian areas from use in order to obtain PFC, thereby benefiting GRSG habitat. Direct short-term impacts include ground disturbing activities during the construction of the developments which includes trenching and clearing of soil to install pipelines and associated trough(s), and disturbances associated with fence construction. Therefore the amount of short-term impacts due to new water developments would be the same as Alternative A, as most spring developments are associated with improved grazing management with the goal of improving vegetation conditions. These types of projects also indirectly benefit upland vegetation through improved livestock distribution. This alternative also includes making necessary modifications to existing developments in PHMA to maintain the continuity of the predevelopment riparian area. This would increase the amount of acres of short-term impacts on vegetation to make necessary modifications when compared with Alternative A. However, this would also indirectly increase the amount of acres of vegetation improvement in the long term through the proper maintenance of the development; with the assumption grazing management is meeting or making progress toward Land Health Standards.

Under Alternative B, riparian areas would be managed for PFC. Both vegetation and soils are assessed to determine if a system is at PFC or pertinent Forest Plan standards and guidelines. Vegetation and soils would likely be resilient to withstand 25-year flood events when at PFC. Diversity of riparian vegetation could be increased if managed to the potential natural community. Under this alternative, new water developments would be constructed only if they are beneficial to PHMA. This may minimize surface disturbance to soils and vegetation in riparian areas.

Impacts from Vegetation and Soils Management

Habitat restoration and vegetation management actions under Alternative B would aim to improve vegetation conditions and prioritize restoration efforts to benefit sagebrush vegetation. As a result, the restoration and vegetation management actions would enhance vegetation beyond the extent and condition

relative to Alternative A by requiring the use of native seeds, removing encroaching conifers, designing post-restoration management to ensure the long-term persistence of the restoration efforts, considering changes in climate, and monitoring and controlling invasive species. In PHMA and GHMA, fires would be suppressed to conserve habitat. Fewer acres of sagebrush habitat would be converted to an early seral stage than under Alternative A, thus fewer acres may require ESR treatments and invasive species control. The emphasis on native seed and reestablishment of species-appropriate sagebrush seed would improve vegetation conditions. In the absence of fire or fuels treatments, this alternative may result in more decadent sagebrush stands with depleted understories in the future. This could lead to increased risk of catastrophic fire as a result of fire suppression or exclusion and indirectly lead to larger ESR treatments and invasive weed control projects in the long term.

Impacts from Livestock Grazing Management

Under Alternative B, grazing management to achieve vegetation composition and structure consistent with ecological site potential could maintain or enhance sagebrush and perennial grass conditions in PHMA. Impacts on soils from livestock grazing management are likely to be the same as those identified under Alternative A.

Impacts from Fire and Fuels Management

Wildfire Management

Wildfire in PHMA and adjacent GHMA would be suppressed to conserve habitat. Fewer acres of sagebrush habitat would be converted to an early seral stage than under Alternative A. However, in the long term there could be a greater potential for large, uncharacteristic fire as a result of fire suppression and exclusion. As a result of actions, more fires would be suppressed in the surrounding vegetation communities to protect sagebrush, and fewer acres of sagebrush habitat would be lost to fire. However, increased fire suppression could also contribute to larger catastrophic fires in the long term due to increases in fuel loading in PHMA and adjacent GHMA. With suppression efforts focused on PHMA and adjacent GHMA more acres would likely burn in areas outside of PHMA. This could lead to catastrophic fires converting sagebrush habitats to early seral stage in GHMA, or to annual grasslands in low elevations. Large portions of GHMA habitat are areas that have been impacted by fire over the last decade and still have the potential to become PHMA as succession progresses. These communities can be negatively impacted and may cross a threshold if they are burned again. Changes in soil, vegetation, and water properties would be more likely to occur outside of PHMA under this alternative.

Fuels Management

Fuels projects could not reduce sagebrush canopy cover below 15 percent, with the exception of fuels breaks. In PHMA, seasonal restrictions would apply to

fuels treatments, and prescribed fire would be generally be excluded, unless meeting site-specific requirements, in sagebrush habitat where there is less than 12 inches of annual precipitation.

Treatments would be to rest areas from livestock grazing for two full growing seasons. Fuels treatments would use native plant seeds, with exceptions for availability and probability of success when nonnative seeds would meet GRSG objectives. Restrictions under Alternative B would reduce the opportunity for fuels treatments and limit treatment objectives, which would lead to fewer acres treated. Under this alternative, treatments would be limited to those that benefit GRSG or the identified GRSG objectives. Restrictions would also limit the number of acres treated and potentially the effectiveness of the treatments. Overall fewer acres would be treated under Alternative B than Alternative A.

Impacts from Wild Horse and Burro Management

Vegetation
Under Alternative B, vegetation in HMAs/WHBTs would be managed to achieve GRSG habitat objectives. This could allow for improvement of sagebrush/perennial grass communities in those HMAs/WHBTs.

Invasive Weeds
Under Alternative B, impacts on invasive weeds would be the same as those analyzed under Alternative A.

Soils
Under Alternative B, soils in HMAs/WHBTs would be managed to achieve GRSG habitat objectives. This could allow for improvement of soils conditions in those HMAs/WHBTs.

Impacts from Climate Change Management
Under Alternative B, potential improvements to sagebrush/perennial grass communities, soil health, and functions would also improve creating greater resiliency to the predicted effects of climate change.

Impacts from Leasable Minerals Management
Under Alternative B, PHMA would be closed to leasable minerals and GHMA would be authorized only under a no surface occupancy stipulation. This could reduce vegetation and soils disturbance. Where applications for permits to drill are authorized for existing leases, surface disturbance would be limited to 3 percent in PHMA. This would minimize disturbance to vegetation and soils. Although lands may be listed as closed, there may not be a resultant change in vegetation or soil conditions.

Impacts from Locatable Minerals Management
Under Alternative B, lands would be recommended for withdrawal in PHMA. This could reduce vegetation and soils disturbance in PHMA. Although lands

may be listed as withdrawn and/or closed, there may not be a resultant change in vegetation or soil conditions if there is no potential for the mineral resource.

Impacts from Salable Minerals Management

Under Alternative B, PHMA is closed for salable minerals material disposal and would disturb less vegetation and soils than in Alternative A. This would result in improved sagebrush/perennial grass communities. Also, reduced disturbance would likely result in less introduction and spread of invasive plant species.

Impacts from Land Uses and Realty Management

Under Alternative B, PHMA would be managed as an exclusion area, while GHMA would be managed as an avoidance area. New ROW actions would be restricted to the footprint of existing ROWs in GHMA and in designated corridors in PHMA. This would keep any new disturbance to vegetation or soils to previously disturbed locations. This Alternative involves burial of new or existing power lines where feasible and this could increase the disturbance of vegetation and soils in new locations. Under Alternative B, disturbance to sagebrush would be limited to 3 percent surface disturbance. This could maintain sagebrush/perennial grass vegetation communities in the PHMA in the planning area. Vegetation conditions could improve where other developments, such as fences and roads would be reclaimed if they are no longer in use.

Impacts from Renewable Energy Management

Under Alternative B, vegetation and soils disturbance from solar energy development would be excluded in PHMA and GHMA, and wind energy would be excluded in PHMA and remain an avoidance area for wind energy. Although lands may be listed as excluded or avoided from energy development, there may not be a resultant change in vegetation or soil conditions. Under Alternative B, disturbance to sagebrush would be limited to 3 percent surface disturbance. This could maintain sagebrush/perennial grass vegetation communities in the PHMA in the planning area.

Impacts from Comprehensive Travel and Transportation Management

Limiting motorized travel to existing roads, primitive roads and trails under Alternative B would minimize disturbance of vegetation and soils from cross-country vehicle traffic in the planning area. Limiting or prohibiting construction of new roads would minimize disturbance to vegetation and soils in PHMA.

Impacts from Recreation Management

Under Alternative B, only SRPs that have neutral or beneficial impacts on PHMA would be authorized. This could limit the disturbance to vegetation and soils in PHMA.

4.5.6 Alternative C

Impacts from GRSG Management

Under Alternative C, passive restoration would occur. Passive restoration methods may not allow for conversion to a different vegetation community, as described in state-and-transition models. This applies to those vegetation communities that have passed a threshold, or transition, away from a reference or desired state. Unlike community pathways, transitions are not reversible by simply altering the intensity or direction of the factors that produced the change and instead require the application of distinct factors such as the addition of seeds, the removal of shrubs, or the addition of top soil (Bestelmeyer et al. 2003).

Impacts from Riparian Areas and Wetlands Management

Under Alternative C, bank trampling in riparian areas would be limited to 10 percent of livestock accessible stream and spring margin and meadow areas. This could allow for soils along riparian areas to experience minimized disturbance from livestock. Riparian area soils could maintain hydric conditions.

Impacts from Vegetation and Soils Management

This alternative focuses on the restoration of crested wheatgrass seedings and cheatgrass infestation areas. It does not prioritize any other treatments in PHMA It would also prioritize the use of flash burners, mowing, and selected hand cutting for weed treatments, with herbicide only being used if there is no other alternative.

This alternative relies more on passive restoration and would lead to fewer acres of vegetation management being treated compared with Alternative A. However, it is likely that more acres of crested wheatgrass seedings and cheatgrass invaded areas would be treated improving vegetation conditions for GRSG habitat with success in those areas. With minimizing the use of herbicides to treat annual grasses and noxious weeds fewer acres of acres of treatment would be completed under this alternative compared with Alternative A. Active seeding of those areas of intensive disturbance would result in short-term disturbance of vegetation and soils until establishment of perennial vegetation is obtained. The use of flash burning, mowing and other mechanical methods could show a temporary disturbance in vegetation and soils.

Impacts from Livestock Grazing Management

Vegetation

Under Alternative C, livestock grazing would not be permitted in occupied GRSG habitat. As a result, fine fuels could increase throughout occupied habitat, and fire risk may increase as well. Depending on the vegetation conditions and community types before livestock is removed, this would result in higher fine fuel loading or a closed shrub canopy.

Invasive Species

Under Alternative C, large-scale removal of livestock could reduce one of the vectors of invasive weed establishment and spread. Removing fences, water troughs, and pipelines from PHMA could temporarily increase the disturbance of vegetation and soils. This could increase invasive weed establishment and spread at those localized disturbance areas. If those invasive species populations were left untreated, invasive species could spread into desired plant communities.

Under Alternative C, all PHMA areas closed to livestock grazing could show a reduction in the potential for invasive species establishment; however, this may not control or reduce the existing invasive species presence. The dominance of cheatgrass and medusahead in the intermountain west, partly caused by extensive overgrazing in the late 1800s and early 1900s, would not be rectified by removing cattle or by reducing their numbers. The new cheatgrass-dominated "steady state" would require such treatments as herbicides, seeding, and fertilizing to restore the flora to its state before Euro-American contact (Sheley and Petroff 1999).

Soils

Trampling impacts on soils could be minimized by large-scale removal of livestock grazing under Alternative C. Reduced trampling could reduce impacts on biological soil crusts.

Impacts from Fire and Fuels Management

Fuels treatments would focus on areas of human habitation or in areas of significant existing disturbances. This alternative would have more restrictions and result in fewer acres treated when compared with Alternative A. Under these restrictions fuels treatments would only allow the removal of grass along roadsides or other disturbed areas, and would not include the removal of shrubs. This would restrict the amount of acres that could be treated in PHMA areas.

Impacts from Wild Horse and Burro Management

Under Alternative C, helicopter use in wild horse gathers would be eliminated. This could lead to less efficient gather operations, which could cause AMLs to continue to be exceeded in HMAs/WHBTs. Removal of soils and vegetation resources is likely to occur where wild horse and burro populations are concentrated.

Impacts from Climate Change Management

Under Alternative C, impacts on vegetation and soils would be the same as Alternative A.

Impacts from Leasable Minerals Management

In closed areas, there would be little disturbance to oils and vegetation from leasable minerals management. This would likely improve soils and vegetation conditions.

Impacts from Locatable Minerals Management

Disturbance of vegetation and soils due to development of locatable minerals management would be eliminated in PHMA under Alternative C. Disturbance to vegetation would be substantially less than Alternative A.

Impacts from Salable Minerals Management

Under Alternative C, PHMA would be closed to salable minerals management, resulting in no human soil or vegetation disturbance on those sites. This would improve vegetation and soil conditions.

Impacts from Land Uses and Realty Management

Under Alternative C, all PHMA would be a ROW/SUA exclusion area resulting in no human soil or vegetation disturbance on those sites. This would improve vegetation and soil conditions.

Impacts from Renewable Energy Management

Under Alternative C, solar and wind energy development would be excluded from PHMA and GHMA, resulting in no human soil or vegetation disturbance on those areas. This would improve vegetation and soil conditions.

Impacts from Comprehensive Travel and Transportation Management

Limiting use of motorized vehicles to existing roads and trails, which would close lands to cross country travel under Alternative C, would minimize disturbance of vegetation and soils from vehicle traffic in the planning area.

Impacts from Recreation Management

Under Alternative C, impacts on vegetation and soils would be the same as Alternative A.

4.5.7 Alternative D

Impacts from GRSG Management

Under Alternative D, lands would be managed to meet GRSG and habitat objectives. Sagebrush/perennial grass ecosystems would be enhanced or maintained. This would directly or indirectly increase sagebrush vegetation. Conifer stands in historic sagebrush areas would be reduced. Under Alternative D, areas designated as OHMA would be managed under specific required design features intended to improve the vegetation conditions present.

Impacts from Riparian Areas and Wetlands Management

Impacts on riparian areas would be similar to Alternative B., although under this alternative, riparian areas and wetlands would receive more emphasis in the

development of management actions for weed control, vegetation treatments, fuels management and water developments. Objectives for riparian areas would also be incorporated into the permitting process for livestock grazing. Collectively, these measures would have the effect of improving overall watershed health with more positive effects on vegetation and soils resources compared with Alternative A.

Alternative D would allow new water developments to occur only when GRSG GHMA and PHMA would benefit. However, most water developments are implemented in association with livestock grazing management, with focus on alleviating or excluding riparian areas from livestock use in order to obtain PFC and improving distribution in the uplands, thereby benefiting GRSG habitat. Therefore the amount of short-term impacts due to new water developments would be the same as Alternative A, as most spring developments are associated with improved grazing management. The alternative also includes making necessary modification to existing developments in PHMA to maintain the continuity of the predevelopment riparian area. This would increase the amount of acres of short-term impacts on vegetation to make necessary modifications when compared with Alternative A. However, this would also indirectly increase the amount of acres of vegetation improvement in the long term through the proper maintenance of the development, with the assumption that grazing management is meeting or making progress toward BLM Land Health Standards.

Impacts from Vegetation and Soils Management

All vegetation and soils management activities would be prioritized in PHMA and GHMA under this alternative. Treatments would prioritize the use of native seed and establishing appropriate sagebrush species/subspecies that meet GRSG seasonal habitat requirements. This includes ESR, invasive species/noxious weed, conifer encroachment, and restoration activities. Management actions would be designed to establish and maintain a resilient sagebrush vegetation community and restore sagebrush vegetation communities to reduce habitat fragmentation and maintain or re-establish habitat connectivity over the long term. Invasive and/or noxious weed populations would be reduced, helping to improve overall vegetation conditions and health.

Treatments would also be rested from livestock for two growing seasons or until vegetation or habitat objectives are met. Treatments would be implemented only for the benefit of GRSG or the identified GRSG objective. These restrictions would increase the amount of acres treated in PHMA and GHMA as compared with Alternative A, and decrease the amount of acres treated outside of PHMA and GHMA. Under this alternative more fires would be suppressed to protect sagebrush, and fewer acres of sagebrush habitat would be lost to fire in PHMA reducing the amount of ESR treatments needed when compared with Alternative A. However, with suppression efforts focused on

PHMA and GHMA more acres would likely burn in areas outside PHMA and GHMA increasing the need for ESR treatments in non- GRSG habitat.

Impacts from Livestock Grazing Management

Under Alternative D, grazing management to achieve vegetation composition and structure consistent with ecological site potential could maintain or enhance sagebrush and perennial grass conditions in PHMA and GHMA. In those areas not meeting GRSG habitat objectives, the rest and seasonal changes could improve sagebrush communities by relieving some grazing pressure. Drought management actions to remove livestock temporarily when plants are stressed would help to maintain desired plant communities. Livestock resting during herbaceous plant growth would help to increase vigor of desired plants. This would provide a more resilient plant community to withstand livestock grazing pressure.

Impacts from Fire and Fuels Management

Wildfire Management

Wildfire management will provide first for firefighter and public safety, and then set priorities to protect communities, infrastructure, improvements, and natural and cultural resources based on values to be protected, human health and safety, and costs. These priorities are outlined under the current Federal Wildland Fire Management Policy. As safety allows, in PHMA and GHMA unburned islands and patches of sagebrush would be retained, as well as minimizing burn-out operations in PHMA and GHMA. Under this alternative, fewer acres of sagebrush habitat in PHMA and GHMA would be converted to an early seral stage, and would have less risk for invasive grass and noxious weed invasion than under Alternative A.

As a direct result of actions, more fires would be suppressed in the surrounding vegetation communities to protect sagebrush, and fewer acres of sagebrush habitat would be lost to fire. However, indirect impacts of fire suppression could lead to a greater potential for large, uncharacteristic fire in the future as a result of fire exclusion over the long term due to increases in fuel loading in PHMA and GHMA. With suppression efforts focused on PHMA and GHMA more acres would likely burn in areas outside of these areas. This could lead to large fires converting sagebrush habitats to early seral stage or to annual grasslands in low elevations. Changes in soil, vegetation, and water properties would be more likely to occur outside of PHMA and GHMA under this alternative.

Prioritizing fire suppression, through the FIAT process, would help to minimize disturbance from wildfire to the sagebrush community type. As wildfire disturbance is minimized in sagebrush communities, vegetation health and condition would be improved. Sagebrush/perennial grass communities are expected to be more resilient to disturbance and more resistant to exotic

annual grass invasion. This would also provide seed source available on site for future use.

Fuels Management

Fuels management treatments would be prioritized inside and close to PHMA to prevent large scale loss of habitat. Treatment design would locate projects adjacent to existing disturbances such as power lines, roads, fence lines, and other disturbances where feasible. Lotic riparian habitats would also be managed in conjunction with adjacent terraces and valley bottoms as natural fire breaks to reduce size and frequency of wildfires in PHMA and GHMA. No treatments would be allowed in PHMA or GHMA if it is determined that the treatment would not be beneficial to GRSG or their habitat. Treatment types would place emphasis on maintaining, protecting, and expanding GRSG habitat. A full suite of integrated vegetation treatments, including but not limited to chemical, mechanical, seeding, and prescribed fire treatments as appropriate would be used to enhance PHMA and restore GHMA that are currently in FRCC 2 and FRCC 3 fire condition classes.

The use of native seed would be required for fuels management treatments based on availability, adaptation (site potential), and probability of success. Nonnative seed may be used as a fire resistant fuels treatment. In all cases, seed must be certified weed-free. This alternative is more restrictive than Alternative A, but would not likely decrease the amount of acres treated overall; however, it would increase the amount of acres treated in and adjacent to PHMA and GHMA compared with Alternative A. This alternative would also ensure that the treatment would be beneficial to GRSG or it would not be implemented. Indirectly the fuels projects under this alternative would lead to fewer acres burned in and adjacent to PHMA and GHMA than under Alternative A. Prioritization of fuels and post fire stabilization and rehabilitation treatments, using the FIAT process, will lead to improved sagebrush/perennial grass communities, especially in the warmer, drier sites. Through the FIAT process, sagebrush/perennial grass communities would likely be more resilient to disturbance and resistant to invasion by invasive annual grasses.

Impacts from Wild Horse and Burro Management

Adjustments to AML numbers could alter vegetation structure and composition by removing some of the disturbance caused by wild horse and burro movement across the landscape. In those areas on BLM-administered lands not meeting Standards for Rangeland Health, where causes are due to wild horse and burro populations, adjustments to AML could help to improve vegetation conditions.

Impacts from Climate Change Management

Under Alternative D, vegetation treatments would be implemented as climate change strategies. These treatments would reduce the presence of cheatgrass, reduce conifer encroachment in PHMA, and seed shrubs and grasses. These

treatments would help to maintain or enhance vegetation that comprises GRSG habitat. Hazardous fuels treatments would be implemented with design toward improving wildlife and GRSG habitat. Vegetation conditions would be improved in moderate to high quality habitat where bioclimatic conditions are predicted to persist through 2050.

Impacts from Leasable Minerals Management

Under Alternative D, no new surface occupancy would be authorized in PHMA and GHMA. This could reduce vegetation and soils disturbance. Exploration activities would be allowed as long as sagebrush species are not crushed. This could maintain sagebrush health and resiliency in PHMA. OHMA would be subject to RDFs, consistent with applicable law which should minimize disturbance to vegetation and soils. Mitigation measures could increase sagebrush and perennial grass communities in off-site areas to compensate for permitted loss of sagebrush loss. Lands already leased would continue under current management.

Impacts from Locatable Minerals Management

Same as Alternative A, but some additional mitigation would be imposed for a no net unmitigated loss.

Impacts from Salable Minerals Management

Under Alternative D, PHMA and GHMA would be closed to salable minerals management, resulting in no soil or vegetation disturbance on those sites. This would improve or maintain vegetation and soil conditions.

Impacts from Land Uses and Realty Management

Under this alternative, ROW/SUAs are designated as avoidance areas in PHMA and GHMA. New ROW actions would be restricted to the footprint of existing ROWs in in PHMA and GHMA with emphasis on placing them in designated corridors. This would keep any new disturbance to vegetation or soils to previously disturbed locations. This Alternative involves burial of new or existing power lines where feasible and this could increase the disturbance of vegetation and soils in new locations. Any new disturbance would be subject to net conservation gain and mitigation strategy. This could help maintain sagebrush/perennial grass vegetation communities in the GRSG habitat in the planning area. Vegetation conditions could improve where other developments, such as fences and roads would be reclaimed if they are no longer in use.

Impacts from Renewable Energy Management

Under Alternative D, wind and solar energy development would be excluded in PHMA and GHMA. Vegetation and soils disturbance from energy development would be eliminated in GRSG habitat containing sagebrush/perennial grass vegetation communities. By exclusion of development, the vegetation and soil conditions will neither be adversely nor beneficially impacted, but rather maintain current conditions and trends."

Impacts from Comprehensive Travel and Transportation Management

Limiting motorized travel to designated roads, primitive roads and trails under Alternative D in PHMA and GHMA would minimize disturbance of vegetation and soils from vehicle traffic in the planning area. Limiting or prohibiting construction of new roads would minimize disturbance to vegetation and soils in PHMA. Mitigation measures could increase the sagebrush/perennial grass community type to offset any loss of sagebrush. Requiring certified weed free seed for reclamation of roads would minimize invasive species establishment or spread.

Impacts from Recreation Management

Under Alternative D, only SRPs that have neutral or beneficial impacts on PHMA would be authorized. This could limit the disturbance to vegetation and soils in PHMA. No new construction of recreation facilities in PHMA or GHMA would reduce human disturbance to soils and vegetation.

4.5.8 Alternative E

This alternative proposes to reduce the impact on GRSG habitat (Core, Priority, and General) by applying strategies to avoid, minimize, and mitigate, with the addition of the Conservation Credit System managed by the State of Nevada.

Impacts from GRSG Management

Under Alternative E, lands would be managed to meet GRSG and habitat objectives. Lands would be managed for a net conservation gain of sagebrush vegetation. Also, sagebrush communities would be avoided, minimized, or mitigated from human disturbances. Projects and their associated disturbance would trigger habitat evaluation and consultation with the Sagebrush Ecosystem Technical Team. The Conservation Credit System would help to mitigate vegetation impacts on maintain or improve sagebrush/perennial grass community types. This would directly or indirectly increase sagebrush vegetation.

Impacts from Riparian Areas and Wetlands Management

Under Alternative E, invasive and noxious weeds would be more actively controlled than under Alternative A. This would help to maintain native riparian vegetation and would help prevent soil erosion.

Impacts from Vegetation and Soils Management

Under this alternative the fundamental decision-making policy of avoid, minimize, and mitigate would be followed. The alternative assigns the Nevada Governor's Sagebrush Ecosystem Council with establishing policies for the identification and prioritization of landscape-scale enhancement, restoration, fuel reduction, and mitigation projects. Without knowing what actions the Nevada Sagebrush Ecosystem Council would take, the level of this alternative's impacts cannot be determined.

The main goal of the alternative is to achieve conservation through "net conservation gain" in the Core, Priority, and General Habitat categories in the sagebrush ecosystem for activities that can be controlled, such as a planned disturbance or development. Therefore, this alternative would limit the level of disturbance to vegetation, but would also mitigate any loses with treatments designed to improve vegetation.

Since mitigation would occur only after all appropriate and practicable avoidance and minimization measures have been taken, the level of mitigation treatments is unknown. This limit would not apply to removal of invasive or encroaching vegetation, where such removal actually creates habitat. Therefore, this alternative could improve more acres of vegetation in GRSG habitat than Alternative A. The Sage Steppe Ecosystem Restoration Strategy in Northern California actions are intended to provide design and implementation guidelines for effective sagebrush restoration. These actions are likely to improve GRSG habitat.

Impacts from Livestock Grazing Management

Under Alternative E, grazing management to achieve vegetation composition and structure consistent with ecological site potential could maintain or enhance sagebrush and perennial grass conditions in SGMA. In those areas not meeting GRSG habitat objectives, the rest and seasonal changes could improve sagebrush communities by relieving some grazing pressure; however, no AUM reductions are proposed as a result of not achieving GRSG objectives.

Alternative E would encourage grazing practices that would promote the health of perennial grass communities to suppress cheatgrass. This may not control or reduce the existing invasive species presence. The dominance of cheatgrass and medusahead in the intermountain West, partly caused by extensive overgrazing in the late 1800s and early 1900s, would not be rectified by simply removing cattle or by reducing their numbers. The new cheatgrass-dominated "steady state" would require massive levels of fossil fuel input via herbicides, seeding, and fertilizing to restore the flora to its state before Euro-American contact (Sheley and Petroff 1999).

Passive restoration methods may not allow for conversion to a different vegetation community, as described in state-and-transition models. This applies to those vegetation communities that have passed a threshold, or transition, away from a reference or desired state. Unlike community pathways, transitions are not reversible by simply altering the intensity or direction of the factors that produced the change and instead require the application of distinct factors, such as adding seeds, removing shrubs, or adding topsoil (Bestelmeyer et al. 2003).

Impacts from Fire and Fuels Management

Wildfire Management

The type of impacts from wildland fire management would be similar as those described under Alternative D, except they would apply to SGMA rather than PHMA and GHMA. This alternative also relies on some actions that are not under the control of federal agencies, such as the use of the Nevada Division of Forestry, County Fire Protection Districts, and volunteer firefighting forces that are in place throughout Nevada.

Fuels Management

Alternative E would limit habitat disturbance, including habitat improvement projects, in occupied and suitable habitat unless objectives of those habitat treatments show credible positive results. This limit would not apply to removing invasive or encroaching vegetation, where such removal actually creates habitat.

The alternative would also allow the construction of temporary roads to reduce fuels in pinyon-juniper treatment areas. Once the treatment is complete the temporary roads would be removed and restored, thereby having no negative impact. Alternative E would also limit the amount of fuels treatments in winter habitat and the use of prescribed fire in Wyoming big sagebrush communities. Alternative E would focus fuels treatments in occupied habitat, thereby reducing the risk of large uncharacteristic wildfires in the long term. This would lead to fewer acres burned in GRSG habitat, when compared with Alternative A.

Impacts from Wild Horse and Burro Management

Under Alternative E, wild horse and burro populations would be managed to AML to avoid and minimize impacts on SGMA. In SGMA, impacts on vegetation and soils would be the same as Alternative A.

Impacts from Climate Change Management

Under Alternative E, climate change adaptation strategies would be determined by the Nevada Governor's Sagebrush Ecosystem Council, the Nevada Sagebrush Ecosystem Technical Team, and the Nevada Conservation Credit System. Impacts on vegetation and soils could be enhanced or reduced based on decisions and actions of the above mentioned groups.

Impacts from Leasable Minerals Management

Under Alternative E, avoidance management and enhancement and reclamation of disturbed lands would be implemented to preserve, protect, and improve habitat in SGMA. This could minimize vegetation and soil disturbances in those areas. Other leasable minerals management activities would be outside SGMA. This could enhance or maintain vegetation and soils in occupied, suitable, and potential habitats. Although lands may be listed as avoided, there may not be a resultant change in vegetation or soil conditions. Reclamation using native plants would help to increase sagebrush/perennial grass communities in areas of

previous disturbance. Invasive and noxious weed control in disturbed areas could help to decrease undesirable vegetation and to increase desired sagebrush and perennial grass communities.

Impacts from Locatable Minerals Management

Alternative E would not identify areas that could be petitioned for withdrawal from mineral entry or open to locatable mineral exploration or development. However, the strategy to avoid, minimize, or mitigate impacts on GRSG habitat under Alternative E would result in fewer impacts on vegetation and soils from hard-rock mining, in comparison with Alternative A.

Impacts from Salable Minerals Management

Alternative E does not identify areas as closed to mineral material disposal. SGMA management applies only to lands in Nevada. However, the strategy to avoid, minimize, or mitigate impacts on GRSG habitat under Alternative E would result in fewer impacts on vegetation and soils resources from salable mineral development, in comparison with Alternative A.

Impacts from Land Uses and Realty Management

Under Alternative E, facilities and activities would be guided by the strategy to avoid, minimize, or mitigate impacts on GRSG habitat and should result in fewer impacts on vegetation and soils resources from activities associated with lands and realty development in comparison with Alternative A. Active invasive and noxious weed control in ROW areas could help to decrease undesirable vegetation and increase desired sagebrush/perennial grass communities.

Impacts from Renewable Energy Management

Under Alternative E, facilities and activities would be guided by the strategy to avoid, minimize, or mitigate impacts on GRSG habitat. This should result in fewer impacts on vegetation and soils resources from renewable energy development, in comparison with Alternative A. Active invasive and noxious weed control in ROW areas could help to decrease undesirable vegetation and increase desired sagebrush/perennial grass communities.

Impacts from Comprehensive Travel and Transportation Management

Impacts are the same as under Alternative A.

Impacts from Recreation Management

Impacts are the same as under Alternative A.

4.5.9 Alternative F

Impacts from GRSG Management

Under Alternative F, disturbance to sagebrush would be limited to 3 percent surface disturbance in PHMA. This could maintain sagebrush/perennial grass vegetation communities in the priority habitat in the planning area. Under Alternative F, restoration would be implemented in unoccupied habitat that may

be occupied if converted to a potential natural community. Fuels treatments would be designed to protect existing sagebrush ecosystems.

Impacts from Riparian Areas and Wetlands Management

No new water developments for diversion from spring or seep sources would be allowed in GRSG habitat under this alternative. This would remove the ability to construct any spring/seep developments in GHMA or PHMA and would lead to less acres of disturbance to vegetation in the short term related from the direct impact of construction when compared with Alternative A. However, this could lead to an increase in construction of other water developments such as stock ponds and other water catchments not directly diverting water from springs or seeps. This would lead to a greater amount of acres disturbed to upland vegetation when compared with Alternative A since the disturbance related to spring developments is only for a short term and typically are rehabilitated after construction. With the construction of stock tanks the loss of vegetation association with the project would be long term due to the replacement of vegetation with a small reservoir.

Under Alternative F, riparian areas would be managed for PFC or pertinent Forest Plan standards and guidelines. Both vegetation and soils are assessed to determine if a system is at PFC. Vegetation and soils would likely be resilient to withstand 25 year flood events when at PFC. Under this alternative, no new water developments would be constructed, minimizing additional surface disturbance to vegetation and soils.

Impacts from Vegetation and Soils Management

The type of impacts from vegetation and soils management would be the same as those described under Alternative B, with the exception that this alternative would exclude livestock grazing from burned areas until woody and herbaceous plants achieve GRSG habitat objectives. This would keep livestock off burned areas for a longer period than Alternative B and could speed up burned area recovery toward meeting GRSG habitat requirements. However, this action could indirectly lead to heavier fine fuel loading and a greater potential for fire reoccurrence.

Impacts from Livestock Grazing Management

Under Alternative F, 25 percent of grazing areas in GRSG habitat would be rested from grazing each year. This could increase the resiliency of grazed species, but, in areas that are impacted by invasive grasses; the reduction may increase the potential for wildfire due to fine fuel loading.

Impacts from Fire and Fuels Management

Under Alternative F, the amount of fine fuels may increase, possibly leading to an increased fire risk and severity. An increased fire severity may cause a loss of sagebrush/perennial grass vegetation and increased fire suppression costs.

Impacts from Wild Horse and Burro Management

Wild horse AMLs would be reduced by 25 percent in occupied GRSG habitats. While impacts from wild horses and burros would remain, this would reduce the effects of wild horses described under Alternative A. More residual grasses and forbs would likely remain in occupied GRSG habitat that overlaps HMAs/WHBTs.

Impacts from Climate Change Management

Under Alternative F, impacts on vegetation and soils would be the same as Alternative A.

Impacts from Leasable Minerals Management

Under Alternative F, impacts on vegetation and soils would be the same as Alternative C.

Impacts from Locatable Minerals Management

For locatable minerals under Alternative F, all lands in PHMA would be recommended for withdrawal from mineral development. This could reduce the vegetation and soil disturbance when compared with Alternative A. Although lands may be listed as withdrawn, there may not be a resultant change in vegetation or soil conditions until withdrawals are completed. The condition of vegetation and soils resources would likely improve due to further limitations on development and disturbance.

Impacts from Salable Minerals Management

In PHMA, mineral material pits no longer in use would be restored to meet GRSG habitat conservation objectives, and new salable mineral disposals would not be allowed. Vegetation and soils conditions would improve. In GHMA, salable minerals would be open for new disposal, similar to Alternative A.

Impacts from Land Uses and Realty Management

Under Alternative F, new ROW actions would be restricted to the footprint of existing ROWs, and new ROWs would be excluded in PHMA and GHMA. This would keep any new disturbance to vegetation or soils to previously disturbed locations. This Alternative involves burial of existing power lines where feasible and this could increase the disturbance of vegetation and soils.

Impacts from Renewable Energy Management

Under Alternative F, vegetation and soils disturbance from wind energy development would be excluded in PHMA and GHMA. By exclusion of development, the vegetation and soil conditions will neither be adversely nor beneficially impacted, but rather maintain current conditions and trends.

Impacts from Comprehensive Travel and Transportation Management

Limiting motorized travel to existing routes under Alternative F would minimize disturbance of vegetation and soils from vehicle traffic in the planning area. Limiting or prohibiting construction of new roads would minimize disturbance

to vegetation and soils in PHMA. Mitigation measures could increase the sagebrush/perennial grass community type if disturbance exceeds the 3 percent threshold.

Impacts from Recreation Management

Under Alternative F, impacts on vegetation and soils would be the same as Alternative C.

4.5.10 The Proposed Plan

This alternative would require a 3 percent disturbance cap on surface-disturbing activities in PHMA (see **Appendix F**) and would incorporate RDFs consistent with applicable law in PHMA, GHMA, and OHMA. It would also require all human disturbances to result in a net conservation gain for GRSG and their habitat. Lek buffers would also be required (see **Appendix B**).

Collectively, these GRSG conservation management actions would increase mitigation requirements for land use authorizations. This would result in more complex project designs, could exclude infrastructure placement in the most cost effective locations, and would result in overall greater development costs. A corresponding effect could be a reduction in the number of authorization applications received for activities in PHMA and longer more complicated review periods for those that are proposed in PHMA.

Impacts from GRSG Management

Under the Proposed Plan, lands would be managed to meet GRSG habitat objectives. Sagebrush/perennial grass ecosystems would be enhanced or maintained. This would directly or indirectly increase sagebrush vegetation. Conifer stands in historic sagebrush areas would be reduced.

Impacts from Riparian Areas and Wetlands Management

Impacts on riparian areas would be similar to Alternative D, although under this alternative, riparian areas and wetlands would receive more emphasis in the development of management actions for weed control, vegetation treatments, fuels management, and water developments. Habitat objectives for riparian areas would also be incorporated into the permitting process for livestock grazing. Collectively, these measures would improve overall watershed health, with more positive effects on vegetation and soils resources than Alternative A.

The Proposed Plan would allow new water developments to occur only when GHMA and PHMA would benefit. This differs from Alternative B by including GHMA along with PHMA. However, most water developments are implemented in association with livestock grazing management, with a focus on alleviating or excluding riparian areas from livestock use. This would be to obtain PFC and improve distribution in the uplands, thereby benefiting vegetation communities. Therefore, the number of short-term impacts due to new water developments would be the same as Alternative A. This is because most spring developments are associated with improved grazing management.

Alternative E also would modify developments in PHMA to maintain the continuity of the predevelopment riparian area (also included under Alternative B). This would increase the number of acres of short-term impacts on vegetation to make necessary modifications, compared with Alternative A. However, it would also indirectly increase the number of acres of vegetation improvement in the long term by properly maintaining development, with the assumption that grazing management is meeting or progressing toward BLM Land Health Standards.

Impacts from Vegetation and Soils Management

All vegetation and soils management activities would be prioritized in PHMA and GHMA under Alternative E. Treatments would prioritize the use of native seed and establishing appropriate sagebrush species and subspecies that meet GRSG seasonal habitat requirements, while benefiting vegetation community conditions. This includes post-fire stabilization and rehabilitation, invasive species and noxious weeds, conifer encroachment, and restoration. Management actions would be designed to establish and maintain a resilient sagebrush vegetation community and to restore sagebrush vegetation communities.

Establishing sagebrush focal areas would provide for opportunities to improve large blocks of sagebrush and perennial grass communities by prioritizing management and conservation in these areas. This would include reviewing livestock grazing permits.

Treatments would also be rested from livestock until vegetation or habitat objectives are met. Treatments would be implemented only for the benefit of GRSG or the identified GRSG objective. These restrictions would increase the number of acres treated in PHMA and GHMA, compared to Alternative A, and would decrease the number of acres treated outside of PHMA and GHMA.

Results from the VDDT are presented in **Table 4-8** below. This modeling effort is described further in **Appendix M**. Stand replacement wildfire; mosaic wildfire, overgrazing, insects and disease, and conifer encroachment were incorporated into the model to quantify changes in GRSG habitat. The modeling effort did not include changes in habitat conditions associated with climate change or with permitted activities such as infrastructure development, travel management, or mineral development. The model also estimated 8 treatment acres required to meet target sagebrush habitat quality goals.

Based on guidelines provided by the GRSG National Technical Team Report (NTT 2011), 70 percent of an area should be in 10 to 30 percent sagebrush canopy cover to meet GRSG sagebrush habitat objectives. The tables included as part of the vegetation impacts from Alternative A and the Proposed Plan each present the percentage of a given GRSG analysis area meeting GRSG sagebrush habitat objectives by alternative after 10 years and 50 years' time.

The acres of treatment proposed in each of the analysis area are necessary to improve or maintain habitat conditions. The proposed plan provides treatment acres by decade, sufficient to meet desired habitat conditions (70 percent of the analysis area meeting 10 to 30 percent sagebrush cover; NTT 2011). **Table 4-8** displays the combined BLM and Forest Service treatment acres by analysis areas for each decade during the next fifty years; **Table 4-9** displays the trends as a result of the combined treatment acres in both BLM and Forest Service Proposed Plans, when compared to the treatment rates and types under Alternative A.

Table 4-8
BLM and Forest Service Acres Treated

Analysis Area	Mechanical Treatment	Prescribed Fire	Grass Restoration
15	788,000	0	885,000
26	46,000	8,000	503,000
30	16,000	0	9,000
31	34,000	10,000	257,000

Source: BLM and Forest Service GIS 2015

Table 4-9
Trend on BLM and Forest Service Lands

Analysis Area	No Action Modeled[1] Habitat Condition and Trend[2]			Proposed Plan Modeled[1] Habitat Condition and Trend[2]		
	Initial Condition	10-Year Condition	50-Year Condition	Initial Condition	10-Year Condition	50-Year Condition
15	77%	72%	55%	77%	74%	71%
26	73%	70%	62%	73%	72%	70%
30	79%	73%	53%	79%	76%	71%
31	87%	81%	58%	87%	83%	71%

Source: BLM and Forest Service GIS 2015
[1]The outputs are not absolutes and are bound by the assumptions and limitations of the data.
[2]Habitat condition percentages are the amount of the analysis area that meets 10-30 percent sagebrush cover.

For Alternative A, the model results show a declining trend in all of the analysis areas. At 50 years, all areas would be below desired conditions, meaning less suitable habitat would be available for GRSG than currently exists, which would result in GRSG population declines in those areas.

Conifer removal can provide immediate benefit to GRSG by restoring habitat quality whereas other vegetation management projects aimed at restoring sagebrush may aid GRSG over the long term, but not provide immediate habitat improvement. Under the Proposed Plan, the BLM and Forest Service would include treatment programs to reduce the likelihood of conifer encroachment and further improve GRSG abundance and distribution. During the each decade, a total of 717,000 acres of BLM-administered lands and 202,000 acres of

National Forest System lands would be treated with mechanical means or prescribed fire to reduce conifer encroachment. Conifer removal would facilitate GRSG population and habitat recovery through methods determined appropriate for the terrain at the site-specific level. Thus, the vegetation management tools described in the proposed plan would help to reduce encroachment and improve GRSG habitat.

The policies under the Proposed Plan would also reduce the impacts from invasive plants in these habitats compared with Alternative A, and monitoring and mitigation components of the Proposed Plan would help to ensure GRSG seasonal habitat objectives (**Tables 2-2**, **2-5** and **2-6**) are met.

The Proposed Plan would result in all areas meeting or exceeding desired conditions based on the vegetation treatment objectives. For all areas, GRSG populations should remain stable or improved, absent other factors that may not have been accounted for in the model.

Impacts from Livestock Grazing Management

Under the Proposed Plan, grazing management to achieve vegetation composition and structure consistent with ecological site potential could maintain or enhance sagebrush and perennial grass conditions in PHMA. In those areas not meeting GRSG habitat objectives, the rest and seasonal changes could improve sagebrush communities by relieving some grazing pressure. Drought management actions, such as temporary livestock removal when plants are stressed, would help to maintain desired plant communities.

Livestock resting during herbaceous plant growth would help to increase vigor of desired plants. This would provide a more resilient plant community to withstand livestock grazing pressure, when compared to Alternative A. Prioritizing permit review in SFA could improve vegetation conditions where livestock is a cause for not meeting habitat objectives.

Impacts from Fire and Fuels Management

Wildfire Management

Wildfire management will provide first for firefighter and public safety; then it will set priorities to protect communities, infrastructure, improvements, and natural and cultural resources, based on values to be protected, human health and safety, and costs. These priorities are outlined under the current Federal Wildland Fire Management Policy. As safety allows, in PHMA and GHMA unburned islands and patches of sagebrush would be retained, as well as minimizing burn-out operations in PHMA and GHMA.

Under the Proposed Plan, fewer acres of sagebrush habitat in PHMA and GHMA would be converted to an early seral stage and would have less risk for invasive grass and noxious weed invasion than under Alternative A.

As a direct result of actions, more fires would be suppressed in the surrounding vegetation communities to protect sagebrush, and fewer acres of sagebrush habitat would be lost to fire. However, indirect impacts of fire suppression could lead to a greater potential for large uncharacteristic fires in the future as a result of fire exclusion over the long term due to increases in fuel loading in PHMA and GHMA. With suppression focused on PHMA and GHMA, more acres would likely burn in areas outside of these areas. This could lead to large fires converting sagebrush habitats to early seral stage or to annual grasslands in low elevations outside PHMA and GHMA. Changes in soil, vegetation, and water properties would be more likely to occur outside of PHMA and GHMA under this alternative.

Prioritizing fire suppression through the FIAT process would help to minimize disturbance from wildfires on the sagebrush community in GRSG habitat. As wildfire disturbance is minimized in sagebrush communities, vegetation health and condition would be improved. This would also provide seeds for the future.

Requiring firefighting vehicles to be washed down before being driven onto GRSG habitat would help to prevent the introduction and spread of invasive plant species.

Fuels Management

Fuels management treatments would be prioritized close to PHMA to prevent large-scale loss of habitat. Treatment design would locate projects next to existing disturbances, such as power lines, roads, fence lines, and other disturbances where feasible. No treatments would be allowed in PHMA or GHMA if the treatment would not be beneficial to GRSG or their habitat.

Treatment types would emphasize maintaining, protecting, and expanding GRSG habitat. A full suite of integrated vegetation treatments, including chemical, mechanical, seeding, and prescribed fire treatments, would be available to enhance PHMA and restore GHMA that are currently in FRCC 2 and FRCC 3.

The use of native seed would be required for fuels management, based on availability, adaptation (site potential), and probability of success. Nonnative seeds may be used as a fire-resistant fuels treatment. In all cases, seed must be certified weed free. This alternative is more restrictive than Alternative A, but it would not likely decrease the number of acres treated overall; however, it would increase the number of acres treated in and next to PHMA and GHMA, compared to Alternative A.

The Proposed Plan would also ensure that the treatment would be beneficial to GRSG or it would not be implemented. Indirectly the fuels projects under this alternative would lead to fewer acres burned in and next to PHMA and GHMA than under Alternative A. Prioritization of fuels and post-fire stabilization and rehabilitation treatments, using the FIAT process, would increase sagebrush and perennial grass communities, especially in the warmer drier sites. Through the

FIAT process, sagebrush and perennial grass communities would likely be more resilient to disturbance and resistant to invasion by invasive annual grasses.

Impacts from Wild Horse and Burro Management

Adjustments to AML numbers could alter vegetation structure and composition by removing some of the disturbance caused by wild horse and burro movement across the landscape. In those areas on BLM-administered lands not meeting Standards for Rangeland Health, where causes are due to wild horse and burro populations, adjustments to AML could help to improve vegetation conditions.

Impacts from Climate Change Management

Under the Proposed Plan, vegetation treatments would be implemented as climate change strategies. These treatments would reduce the presence of cheatgrass; reduce conifer encroachment in priority GRSG habitat, and seed shrubs and grasses. These treatments would help to maintain or enhance vegetation that comprises GRSG habitat. Hazardous fuels treatments would be implemented with design toward improving wildlife and GRSG habitat. Vegetation conditions would be improved in moderate to high quality habitat where bioclimatic conditions are predicted to persist through 2050.

Impacts from Leasable Minerals Management

Under the Proposed Plan, there would be no surface occupancy in PHMA and controlled surface use with timing limitations in GHMA. All disturbances would have to be mitigated to a net conservation gain, and RDFs would be applied consistent with applicable law. This could reduce vegetation and soils disturbance. Mitigation to replace sagebrush and perennial grass communities would result in increased populations of desired vegetation. Exploration would be allowed as long as sagebrush species are not crushed. Seasonal restrictions on exploratory drilling would minimize vegetation and soils disturbance, also minimizing the spread and introduction of invasive species. This could maintain sagebrush health and resiliency in PHMA and GHMA.

Impacts from Salable Mineral Management

Under the Proposed Plan, PHMA would be closed to new salable minerals actions, and GHMA would be open to salable minerals. All disturbances would be required to mitigate to a net conservation gain, and RDFs would be applied consistent with applicable law. This would reduce vegetation and soils disturbance. Mitigation measures could increase sagebrush and perennial grass communities in off-site areas to compensate for permitted loss of sagebrush loss.

Impacts from Locatable Minerals Management

Under the Proposed Plan, SFA would be recommended for withdrawal, and PHMA outside of SFA and GHMA would remain open to mineral location. The proposed plan decisions on locatables are subject to valid existing rights and consistent with applicable law. The recommended withdrawal could reduce

vegetation and soils disturbance, as would applying RDFs, consistent with applicable law, in the other PHMA and GHMA. Mitigation to replace sagebrush and perennial grass communities would increase populations of desired vegetation. Mitigation measures could increase sagebrush and perennial grass communities in off-site areas to compensate for permitted loss of sagebrush.

Impacts from Land Uses and Realty Management

Under the Proposed Plan, PHMA and GHMA would be avoidance areas for major ROW actions and would remain open for minor ROWs in GHMA. This could reduce vegetation and soils disturbance. Mitigation to replace sagebrush and perennial grass communities would result in increased populations of desired vegetation. The Proposed Plan involves burying new or existing power lines where feasible, which could increase the disturbance of vegetation and soils at those microsites. Overall, this could maintain sagebrush and perennial grass communities in PHMA in the planning area. Vegetation could increase where other developments, such as fences and roads, would be reclaimed if they are no longer in use.

Impacts from Renewable Energy Management

Under the Proposed Plan, utility scale solar development would be excluded in PHMA and GHMA. Utility scale wind energy development would be excluded in PHMA and avoided in GHMA. Vegetation and soils disturbance from energy development would be minimized or eliminated in priority habitat containing sagebrush and perennial grass. Under the Proposed Plan, if wind energy development were authorized in GHMA, a net conservation gain of GRSG habitat would be required. This could reduce vegetation and soils disturbance and increase sagebrush and perennial grass. Mitigation to replace sagebrush and perennial grass would increase desired vegetation.

Impacts from Comprehensive Travel and Transportation Management

Limiting motorized travel to existing roads, primitive roads, and trails under the Proposed Plan would minimize disturbance of vegetation and soils from vehicle traffic. This would also help to minimize the introduction of invasive species. Limiting or prohibiting construction of new roads would minimize disturbance to vegetation and soils in priority habitat. Mitigation measures could increase the sagebrush and perennial grass community to offset any loss of sagebrush. Requiring certified weed-free seed for road reclamation would minimize invasive species establishment or spread.

Impacts from Recreation Management

Under the Proposed Plan, only SRPs that have neutral or beneficial impacts on PHMA and GHMA would be authorized. This could limit the disturbance to vegetation and soils in PHMA and GHMA. No new construction of recreation facilities in PHMA or GHMA would reduce human disturbance to soils and vegetation. Limited disturbance in PHMA and GHMA for construction of

recreation facilities would also help to minimize the potential for introducing and spreading invasive species.

Impacts from Adaptive Management

In general, hard trigger responses in PHMA and GHMA would result in more restrictive management of resources uses, which would lead to an overall beneficial effect on vegetation management. In PHMA and GHMA where a hard trigger has been reached, the corresponding adaptive management responses are identified in **Table 2-9** and **Table 2-10**. **Table 4-10** below describes the effects on vegetation management in the affected BSU.

Table 4-10
PHMA and GHMA Adaptive Management Effects

Program Area	Corresponding Analysis
Vegetation Management	If a soft trigger of a decline of two percent landscape sagebrush cover is reached in PHMA or GHMA of 25-65 percent landscape sagebrush cover, then those areas would be prioritized for habitat restoration and fuels reduction treatments. This, combined with the FIAT prioritization, would lead to maintained or improved sagebrush health and resilience. Other vegetation community types, such as perennial grasses and perennial forbs would likely also benefit from habitat treatments. If a hard trigger of a decline of 5 percent landscape sagebrush cover is reached in PHMA or GHMA of 25-65 percent landscape sagebrush cover or if disturbance reduces the landscape sagebrush cover below 30 percent then the areas would receive top priority for regional mitigation restoration and/or fuels treatments. This would result in limiting any further degradation to these sagebrush/perennial grass communities and then the vegetation conditions would improve due to the increased habitat restoration work. In PHMA and GHMA where landscape sagebrush cover is greater than 65 percent, the soft trigger value of 5 percent and hard trigger value of 10 percent declines would result in the same impacts mentioned above. Sagebrush and perennial grass communities would improve due to increased restoration activities. This was reviewed and analyzed in the range of alternatives (Alternatives B, D and F) in the Draft LUPA/DEIS.

4.6 RIPARIAN AREAS AND WETLANDS

This section discusses impacts on riparian areas and wetlands from existing management actions and resource uses by alternative. Refer to **Chapter 3** for a discussion of existing riparian and wetland areas in the planning area (**Section 3.4**, Riparian Areas and Wetlands).

4.6.1 Methods and Assumptions

Acres of riparian areas and wetlands were calculated from the National Wetlands Inventory database (USFWS 2013b).

Indicators

Indicators of impacts on riparian areas and wetlands are as follows:

- Amount and condition of riparian and wetland vegetation.

Assumptions

- 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.
- New invasions of noxious and invasive weeds would continue to occur and spread as a result 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.
- Ecological health and ecosystem functioning depend on a number of factors, including vegetation cover, species diversity, nutrient cycling and availability, water infiltration and availability and percent cover of weeds.
- Short-term effects on riparian and wetland vegetation would occur over a time frame of two years or less and long-term effects would occur over longer than two years.
- The terms Riparian Areas and Wetlands are used interchangeably and may refer to such habitat types as seeps, springs, streams, spring-brooks, and mesic, dry and/or wet meadows. Riparian areas and wetlands in PHMA and GHMA in the sub-region are estimated to total 48,700 acres (USFWS 2013b) (note; this figure likely underestimates total riparian-wetland acres in sub-region). Some alternatives, especially Alternative C, may result in an increase in this acreage. All alternatives would result in an improvement in both condition and trend of riparian areas over time. Improvement in riparian habitat conditions is assumed to be lowest for Alternative A and highest for Alternatives C and F.

4.6.2 Nature and Type of Effects

Type of effects of land uses or management actions on riparian areas and wetlands can include direct, indirect and cumulative effects (refer to **Section 5.5**, Riparian and Wetland Resources, for a discussion of cumulative impacts on riparian areas). Direct effects typically include compaction of soils and loss or alteration of riparian plants and riparian plant communities. Indirect effects are often the result of actions implemented for reasons other than management of riparian habitats but result in impacts on riparian habitats. The nature of these effects can vary from negligible to substantial depending on time frames, condition of the riparian system and types of land or resource uses. Generally effects which are chronic in nature and occur over long period are more

significant to riparian resources than effects that are short term and temporary. Riparian and wetland plant communities are typically more resilient than uplands to minor or temporary disturbances because of the availability of moisture and a longer growing season. More information on the nature and types of effects from land uses and management actions on riparian areas and wetlands analysis is presented below.

Impacts from GRSG Management

Short- and long-term direct and indirect effects on riparian areas and wetlands as a result of GRSG management efforts in the planning area are positive. Priority riparian habitats including areas important for late brood rearing would be targeted for improvement through efforts to improve GRSG habitat. Improvement of riparian areas and wetlands would be included as an important consideration in implementing changes in livestock grazing practices, prioritizing wild horse gathers, developing restoration projects, prioritizing weed treatments and adopting mitigation and avoidance measures for surface-disturbing activities in areas of GRSG habitat. Efforts to manage GRSG would also result in increased focus on inventory and assessment of priority riparian areas leading to identification of opportunities to enhance or protect these areas.

Impacts from Riparian Areas and Wetlands Management

Riparian management results in positive direct and indirect effects on riparian areas and wetlands over both the short term and long term. Direct effects include restoration and enhancement of riparian habitats, while indirect effects can include restoration, management or enhancement of surrounding uplands or of watersheds in general. Many programs including range, wildlife (including special status species), wild horses and burros, vegetation (including restoration, fuels, weeds) and fire (including burned area rehabilitation and prescribed burning) are designed to improve overall health and resiliency of rangeland habitat often resulting in long-term direct or indirect benefit to riparian areas. In the case of locatable, salable and leasable minerals, management of riparian areas often includes incorporating measures such as avoidance, use of best management practices and mitigation into permitting documents to reduce or eliminate impacts.

Impacts from Water Resources Management

Water management can have both positive and negative direct and indirect effects on riparian areas and wetlands. Generally, these effects are long term. BLM and the Forest Service typically manage water resources indirectly through practices which promote watershed health or through permitting activities which provide direction on activities affecting water use such as mine dewatering, energy development or construction of range improvements. Generally, watershed management practices which increase health of vegetation communities (both upland and riparian) have a direct or indirect long-term positive effect on riparian areas and wetlands. Functional watersheds stabilize

soil and reduce erosion; provide resiliency against disturbance including wildfire, weed infestations and grazing; capture and store water; and, provide a filtering mechanism for pollutants (See **Section 3.15**, Water Resources).

Negative direct and indirect effects on riparian areas from water management activities associated with mining operations, spring developments or other land uses can include loss of vegetation and soil and loss or diversion of surface or subsurface flows. In some cases, these impacts are mitigated by enhancing or protecting riparian areas and wetlands in other locations. State of Nevada regulations also require users of surface water to provide access to wildlife, thus reducing impacts of permitted diversion projects.

Impacts from Vegetation and Soils Management

Impacts on riparian areas are often indirect and include overall improvement of rangelands and watersheds (refer to above discussion on benefits of functional watersheds). In the case of weed control, impacts can be direct and positive where removal of invasive plants can result in establishment and expansion of riparian and wetland plant species. Direct positive impacts on riparian areas can also occur where vegetation management practices include reseeding of burned or disturbed floodplains. Generally, these impacts are long term.

Impacts from Livestock Grazing Management

Livestock management is probably the single most important factor affecting riparian areas and wetlands in the sub-region. This is because livestock grazing is so widespread and livestock are highly attracted to riparian areas. Although they comprise only a small percent of the total planning area, riparian habitats often are the only sources of succulent forage and water once uplands dry out. The detrimental effects of poor livestock grazing practices on riparian areas are well documented (refer to **Section 3.4**, Riparian Areas and Wetlands).

Direct and indirect effects on riparian areas and wetlands from managed livestock grazing are generally positive. Managed grazing can directly benefit riparian systems by reducing those impacts from grazing that are considered detrimental to proper functioning of riparian ecosystems (see **Section 3.4**, Riparian Areas and Wetlands). More important, managed grazing benefits riparian areas and wetlands by allowing riparian plant communities to become established and grow (Myers 1989).

Effective livestock management for riparian areas typically includes a reduction in frequency and duration of hot season grazing. Uplands becoming dry and temperature warming have the effect of concentrating livestock on riparian areas, often causing overuse of riparian plant species and trampling and compacting riparian soils. By reducing the duration of livestock grazing in riparian areas, growth and establishment of riparian species typically increases.

How much and what type of vegetation exists on a site determines how well the riparian system performs its functions of reducing flow velocity, sediment

trapping, bank building, and erosion protection (Ehrhart and Hansen 1998). Where functionality of riparian systems depends on riparian and wetland plants, properly managed grazing would help to ensure long-term health and sustainability of the riparian-wetland resource. Healthy riparian systems are resilient to such disturbances as floods, droughts, and wildfires (Prichard et al. 1999; Dalldorf et al. 2013; Chaney et al. 1993).

Numerous strategies to improve stream and riparian habitat through proper management of livestock have been developed and implemented on western rangelands in recent decades. Strategies range from fencing and removing riparian areas from adjoining grazed uplands to establishing limits on streambank trampling and riparian plant use. Another strategy is to develop prescriptive grazing protocols to reduce the duration and frequency of hot season use (Wyman et al. 2006; Chaney et al. 1993; Clary and Webster 1989). Such techniques as riding and herding, using supplements, and constructing water developments are also commonly applied separately or in conjunction with grazing systems to reduce livestock use of riparian areas (Wyman et al. 2006). The importance of incorporating an adaptive approach to riparian grazing management is gaining recognition.

Several common themes emerge from the literature addressing livestock grazing management for riparian areas, as follows:

- Riparian areas should be managed in conjunction with surrounding uplands (Wyman et al. 2006; Chaney et al. 1993). Healthy riparian systems are a function of healthy watersheds.
- Merely reducing stocking rates rarely solves problems until other factors, such as season of use, are addressed (Wyman et al. 2006; Leonard et al. 1997).
- Developing riparian grazing strategies is often highly site specific, and there are no one size fits all solutions (Wyman et al. 2006; Leonard et al. 1997).
- Most successful riparian grazing systems are based on reducing frequency and duration of hot season grazing over time (Wyman et al. 2006; Chaney et al. 1993; Ehrhart and Hansen 1997; Dalldorf et al. 2013; Elmore and Kauffman 1994).
- Understanding and incorporating livestock management goals into the development of a riparian grazing system is important to success (Wyman et al. 2006; Ehrhart and Hansen 1997).

Range improvements associated with livestock management, including constructing water developments and fences, can have both direct and indirect short- and long-term impacts on riparian areas and wetlands. Water developments can indirectly benefit riparian and wetland areas by providing off-site water sources for livestock, thus reducing use of riparian areas. Similarly,

fencing provides a means for control and management of livestock, allowing for growth and establishment of riparian plants.

Negative effects can occur when water developments affect hydrologic function of springs or other riparian areas by interrupting normal flow patterns (generally, direct impacts from fences on riparian areas are minor). Although new range improvements are implemented through the NEPA process and typically include measures to avoid or eliminate adverse impacts, many older developments in PHMA and GHMA in the sub-region were poorly constructed or are in various stages of disrepair. Consequently, many of these older developments are acting to drain water away from spring sources or otherwise adversely affecting the ability of the riparian system to function properly.

Impacts from Fire and Fuels Management

Direct and indirect effects on riparian areas and wetlands from fire and fuels management are generally positive. Treatments including reseeding of burned drainage bottoms or reducing of heavy fuel loads adjacent to riparian areas represents a direct benefit. Management that targets protection or enhancement of surrounding watersheds through reseeding, prescribed fire or through application of mechanical or chemical fuel treatments represents an indirect benefit. Both direct and indirect effects from fire and fuels management are generally long term.

Impacts from Wild Horse and Burro Management

Direct and indirect impacts on riparian areas and wetlands from management of wild horses and burros are positive. By managing wild horse and burro populations for other multiples uses and for a "thriving ecological balance" impacts in the form of trampling and overuse of vegetation on both uplands and riparian areas are reduced. Management of wild horses and burros at or below AMLs also provides an indirect benefit to riparian areas and wetlands when conflicts with livestock management fences are reduced. These impacts are long term.

Impacts from Climate Change Including Management

The direct and indirect effects of climate change on riparian areas and wetlands are assumed to be negative. Increased ambient and water temperatures, changes in flow regimes and reduced stream flows can negatively affect riparian ecosystems (See **Section 3.22**, Climate Change). Efforts to mitigate these effects through proactive strategies to address climate change would provide an indirect benefit to riparian areas. Negative effects are long term.

Impacts from Leasable Minerals Management

Direct, indirect, and cumulative impacts associated with oil and gas exploration as well as construction and maintenance of facilities and supporting infrastructure can cause short- and long-term impacts on riparian areas and wetlands. The nature and type of effects are typically project specific and depend on the degree to which impacts can be avoided or mitigated. In recent

environmental analyses of oil and gas leases and/or actual projects for lands in the planning area, the following potential impacts on riparian habitats were identified: loss or alteration of riparian and wetland vegetation; accelerated erosion; degradation of water quality from spills or leaking of hazardous substances as well as from increases in sediment loading; increased invasions of weedy plant species into riparian areas; increased flooding and erosion as a result of culvert placement in wetlands; loss or alteration of wetland function and hydrology; alteration of biological and chemical functions of wetland soils; dewatering of springs and/or riparian or hydric soils; and, loss in habitat quality for fish and wildlife (BLM 2012t; BLM 2005e; DOE 2011).

Management includes closing areas to surface occupancy and providing for stipulations that reduce disturbance of riparian areas and wetlands. Areas closed to surface occupancy include wilderness, wilderness study areas, and special recreation management areas. Stipulations to protect riparian areas or mitigate impacts are incorporated into leases through the NEPA process.

Impacts on riparian areas and wetlands from geothermal energy development are mostly the same as those described for other fluid minerals. However, water management activities from geothermal development including injection can also alter temperatures or chemistry of the ground water and any associated hot springs or seeps. Stipulations to protect riparian areas or mitigate impacts are incorporated into leases through the NEPA process.

Impacts from Locatable Management

For locatable minerals, all PHMA and GHMA in the planning area (excluding limited areas withdrawn or petitioned for withdrawal) are open to mineral exploration and development under the 1872 Mining Law. The alternative decisions would apply to locatable minerals subject to valid existing rights and consistent with applicable law. Direct and indirect impacts on riparian areas and wetlands would be similar to those described for Leasable Minerals Management (with the exception of those impacts specific to oil and gas development). Requirements to prevent undue or unnecessary degradation allow for development of measures to avoid or mitigate impacts through Notices of Intent and Plans of Operation. Mitigation measures which include projects or funds to enhance and protect riparian habitats can have positive direct and indirect impacts.

Impacts from Salable Minerals Management

Surface disturbance as well as construction and maintenance of roads associated with salable minerals management has the potential to impact riparian areas and wetlands. Loss of vegetation, soil compaction and sediment from roads can cause direct, indirect and cumulative impacts on riparian areas and wetlands. Impacts can be short or long-term. Measures to reduce or avoid impacts are developed through the permitting process.

Impacts from Land Uses and Realty Management

Establishment of rights of way exclusion or avoidance areas provides an indirect positive benefit to riparian and wetland habitats by protecting these areas from disturbance. Retention of lands in public ownership also provides an indirect positive benefit since further use or development of these areas would be subject to environmental review. These impacts are long term.

Impacts from Comprehensive Travel and Transportation Management

Area designations of closed or limited to off-highway vehicle use represent indirect positive effects on riparian areas and wetlands, while a designation of open represents a negative long-term effect. Impacts on riparian areas from both highway vehicles and OHVs are variable and depend on the frequency of use, soil/substrate present, and transportation route design/construction. Where proper crossings have been installed (e.g., properly sized culverts, bridges, and rock crossings) or where substrate is durable, transportation impacts may be negligible. Where vehicle use crosses finer sediments without proper armoring, compaction and rutting can occur. Roads in general can alter surface flows and accelerate erosion through loss of vegetation which leads to loss of water tables and further loss of riparian vegetation (See **Section 3.4**, Riparian Areas and Wetlands).

Impacts from Recreation Management

Although impacts from recreation on riparian areas and wetlands including trampling and compaction and loss of soil and vegetation negatively affect riparian areas, managed recreation can directly or indirectly benefit riparian resources. Mitigation or avoidance of impacts through the process of issuing Special Recreational Use (SRU) permits or through the management of recreational use can result in protection of riparian areas and wetlands from human caused disturbance over the long term.

Impacts from Special Designations Management

Special designations of WSAs, ACECs, RNAs, NHTs, WSRs, NCAs, and Wilderness indirectly benefits riparian areas and wetlands. These designations all include restrictions on surfaces use which would result in protection of associated riparian habitats over the long term.

4.6.3 Impacts Common to All Alternatives

All alternatives have at least some provisions that would directly and indirectly benefit riparian areas and wetlands over the long term.

Resource and Land Uses Not Considered Further

Wind and solar energy development and conifer removal create few impacts because this type of development does not generally occur in riparian areas or wetlands. Because sites for wind and solar energy development do not typically include drainage bottoms, wetlands or other low lying areas, impacts on riparian habitats from these land uses are typically negligible. Although removal of conifers can increase water yields indirectly benefiting riparian resources,

generally conifer removal treatments are intended to improve upland habitats for GRSG or other species.

4.6.4 Alternative A

Riparian areas and wetlands throughout the planning area currently receive consideration and/or protection under a number of program allocations. Where applicable, most programs include provisions for either restoring or enhancing priority riparian habitats or for minimizing disturbance and/or mitigating impacts. Effectiveness of current management strategies on condition and trend of riparian areas and wetlands across the planning area has been variable (refer to Section 3.4, Riparian Areas and Wetlands).

Impacts from GRSG Management

Although management of the GRSG is not consistently provided for in existing LUPs across the sub-region, the delineation of PMUs in Nevada and Northeastern California and the development of local working groups would focus management and monitoring efforts on PHMA, including riparian areas. Condition and trend of important riparian areas and wetlands in PMUs would likely improve under this alternative.

Impacts from Riparian Areas and Wetlands Management

All LUPs in the sub-region recognize importance of riparian areas and wetlands and include guidance for protection or enhancement of this resource in PHMA and GHMA. Priority riparian habitats are targeted for improvement while impacts on riparian areas as a result of management actions or authorizations are considered through the NEPA process. Many livestock grazing systems developed through the permit renewal process and through assessments of rangeland health are focused on improving riparian habitat conditions. In some cases, mitigation programs developed for land uses such as mining have resulted in restoration of thousands of acres of riparian areas and wetlands in PHMA and GHMA.

Condition and trend data for riparian and wetland habitats in the planning area suggest existing programs which directly or indirectly provide for riparian area management are only partially effective (see **Section 3.4**, Riparian Areas and Wetlands). Generally, restoration efforts have been focused on priority streams habitats, especially those supporting fisheries. Although highly important to GRSG, lentic riparian areas have received less focus likely because they are small in size, widespread and more difficult to manage. Under this alternative, condition and trend of riparian areas and wetlands in PHMA or GHMA is likely to improve but progress may not be consistent across the planning area.

Impacts from Water Resources Management

Under Alternative A, the BLM and the Forest Service would continue to manage programs allocations including fire and fuels, vegetation, livestock, and wild horse and burros for improved watershed health and function throughout the planning area. Where management actions are effective, condition and trend of

riparian areas and wetlands would continue to improve over time throughout the sub-region. Where land uses such as mining, energy, realty and other programs impact water resources, stipulations or mitigation measures developed through the NEPA process would continue to reduce or mitigate impacts on priority riparian habitats.

Impacts from Vegetation and Soils Management

Under Alternative A, vegetation and soils would continue to be managed under the Integrated Vegetation Management policies. These policies and standards include strategies for control of invasive plants as well as application of vegetation and fuels treatments to restore ecological structure and function. Where these policies are applied, condition and trend of riparian areas and wetlands would be maintained or improved in the planning area. Control of invasive plants occurs on uplands and riparian areas, creating both direct and indirect positive impacts on riparian habitats. Where invasive plants are controlled, native communities tend to be more stable and resilient. Vegetation treatments are typically applied to uplands, creating indirect benefits to riparian areas by improving overall watershed health and function.

Impacts from Livestock Grazing Management

All districts and offices on BLM-administered lands in the sub-regional decision area are subject to meeting the standards for rangeland health, including the standard that riparian and wetland sites exhibit PFC and achieve state water quality criteria. On National Forest System lands, riparian areas are managed through a combination of utilization standards and design features discussed and documented each year in the Annual Operating Instructions as well as response to direction found in Allotment Management Plans. Functional condition of riparian areas and wetlands are considered in the development of riparian utilization standards. Partnerships involving restoration of intermingled public and private lands are increasingly being implemented in PHMA and GHMA throughout the sub-region. These collaborative watershed restoration efforts are improving many miles and acres of lotic and lentic riparian habitats in GRSG habitat. Flexibility in designing and implementing prescriptive riparian grazing management is a key factor in the success of these collaborative efforts.

Under Alternative A, there are no fallback standards[1] in PHMA and GHMA. This situation likely contributes to variable success in meeting goals for riparian areas across the planning area (see **Section 3.4**, Riparian Areas and Wetlands).

Range improvements which are properly constructed and analyzed would continue to improve condition and trend of riparian habitats in PHMA and GHMA in the sub-region through better distribution and management of livestock. However, there are no requirements for remediating older developments that may be draining spring sources or otherwise damaging

[1]Standards applied when other approaches to grazing management have not been effective

riparian areas. The condition and trend of riparian areas and wetlands affected by nonfunctional or poorly designed developments would likely stay the same or would continue to decline.

Based on the above discussion, the condition and trend of riparian areas and wetlands in PHMA and GHMA is likely to improve in portions, but not all, of the sub-region.

Impacts from Fire and Fuels Management

Under current strategies and policies for management of fires and fuels, condition and trend of riparian areas and wetlands in the planning area would either be maintained or improved. Riparian habitats would remain intact where suppression efforts successfully limited loss of riparian communities to fire (although this effect could be temporary if suppression led to higher fuel loads and more intense fire in future years). Fuels treatments would provide direct and indirect benefits to priority riparian areas by limiting frequency and intensity of fires in both uplands and in riparian habitats in the planning area.

It is important to note that most LUPs do not include provisions for managing fire and fuels to protect GRSG habitat. Although existing fire and fuels management programs may benefit riparian areas in general, important riparian habitats located in PHMA and GHMA may not receive priority consideration for either suppression or fuels management in comparison to other areas.

Impacts from Wild Horse and Burro Management

Where wild horse and burro populations are managed at or below AMLs, condition and trend of riparian habitats in PHMA and GHMA would be maintained or improved. Fewer numbers of horses would allow for recovery of riparian plant communities impacted from grazing and trampling by wild horses, while conflicts with fences important for the control and management of livestock would decrease. Where numbers of wild horses are in excess of AMLs, condition and trend of riparian habitats (especially lentic riparian areas) would decline as a result of trampling and compaction. Conflicts with livestock management fences would also increase potentially contributing to unauthorized use by livestock in priority riparian areas and wetlands.

Impacts from Climate Change Management

Although there are no specific provisions for management of climate change in LUPs in the sub-region, climate management as it relates to riparian areas and wetlands in PHMA and GHMA would likely be addressed through efforts to improve watershed function and health. These actions would result in improved condition and trend of riparian areas and wetlands in GRSG habitat.

Impacts from Leasable Minerals Management

Riparian areas and wetlands could potentially be impacted from activities associated with leasing of fluid minerals over the majority of the planning area including PHMA and GHMA. Exceptions to this could occur with newer LUPs

which contain some provisions for modifying or waiving lease stipulations in cases where the resource either does not exist or where some type of mitigation can protect the resource. Otherwise, stipulations added to leases would reduce adverse direct and indirect impacts on riparian habitats from vegetation and soil loss. Impacts from geothermal energy development would be the same as for other fluid minerals.

Impacts from Locatable Management

Under Alternative A, riparian areas and wetlands throughout GRSG habitat are subject to impacts from locatable minerals management with limited exceptions (exceptions include areas either withdrawn or segregated from mineral entry). The requirement for BLM and the Forest Service to prevent undue and unnecessary degradation results in impacts on riparian areas being reduced, avoided, or mitigated where possible and feasible.

Salable Minerals Management

The majority of PHMA and GHMA in the planning area is open to salable minerals management with few exceptions (these include areas with special designations or administrative needs). Measures developed through the NEPA process would reduce, avoid, or mitigate impacts on riparian areas and wetlands as applicable.

Impacts from Land Uses and Realty Management

Under Alternative A, ROW/SUA avoidance and exclusion areas make up a relatively small percent of PHMA or PGMA in the planning area. Consequently, only limited areas of wetland and riparian habitats are protected from disturbance. Important wildlife habitats, including riparian areas, are generally not identified for disposal under Alternative A resulting in a level of protection for these areas.

Impacts from Renewable Energy Management

Impacts on riparian areas and wetlands from renewable energy management are considered negligible (see Assumptions, Section 4.6.3, Impacts Common to All Alternatives).

Impacts from Comprehensive Travel and Transportation Management

Impacts on riparian areas and wetlands from CTTM under Alternative A would be mostly negative since the majority of PHMA and GHMA is designated as open. Disturbance from roads and OHV travel can cause accelerated erosion and loss of plant cover creating both direct and indirect adverse impacts on riparian habitats. Where more restrictive designations have been established under newer plans or on Forest Service-administered lands, impacts on riparian areas would be reduced or eliminated.

Impacts from Recreation Management

Impacts on riparian areas and wetlands from CTTM under Alternative A would be mostly negative since the majority of PHMA and GHMA in the sub-region is

open to recreation with few restrictions. Human caused disturbance can create both direct and indirect adverse impacts on riparian areas as a result of loss of plant cover, soil compaction and increased erosion. Stipulations added to SRU permits may reduce impacts on riparian habitats.

4.6.5 Alternative B

Alternative B would reduce land disturbances in GRSG habitat and would result in fewer impacts on riparian areas and wetlands associated with a particular use compared with Alternative A.

Impacts from GRSG Management

Under Alternative B, comprehensive measures to reduce land disturbance in priority GRSG habitats would greatly reduce potential for disturbance to riparian areas and wetlands in the planning area. These measures including closing or withdrawing large areas of priority GRSG habitats to both leasable and locatable minerals exploration and development, adding stipulations to GHMA for most minerals programs, establishment of ROW avoidance areas, limiting travel, requiring RDFs(consistent with applicable law) for PHMA and retaining GRSG habitat in public ownership would benefit riparian areas and wetlands in comparison to Alternative A. Collectively, these measures would reduce direct and indirect adverse impacts on riparian areas from soil and vegetation loss, soil compaction, accelerated erosion and invasive plant infestations. Retention of priority riparian habitats in public ownership would also preclude opportunities for future development of these important areas.

Under Alternative B, GRSG habitats would also receive greater focus and prioritization for livestock and for wild horse and burro management and for application of ecological restoration practices compared to Alternative A. As a result, direct and indirect adverse impacts from livestock and wild horses and burros would be reduced, while more acres of priority riparian habitats would be enhanced in comparison to Alternative A.

Impacts from Water Resources Management

In comparison to Alternative A, condition and trend or riparian areas and wetlands would improve over some, but not all of the planning area under Alternative B. Water resources would be managed through a combination of ecological restoration, imposing restrictions on new water developments and on modification of old developments.

Actions which promote restoration and function of sagebrush communities would reduce sediment loading, increase water retention and improve site resiliency, while modification of existing water developments would allow for recovery of impaired systems (refer to discussion of Impacts from Water Resources Management, Nature and Types of Effects, Riparian Areas and Wetlands, **Section 4.6.2**). Where authorizations for new water developments would be limited in PHMA and GHMA, direct impacts on riparian areas from disturbance would be reduced. However, indirect adverse impacts on riparian

habitats could also occur if use of water developments as a tool to manage livestock grazing were more limited compared to Alternative A (refer to discussion under Livestock Management, this section).

Impacts from Vegetation and Soils Management

Under Alternative B, restoration efforts including reestablishment of native plants communities as well as development of post-restoration management plans would be prioritized in priority GRSG habitats including riparian areas used for brood rearing. Increased emphasis on improvement and maintenance of important seasonal habitats would result in more positive impacts on riparian areas and wetlands in comparison to Alternative A. Under this Alternative, condition and trend of riparian habitats would improve in compared to Alternative A.

Impacts from Riparian Areas and Wetland Management

Under Alternative B, riparian areas and wetlands in priority GRSG habitat are managed for functionality with an emphasis on perennial forbs, diverse species richness and edge relative to ecological site potential. Management is primarily through application of techniques to reduce hot season grazing by livestock. New water developments are only authorized if they can demonstrate overall beneficial effects on GRSG, while existing developments would be modified where necessary to create beneficial or neutral effects. With some qualifications (see discussion below), these actions would likely result in more acres of riparian areas and wetlands being improved under Alternative B compared to Alternative A.

Riparian Management Objectives

The relationship between managing for plant species richness and functionality and/or reference state vegetation in riparian areas is not clear cut and deserves further discussion. Without additional clarification, these concepts could be construed to be supportive of managing for degraded riparian and wetland habitats, especially on drier sites or in drier regions such as the Great Basin.

As a general concept, plant species diversity and richness in riparian areas often increases along an elevational gradient from wet to dry (Dwire et al. 2004). As habitat conditions improve and/or as soil moisture increases, riparian and wetland plant communities can become increasingly dominated by grasses and grass-like species suited to higher water tables in place of plants (including many species of forbs) which are adapted to drier conditions (Hough-Snee et al. 2013, Dwire et al. 2006, Weixelman et al. 1997, Green and Kauffman 1995).

Livestock grazing can play a role in site degradation and in shifts in plant communities on meadows, especially where grazing practices have led to channel incision and a lowering of the water table. Site degradation as a result of livestock grazing practices was found to cause a shift from a grass dominated state to a grass/forb/shrub state for meadow sites in Central Nevada (Weixelman et al. 1997). On dry and moist meadows in Northeastern Oregon,

species richness and species diversity was higher for grazed sites compared to ungrazed sites (Green and Kauffman 1995).

Ironically, some or all of the three forb species most preferred by broods on meadows in Nevada in late summer (common dandelion, western aster and yarrow) (Savage 1969, Oakleaf 1971, Evans 1986) tend to increase with disturbance from livestock grazing (Weixelman et al. 1997, Neel 1980, Evans 1986, Howell 2014). Note that a preference for these and other tap rooted composite forbs may be explained in part by environmental changes at a larger scale (refer to GRSG, Nature and Type of Effects, Livestock Grazing, **Section 4.4.2)**.

Under Alternative B, objectives for managing riparian and wetland communities for ecological site potential as well as PFC may help to address some of the complexities inherent in management of riparian ecosystems. Development of ecological site descriptions (ESDs) for riparian areas will help to clarify relationships between plant species richness and diversity and reference states. Although ESDs for lentic areas are in the development phase, draft guidelines for lotic areas have been issued by the NRCS (USDA NRCS 2011). Managing riparian areas for proper functioning condition can result in elevated water tables (Prichard et al. 1998) conceivably increasing species richness and diversity by rehydrating terraces and increasing transitional vegetation (White Horse Associates 2011) and similarly, by expanding the area between the stream edge and floodplain terrace (Dwire et al. 2004).

Other Management Actions

Generally, other actions proposed under Alternative B for water resources and for livestock grazing would benefit riparian areas and wetlands in GRSG habitat. Actions which promote restoration and function of sagebrush communities would reduce sediment loading, increase water retention and improve site resiliency, while modification of existing water developments would allow for recovery of impaired systems (refer to discussion under Water Resources, this section). Although restrictions on new developments in GRSG habitat would limit disturbance to riparian habitats, adverse indirect impacts could occur if opportunities to implement better livestock grazing management practices were reduced (refer to discussion under Livestock Management, this section).

Impacts from Livestock Grazing Management

Livestock grazing would continue to be managed under existing policies and regulations as described under Alternative A for both the BLM and the Forest Service. Riparian areas and wetlands, including wet meadows, are being managed for PFC and good ecological conditions on both BLM-administered and National Forest System lands. In addition, no additional acres would be closed to livestock grazing in PHMA and GHMA. Recommendations for changing livestock grazing practices to meet GRSG habitat needs are the same as those currently provided for under Alternative A (and as discussed under Riparian Areas and

Wetlands, Nature and Type of Effects, **Section 4.6.2**). Generally, these include implementing changes in timing and intensity of use, numbers, and distribution of livestock and change in class of livestock.

Differences between Alternative B and Alternative A relative to riparian areas are focused on integrating GRSG needs into grazing plans, term grazing permits, land health assessments, and drought condition evaluations. Emphasis is also placed on integrating private lands into the planning process.

Management actions under Alternative B would establish specific objectives for riparian areas and wetlands based on ecological site descriptions and identified GRSG habitat needs (refer to discussion under Riparian Areas and Wetlands Management, this section). By better integrating GRSG habitat needs into livestock management, the condition and trend of riparian areas and wetlands would improve in comparison to Alternative A.

Direct and indirect effects on riparian areas and wetlands from managed livestock grazing are generally positive. Managed grazing benefits riparian areas and wetlands by allowing for recovery of riparian ecosystems (refer to the discussion of this subject under *Nature and Type of Effects, Livestock Grazing Management*, this chapter).

Alternative B would also differ from Alternate A in regard to range improvements. New water developments in PHMA would be allowed only if the project benefited GRSG (no changes in requirements are proposed for GHMA). Alternative B would also provide for evaluating and modifying water developments to benefit GRSG. Currently, there are no specific requirements to identify and remediate poorly designed or constructed developments that may be impairing riparian and wetland habitats.

Where authorizations for new water developments would be limited in PHMA and GHMA, direct impacts on riparian areas from disturbance would be reduced. However, improvements in water distribution are often critical to successful livestock grazing systems (Ehrhart and Hansen 1997). A lack of alternative water sources can cause concentrated use of remaining sources, while a lack of water on uplands can limit opportunities for rotational or prescriptive grazing practices. Concentrated livestock use of small riparian areas increases trampling, soil compaction, and loss of plant cover. Grazing systems characterized by poor livestock distribution or by similar patterns of use over time are often associated with poor riparian habitat conditions, especially if grazing occurs every year during the hot season (Wyman et al. 2006).

In summary, condition and trend of riparian areas and wetlands in PHMA and GHMA is expected to improve under Alternative B in comparison to Alternative A. This would be a result of an increased focus on managing livestock grazing in late brood-rearing habitat. Proposed changes for range improvements under Alternative B would also benefit riparian areas and

wetlands, with the exception that restrictions on new water developments in PHMA could reduce opportunities for better control and management of livestock.

Impacts from Fire and Fuels Management

Under Alternative B, comprehensive actions to prioritize suppression, fuels management and restoration activities in GRSG habitat would result in more acres of riparian areas and wetlands being improved or maintained in comparison to Alternative A. Hazardous fuels treatments would result in an overall decrease in wildland fire potential, therefore decreasing impacts on riparian resources. Enhanced suppression activities would also reduce opportunities for catastrophic fire and direct loss of riparian plant communities. Where post-fire management addressed restoration of healthy plant communities, both direct and indirect impacts on riparian habitats would be positive. Sediment input would be reduced while there would less opportunity for infestations of invasive plants.

Impacts from Wild Horse and Burro Management

Under Alternative B, impacts on riparian areas and wetlands in GRSG habitat would be less than for Alternative A. Although areas managed for wild horse and burros (HMAs and WHBTs) would continue to be managed to meet AML, gathers would be prioritized in PHMA (where feasible) and GRSG habitat objectives would be incorporated into BLM HMAs and Forest Service territories. Any structural improvements proposed for horses including water developments would be subject to consideration of impacts on GRSG. Prioritization of gathers in PHMA and consideration of water development impacts would reduce impacts on riparian habitats from vegetation removal, trampling and soil compaction.

Impacts from Climate Change Management

Impacts on riparian areas and wetlands from climate change management would be the same as for Alternative A.

Impacts from Leasable Minerals Management

Closure of over nine million acres of PHMA in the planning area to exploration and development associated with leasing would substantially reduce direct and indirect adverse impacts on riparian areas and wetlands in priority GRSG habitat in compared to Alternative A. Fewer acres of riparian areas and wetlands in the planning area would be impacted by loss of vegetation, soil compaction and accelerated erosion. Incorporation of RDFs into the planning and permitting process, consistent with applicable law, for leasable minerals management in PHMA and GHMA would further reduce potential for impacts associated with disturbance compared to Alternative A.

Impacts from Locatable Minerals Management

Under Alternative B, over nine million acres of PHMA would be recommended for withdrawal from mineral entry. Impacts on riparian areas and wetlands from

locatable minerals management under Alternative B would be similar to those described above for Leasable Minerals Management. RDFs, consistent with applicable law, would be applied to PHMA. Although RDFs would similarly limit disturbance from activities associated with both leasable and locatable minerals management, RDFs would only apply where consistent with applicable law.). Overall however, fewer acres of riparian areas and wetlands in the planning area would be impacted by disturbance from locatable mineral management in comparison to Alternative A.

Impacts from Salable Minerals Management

Under Alternative B, nine million acres of riparian acres and wetlands in PHMA would be closed to minerals disposal. Impacts on riparian areas and wetlands from salable minerals management under Alternative B would be similar to those described above for Leasable Minerals Management.

Impacts from Land Uses and Realty Management

Under Alternative B, actions including managing PHMA and GHMA for exclusion and avoidance, respectively; incorporating RDFs consistent with applicable law into existing land uses in both PHMA and GHMA; and, retaining all PHMA in public ownership would benefit more acres of riparian habitat in comparison to Alternative A. Fewer riparian areas would be directly or indirectly affected by disturbance from soil and vegetation loss, soil compaction and accelerated runoff. Where RDFs included incorporation of GRSG habitat needs into reclamation, riparian areas and wetlands would benefit from more stable and resilient plant communities. Under Alternative B, more acres of priority riparian habitats would also be protected from potential alteration associated with disposals.

Impacts from Comprehensive Travel and Transportation Management

Under Alternative B, GRSG habitat would either be closed to motorized travel (PHMA) or would be open but with limitations (GHMA) that require staying on existing roads and trails. Incorporation of RDFs consistent with applicable law, especially as they relate to road construction and use, would also limit disturbance in GRSG habitat.

In comparison to Alternative A, more acres of riparian areas and wetlands in the planning area would be protected from disturbance associated with travel and transportation management under Alternative B. Reduced vehicle use, combined with application of RDFs consistent with applicable law, would result in fewer direct and indirect adverse impacts on riparian habitats from vegetation loss, soil compaction, increased infestations of invasive plants and accelerated rates of erosion.

Impacts from Recreation Management

Although management under Alternative B would not close any areas to recreation activities, it does specify that any SRPs must have a neutral or beneficial effect on PHMA. In comparison to Alternative A, fewer acres of

riparian areas and wetlands would potentially be adversely affected by activities associated with SRPs. Beneficial impacts could also occur, although these are not specified and would likely be minor.

4.6.6 Alternative C

Alternative C would greatly reduce land disturbances resulting in fewer adverse impacts on riparian areas and wetlands associated with a particular use in comparison to Alternative A. Although a proposed ACEC designation overlays PHMA (as displayed in Alternative B), the allocations would be the same for both PHMA and the ACEC. Therefore, the proposed ACEC designation would have no additional effect or impact on GRSG or riparian areas and wetlands and will not be considered further.

Impacts from GRSG Management

Alternative C provides for extensive protection of GRSG habitat (including both PHMA and GHMA) through large-scale restrictions on livestock grazing, mining, and energy development. Removing infrastructure such as fences and water developments and restoring uplands is also proposed. Collectively, these measures would improve riparian habitats through natural healing and by reducing disturbance over a broad area. Compared with Alternative A, Alternative C would result in greater improvement in condition and trend of riparian areas and wetlands in the planning area.

Impacts from Riparian Areas and Wetland Management

Under this alternative, management of riparian areas and wetlands would be primarily addressed through changes in livestock management including closing PHMA to grazing and establishing forage utilization limits in areas open to livestock. In areas closed to livestock, passive restoration (natural healing) is proposed for riparian habitats.

Under Alternative B, large scale changes to livestock grazing management in GRSG habitat would improve condition and trend of riparian areas and wetlands in the planning area compared to Alternative A. Especially where annual hot season grazing by livestock in riparian areas is eliminated or reduced, riparian habitat conditions would improve (refer to discussion of Livestock Grazing Alternative C, this section).

Additional measures proposed under Alternative C including removing water developments, focusing risk assessments on seeps, springs and drainages and restricting ground disturbance in priority GRSG habitat would collectively benefit riparian areas compared to Alternative A. Where hydrologic functions are impaired by old developments, habitat conditions would recover while fewer acres of riparian areas would be impacted by disturbance. Increased focus on riparian habitats in general would also likely lead to more opportunities for improvement of these areas.

Impacts from Water Resources Management

Condition and trend of riparian areas and wetlands impacted by poorly designed or nonfunctional water developments would improve under Alternative C in comparison to Alternative A. Alternative C proposes to remove developments in riparian areas and wetlands in GRSG habitat. Removal of structures such as collection boxes, pipelines and troughs, especially those which are acting to drain or otherwise adversely impact riparian areas, would allow these sites to re-vegetate and to regain hydrologic function.

Impacts from Vegetation and Soils Management

In comparison to Alternative A, many more acres of riparian habitats would potentially be improved throughout the planning area under Alternative C as a result of actions proposed for vegetation and soils management. Strategies including closing all PHMA and GHMA to livestock grazing, restricting grazing in remaining areas, converting nonnative plant communities to native communities, and reclaiming disturbed areas would directly and indirectly benefit riparian areas and wetlands in the planning area, where successful. Where livestock grazing is eliminated or reduced, many acres of riparian areas and wetlands would recover naturally, while restoration of ecological functions on uplands including disturbed areas would reduce opportunities for accelerated runoff and for infestations of invasive weeds. However, as a practical matter, the costs involved with restoring nonnative plant communities to native communities over such a large area add a level of uncertainty to the effects analysis for this alternative.

Impacts from Livestock Grazing Management

Substantial changes in livestock management proposed under Alternative C include removing all grazing from PHMA and GHMA and incorporating stubble height, trampling, and woody browse plant utilization limits in remaining areas. This would benefit more acres of riparian areas and wetlands in the planning area compared to Alternative A. The proposed removal of water developments would also likely benefit riparian areas and wetlands where hydrologic function has been impaired (see discussion for water resources management under Alternative C, this chapter).

Overall condition and trend of riparian areas and wetlands would improve in comparison to Alternative A after livestock are removed from PHMA and GHMA. Riparian areas often recover rapidly once stressors are reduced or eliminated (Hough-Snee et al. 2013; Wyman et al. 2006). Continuous grazing, especially during periods of active plant growth, creates a situation where plant communities cannot recover.

Under current management, many riparian areas throughout the sub-region are grazed annually throughout the summer. Although some studies show productivity, especially in meadows, can decline over time in the absence of grazing (Bryant 1985), research showed strong positive changes in stream

channel width, woody riparian vegetation, and streambank erosion 23 years after livestock were removed from the Hart Mountain National Wildlife Refuge in southeastern Oregon (Betchelor et al. 2015). Thus, currently degraded riparian habitats in GRSG habitat in the planning area would recover under the system of passive restoration proposed for Alternative C.

In areas outside of PHMA and GHMA, a 5 percent limit on riparian browse utilization and a 10 percent trampling limit would also benefit riparian habitats, in comparison to Alternative A, especially where functionality is influenced or controlled by herbaceous or woody plant communities. For some systems, such as marshes or boulder-controlled channels, herbaceous stubble heights and trampling limits may not be applicable (Burton et al. 2011).

Proposals for changes in livestock grazing management under Alternative C could also have adverse indirect impacts on riparian areas and wetlands, especially in areas outside PHMA and GHMA. A loss of management flexibility could preclude the development of collaborative watershed partnerships and site-specific grazing systems designed to benefit riparian habitats. These opportunities currently exist under Alternative A and have proven to be effective where applied.

Proposals to remove livestock and fencing from PHMA and GHMA could also cause additional direct and indirect adverse impacts on riparian areas and wetlands, if wild horses were allowed to expand into previously unoccupied habitat. Increased use of riparian areas and uplands by wild horses would increase as a result of disturbance from trampling, soil compaction and loss of plant cover.

Impacts from Fire and Fuels Management

Impacts on riparian areas and wetlands from fire and fuels management in GRSG habitat would be the same as for Alternative A.

Impacts from Wild Horse and Burro Management

Differences between Alternative C and Alternative A would create variable impacts on riparian areas and wetlands in areas in GRSG habitat. Although wild horses and burros would continue to be managed under existing regulations, GRSG needs would be considered as part of the process under Alternative C. Consideration of habitat needs for late summer brood rearing in areas used by horses could potentially result in more acres of riparian habitat being improved or maintained in comparison to Alternative A. However, restrictions on use of helicopters for gathers would likely create more adverse direct and indirect adverse impacts on riparian areas by wild horses compared to Alternative A. Gathers would be less effective, resulting in population expansions and more impacts on riparian habitats in the form of trampling, soil compaction and consumption of riparian plants. Although use of water trapping as a capture alternative could conceivably concentrate impacts on riparian habitats in

HMAs/WHBTs, the practical application of this technique is limited by access, topography and potential conflicts other resources uses.

Impacts from Climate Change Management

Impacts from climate change management on riparian areas and wetlands under Alternative C would be the same as Alternative A.

Impacts from Leasable Minerals Management

Closure of all PHMA and GHMA to exploration and development activities associated with leasable minerals management would benefit riparian areas and wetlands in the planning area. Adverse direct and indirect impacts on riparian areas including loss of plant cover, soil compaction, increases in invasive plants and increases in erosion rates would be greatly reduced. Compared to Alternative A, more acres of riparian areas and wetlands throughout the planning area would be maintained or enhanced (as a result of natural recovery).

Impacts from Locatable Minerals Management

If successful, withdrawal of all PHMA and GHMA from mineral entry under Alternative C would benefit riparian areas and wetlands in the planning area. Compared to Alternative A, many more acres of riparian habitats would be protected from disturbance. Impacts would be similar to those described for leasable mineral management above.

Impacts from Salable Minerals Management

Closure of all PHMA and GHMA to salable minerals management under Alternative C would benefit riparian areas and wetland in the planning area. Compared to Alternative A, many more acres of riparian habitats would be protected from disturbance. Impacts would be similar to those described above for leasable and locatable minerals management.

Impacts from Land Uses and Realty Management

Measures proposed under Alternative C including ROW exclusion in PHMA; establishment of avoidance requirements for GHMA; and, application of restrictions on land disposals in PHMA and GHMA would reduce impacts on riparian areas and wetlands in comparison to Alternative A. Fewer acres of riparian habitats and adjacent uplands would be directly or indirectly adversely impacted from weed infestations, loss of plant cover, soil compaction and accelerated erosion. Where important GRSG habitat was retained in public ownership, priority riparian habitats would be less likely to be altered by development or other land uses.

Impacts from Comprehensive Travel and Transportation Management

Proposals under Alternative C to restrict cross-country travel and to remove or close roads in priority GRSG habitats would directly and indirectly benefit riparian areas and wetlands by reducing disturbance and improving watershed health and function. Roads can be particularly detrimental to riparian systems (refer to Impacts from Comprehensive Travel Management, Nature and Type of

Effects on Riparian Areas and Wetlands, **Section 4.6.2**). Compared to Alternative A, more acres of riparian areas and wetlands throughout the planning area would be maintained or enhanced (as a result of natural recovery).

Impacts from Recreation Management

Impacts on riparian areas and wetlands from Recreation Alternative C would be the same as for Alternative A.

4.6.7 Alternative D

Alternative D would reduce land disturbances and would result in fewer impacts on riparian areas and wetlands associated with a particular use compared with Alternative A.

Impacts from GRSG Management

Under Alternative D, measures to protect and enhance priority GRSG habitats and to reduce disturbance would improve condition and trend of riparian areas and wetlands throughout much of the planning area. Management, evaluation and protection of GRSG habitat would receive much more focus in comparison to Alternative A. GRSG habitat needs would be prioritized in development of plans for both livestock grazing and for wild horses. Fuels, vegetation treatments and fire suppression actions would all include strategies for enhancement and/or protection of GRSG habitat. Management actions covering minerals, lands and recreation would emphasize avoiding, reducing or minimizing impacts on GRSH habitats. Incorporation of RDFs, consistent with applicable law, into the planning and permitting process would further limit disturbance while providing for consideration of GRSG habitat needs during reclamation for PHMA, GHMA and OHMA. Collectively, these measures would have the effect of substantially reducing direct and indirect adverse impacts from disturbance on riparian areas and wetlands across the planning area in comparison to Alternative A. In addition, many more acres of riparian habitats would be improved under Alternative D.

Impacts from Water Resources Management

Impacts on riparian areas and wetlands from Water Resources Alternative D would be similar to those described for Alternative B. Actions which promote watershed health and function would indirectly benefit riparian areas by reducing sediment loading and by increasing water storage and retention. Where seeps and springs have been altered by nonfunctional or poorly designed water developments, modifications would improve hydrologic function and allow for vegetation recovery. Although limitations on new developments in PHMA and GHMA would reduce direct adverse impacts on riparian areas and wetlands, opportunities to improve livestock distribution (a positive impact on riparian areas) could be reduced (refer to discussion under Riparian Areas and Wetlands, Alternative B, Livestock Grazing Management, **Section 4.6.5).**

In comparison to Alternative A, condition and trend or riparian areas and wetlands would improve over some, but not all of the planning area under Alternative D.

Impacts from Vegetation and Soils Management

Under Alternative D, more emphasis would be placed on vegetation treatments designed to enhance GRSG habitat including both PHMA and GHMA in comparison to Alternative A. Treatments to reduce invasive plants, stabilize soils and to re-establish native plant communities would create direct and indirect positive impacts on riparian and wetland habitats. Impacts including reduced erosion rates on uplands; improved infiltration and storage at the watershed scale; and, development of more resilient plant communities less susceptible to weed infestations would result in more acres of riparian habitats being improved or maintained in the planning area compared to Alternative A.

Impacts from Riparian Areas and Wetland Management

Similar to Alternative B, water developments in GRSG habitat would be limited or modified where applicable, while riparian habitat objectives would be incorporated into the permitting process for livestock management under Alternative D. Alternative D differs from Alternative B in that riparian areas and wetlands would receive greater emphasis in the development of management actions for weed control, vegetation treatments and fuels management.

Most impacts on riparian areas and wetlands under Alternative D are similar to those described for Alternative B. Generally, condition and trend of riparian habitats would be improved in comparison to Alternative A (exceptions could occur if limitations on water developments affect livestock distribution). Where Alternative D includes additional measures to restore and enhance riparian habitats in conjunction with vegetation and fuels treatments, more acres of riparian areas and wetlands would be improved in comparison to both Alternatives A and B.

Caveats (explained in detail under Riparian Areas and Wetland Management, Alternative B, **Section 4.6.5**) for application of riparian habitat objectives proposed under Alternative D apply here as well. Generally, habitat objectives for forbs may not be applicable depending on complexities inherent in riparian ecosystems. However, managing for PFC would provide for the basic processes needed to restore and enhance riparian and wetland habitats. Unlike Alternative B, Alternative D does not establish riparian habitat objectives based on ecological site potential (potentially an important omission as discussed under Alternative B).

Impacts from GRSG Management

Under Alternative D, measures to protect and enhance priority GRSG habitats and to reduce disturbance would improve condition and trend of riparian areas and wetlands throughout much of the planning area. Management, evaluation and protection of GRSG habitat would receive much more focus in comparison to Alternative A. GRSG habitat needs would be prioritized in development of plans for both livestock grazing and for wild horses. Fuels, vegetation treatments and fire suppression actions would all include strategies for enhancement and/or

protection of GRSG habitat. Management actions covering minerals, lands and recreation would emphasize avoiding, reducing or minimizing impacts on GRSH habitats. Incorporation of RDFs, consistent with applicable law into the planning and permitting process would further limit disturbance while providing for consideration of GRSG habitat needs during reclamation for PHMA, GHMA and OHMA. Collectively, these measures would have the effect of substantially reducing direct and indirect adverse impacts from disturbance on riparian areas and wetlands across the planning area in comparison to Alternative A. In addition, many more acres of riparian habitats would be improved under Alternative D.

Impacts from Water Resources Management

Impacts on riparian areas and wetlands from Water Resources Alternative D would be similar to those described for Alternative B. Actions which promote watershed health and function would indirectly benefit riparian areas by reducing sediment loading and by increasing water storage and retention. Where seeps and springs have been altered by nonfunctional or poorly designed water developments, modifications would improve hydrologic function and allow for vegetation recovery. Although limitations on new developments in PHMA and GHMA would reduce direct adverse impacts on riparian areas and wetlands, opportunities to improve livestock distribution (a positive impact on riparian areas) could be reduced (refer to discussion under Riparian Areas and Wetlands, Alternative B, Livestock Grazing Management, **Section 4.6.5).**

In comparison to Alternative A, condition and trend or riparian areas and wetlands would improve over some, but not all of the planning area under Alternative D.

Impacts from Vegetation and Soils Management

Under Alternative D, more emphasis would be placed on vegetation treatments designed to enhance GRSG habitat including both PHMA and GHMA in comparison to Alternative A. Treatments to reduce invasive plants, stabilize soils and to re-establish native plant communities would create direct and indirect positive impacts on riparian and wetland habitats. Impacts including reduced erosion rates on uplands; improved infiltration and storage at the watershed scale; and, development of more resilient plant communities less susceptible to weed infestations would result in more acres of riparian habitats being improved or maintained in the planning area compared to Alternative A.

Impacts from Riparian Areas and Wetland Management

Similar to Alternative B, water developments in GRSG habitat would be limited or modified where applicable, while riparian habitat objectives would be incorporated into the permitting process for livestock management under Alternative D. Alternative D differs from Alternative B in that riparian areas and wetlands would receive greater emphasis in the development of management actions for weed control, vegetation treatments and fuels management.

Most impacts on riparian areas and wetlands under Alternative D are similar to those described for Alternative B. Generally, condition and trend of riparian habitats would be improved in comparison to Alternative A (exceptions could occur if limitations on water developments affect livestock distribution). Where Alternative D includes additional measures to restore and enhance riparian habitats in conjunction with vegetation and fuels treatments, more acres of riparian areas and wetlands would be improved in comparison to both Alternatives A and B.

Caveats (explained in detail under Riparian Areas and Wetland Management, Alternative B, **Section 4.6.5**) for application of riparian habitat objectives proposed under Alternative D apply here as well. Generally, habitat objectives for forbs may not be applicable depending on complexities inherent in riparian ecosystems. However, managing for PFC would provide for the basic processes needed to restore and enhance riparian and wetland habitats. Unlike Alternative B, Alternative D does not establish riparian habitat objectives based on ecological site potential (potentially an important omission as discussed under Alternative B).

Impacts from Livestock Grazing Management

Under Alternative D, livestock grazing in PHMA and GHMA would continue to be managed under existing policies and regulations. These include meeting rangeland health standards on BLM-administered lands and meeting utilization standards on National Forest System lands. Differences from Alternative A include incorporating GRSG habitat standards for riparian areas into the grazing permitting process and adding considerations for water developments in PHMA and GHMA.

Under Alternative D, utilization standards for riparian areas and restrictions on grazing in the following season would apply to grazing authorizations on allotments not meeting or making progress toward meeting GRSG habitat objectives. Modifying or restricting use of water developments to reduce impacts on riparian areas and wetlands in PHMA and GHMA is also proposed. Collectively, these measures would improve or protect more acres of riparian and wetland habitats in comparison to Alternative A.

Proposed administration of livestock grazing on PHMA and GHMA under Alternative D would likely improve the condition and trend of riparian areas and wetlands in comparison to Alternative A. Livestock grazing represents one of the most significant impacts on riparian habitats in the sub-region (refer to discussion of current habitat conditions, Riparian Areas and Wetlands, **Section 3.4**). Opportunities to apply site-specific and flexible riparian grazing protocols to achieve GRSG habitat objectives would continue to be available in PHMA and GHMA. This opportunity would continue to foster development of large-scale collaborative management on both public and private lands. Where objectives and standards are not being met, fallback measures would help. This would

ensure that the condition of riparian habitats receives priority consideration as part of the livestock grazing permitting process. Currently, standards are not being met on many riparian areas and wetlands in PHMA and GHMA across the sub-region (refer to Chapter 3, Riparian Areas and Wetlands, **Section 3.4**).

Greater emphasis on managing water developments for GRSG in comparison to Alternative A would also likely benefit riparian areas. This is because many older projects are adversely impacting seeps and springs across the sub-region. However, restrictions on use of management strategies to improve livestock distribution could also reduce opportunities to apply landscape level management strategies.

Impacts from Fire and Fuels Management

Under Alternative D, fuels treatments and suppression activities would be emphasized in GRSG habitat. RDFs (consistent with applicable law) to enhance fire suppression and to restore vegetation communities would also be applied to OHMAs. Reductions in risk of high intensity wildfire would result in both direct and indirect benefits to riparian areas and wetlands. In comparison to Alternative A, riparian areas as well as supporting watersheds would be less impacted by loss of plant cover and accelerated erosion resulting from catastrophic fire. Where restoration practices enhance watersheds, condition and trend of riparian habitats would improve in comparison to Alternative A.

Impacts from Wild Horse and Burro Management

Under Alternative D, greater emphasis would be placed on managing wild horse and burro populations to meet GRSG habitat objectives, including those established for late summer brood-rearing habitat, than currently exists. If effective, this strategy would result in less direct and indirect direct impacts on riparian habitats compared to Alternative A. Fewer acres of riparian areas would be impacted by trampling, soil compaction and loss of plant cover.

Impacts from Climate Change Management

Alternative D would emphasize actions that help manage potential impacts on GRSG habitat due to climate change. These actions would include restoring connectivity and habitat in fragmented areas; managing for drought, invasive species, and wildfire; and, implementing vegetation treatments to restore degraded areas. All of these actions would help to restore degraded riparian systems and improve water quality, resulting in more acres of riparian areas and wetlands being improved in comparison to Alternative A.

Impacts from Leasable Minerals Management

Under Alternative D, additional restrictions and requirements for leased fluid minerals in PHMA as well as NSO stipulations for unleased fluid minerals in both PHMA and GHMA would have the effect of reducing potential for disturbance to riparian areas and wetlands in comparison to Alternative A. Similarly, closing both PHMA and GHMA to nonenergy leasable mineral development and applying restrictions on geophysical exploration in PHMA would reduce adverse

impacts on riparian habitats from such things as soil compaction, erosion and loss of plant cover. Incorporation of RDFs consistent with applicable law into the planning and permitting process for all habitats (PHMA, GHMA and OHMA) would also reduce potential for disturbance to riparian areas and in some cases, allow for enhancement of riparian sites through reclamation designed to benefit GRSG. Collectively, all these actions would result in fewer acres of riparian habitats being adversely impacted from disturbance and in more acres of riparian areas and wetlands being enhanced compared to Alternative A.

Impacts from Locatable Minerals Management

Impacts from Alternative D on riparian areas and wetlands from locatable minerals management are similar to Alternative A with the exception that RDFs, consistent with applicable law, would be developed through plans of operation and applied to PHMA, GHMA and OHMA. RDFs consistent with applicable law have the potential to benefit more acres of riparian habitats in comparison to Alternative A. Where implemented, RDFs, consistent with applicable law would limit disturbance and reduce direct and indirect adverse impacts. Similar to Alternative A, development of off-site mitigation plans would have the potential to improve condition and trend of riparian habitats under Alternative D.

Impacts from Salable Minerals Management

Under alternative D, actions including prohibiting any new salable minerals sites in PHMA and GHMA, reclaiming inactive minerals sites to meet GRSG habitat objectives, and mitigating disturbance associated with site expansions would benefit more acres of riparian areas and wetlands in comparison to Alternative A. Reduced disturbance in both uplands and riparian areas and reclamation which restores ecological functions would provide direct and indirect benefits to riparian habitats.

Impacts from Land Uses and Realty Management

Under Alternative D, actions to reduce disturbance from activities associated with land uses and realty management would benefit more acres of riparian areas and wetlands compared to Alternative A. PHMA and GHMA would be managed as ROW avoidance, effectively reducing the footprint of disturbance through such actions as limiting new road construction and by collocating new ROWs in existing ROWs. Incorporation of RDFs into the planning and permitting process, consistent with applicable law for PHMA, GHMA and OHMA would further reduce disturbance and in some cases, enhance GRSG habitat through reclamation. Where impacts are mitigated, there would be no net loss of GRSG habitat. Finally, all PHMA and GHMA would be retained in public ownership with limited exceptions. Collectively, these management actions would reduce direct and indirect adverse impacts on riparian habitats that would occur from vegetation loss, soil compaction, erosion and increases in invasive plants. Mitigation and/or reclamation could potentially enhance more acres of riparian habitat compared to Alternative A.

Impacts from Comprehensive Travel and Transportation Management

Under Alternative D, closing areas currently open to motorized travel and placing restrictions on road construction and maintenance in GRSG habitat would reduce direct and indirect impacts on riparian areas in comparison to Alternative A. RDFs which reduce road impacts would also be applied to OHMA, consistent with applicable law. Fewer roads and smaller roads would reduce direct disturbance to riparian areas and wetlands, while there would be less sediment generated from the supporting watershed. Incorporation of GRSG habitat needs into new travel management plans would also reduce future impacts on riparian areas in comparison to Alternative A.

Impacts from Recreation Management

Under Alternative D, actions including restricting construction of new recreational facilities in PHMA and GHMA and requiring SRPs and SUAs to have neutral or beneficial effects on GRSG habitat would benefit riparian areas and wetlands in comparison to Alternative A. Fewer acres of riparian habitats would be disturbed, while requirements for beneficial effects would have the potential to improve riparian areas.

Impacts from Fire and Fuels Management

Under Alternative D, fuels treatments and suppression activities would be emphasized in GRSG habitat. Reductions in risk of high intensity wildfire would result in both direct and indirect benefits to riparian areas and wetlands. Riparian areas as well as supporting watersheds would be less impacted by catastrophic fire over both short- and long-term time frames in comparison to Alternative A.

4.6.8 Alternative E

This alternative proposes to reduce the impact on GRSG habitat (core, priority, and general) by applying strategies to avoid, minimize, and mitigate, with the addition of the Conservation Credit System managed by the State of Nevada.

Alternative E would benefit riparian areas and wetlands in comparison to Alternative A; however, since Alternative E identifies the process rather than describing or defining the measureable results, the analysis is somewhat qualitative. General assumptions can be made, however, about how the alternative could affect riparian areas and wetlands for the various resource allocations. Note that the following analyses and assumptions apply to BLM-administered and National Forest System lands in Nevada.

Impacts from GRSG Management

Alternative E represents a comprehensive strategy to evaluate and manage GRSG habitat and to reduce impacts from human disturbance through an overall hierarchal approach, based on avoidance, minimization, and mitigation. The goal of Alternative E is a net conservation gain, with mitigation requirements determined in consultation with the SETT under the Conservation

Credit System. Alternative E does not establish a disturbance cap and does not identify fixed areas for exclusion or avoidance.

Innovative approaches are the use of a dedicated technical team to address GRSG habitat issues, development of a mitigation banking and credit system to offset impacts, and applying greater focus on collaboration across jurisdictional lines and at a landscape level. If successful, these approaches could increase opportunities for improving riparian areas and wetlands in GRSG habitat over Alternative A. In addition, use of site-specific, consultation-based design features proposed under Alternative E to minimize adverse effects on GRSG would result in fewer acres of riparian areas disturbed, in comparison to Alternative A. The strategies and management actions proposed under Alternative E for GRSG could affect riparian habitats through other resource allocations (see discussions below).

Impacts from Water Resources Management

Added emphasis on managing watershed health under Alternative E would result in more acres of riparian areas and wetlands being improved, in comparison to Alternative A. Strategies for water resources management under Alternative E are focused on consultation-based design features for water developments and on maintaining or enhancing watershed health in SGMA. Emphasis would be on use of water developments, including springs, pipelines, and wells, to improve distribution of livestock, and on minimizing disturbance during construction and maintenance.

The proximity of proposed developments to leks is also a consideration, but this design feature may be more relevant to upland vegetation types. In the case of watershed management, emphasis would be placed on protecting, enhancing, and restoring GRSG habitat, based on ecological potential and on concepts of resiliency and resistance. Collectively, these measures would create both direct and indirect benefits to riparian habitats. This would be as a result of reduced sediment loading, less disturbance, improved site stability, and less concentrated use of riparian areas and wetlands (less trampling, compaction, and vegetation removal).

Impacts from Vegetation and Soils Management

A comprehensive landscape-level approach to protecting, enhancing, and restoring GRSG habitat based on ecological potential and on concepts of resiliency and resistance would directly and indirectly improve riparian and wetland habitats, if successful. Healthy riparian systems are part of the larger watershed; strategies focused on managing for landscapes would likely benefit more riparian habitat over a larger area, compared with Alternative A. In addition, use of the Conservation Credit System and requirements for mitigating disturbance would likely accelerate improvement of riparian areas and wetlands, especially on private lands. Many riparian habitats occur on private land, and as a

resource choice for mitigation, these areas are often highly responsive to restoration due to the persistence of soil moisture.

Impacts from Riparian Areas and Wetland Management

Management of riparian areas and wetlands in important GRSG habitat in Nevada would be emphasized through the use of the Nevada Governor's Sagebrush Ecosystem Council, the SETT, landscape level strategies for vegetation management and the Conservation Credit System. Restoration and mitigation would also be based on GRSG habitat needs as part of the overall strategy (see discussion for riparian habitat objectives, *Livestock Management*, this chapter). If successful, enhanced coordination, project facilitation, technical assistance, and use of a credit system for effective mitigation would all likely improve the condition and trend of riparian areas and wetlands in GRSG habitat, compared to Alternative A.

As described for *Vegetation* Alternative E, improving riparian habitats would likely be accelerated because of their importance to GRSG and responsiveness to restoration. In addition, use of the Conservation Credit System would incentivize improving riparian areas and wetlands on private lands, where many of these important resource areas are located.

Impacts from Livestock Grazing Management

Where successful, comprehensive strategies to manage livestock in GRSG habitat under Alternative E would result in more acres of riparian and wetland habitats being improved compared to Alternative A. Components would directly and indirectly benefit riparian areas, as follows:

- Use of prescriptive and targeted grazing
- Adaptive management
- Landscape level assessments and monitoring approaches
- Restoration practices based on ecological potential
- Strategic use of range improvements, including modification for GRSG where appropriate
- Enhanced collaboration and cooperation among stakeholders

Collectively, these measures are focused on improving both uplands and riparian areas using a landscape approach to both restoration and management. Management of riparian habitats is most effective when entire watersheds are considered as part of developing a grazing plan. Where both riparian areas and uplands support healthy vegetation, infiltration improves, erosion rates decrease, and habitats are less susceptible to invasive plants, floods, fires, and droughts.

A key feature of Alternative E is the use of site-specific habitat objectives to guide livestock grazing management planning on both BLM-administered and

National Forest System lands in GRSG habitat. Objectives for riparian areas and wetlands are based on achieving PFC, managing for a diverse understory to include forbs in and near mesic habitats, and managing for edge (interspersing with adjacent sagebrush). Management for these objectives would promote ecological health and resiliency in riparian habitats.

Alternative E also recognizes the need to evaluate these requirements in the context of site potential and local variability. This is an important consideration, given that ecological site descriptions (ESDs) for riparian areas have not yet been developed and that species richness may not always correlate with ecological condition (refer to the discussion of this subject under *Riparian Areas and Wetlands*, Alternative B, *Riparian Areas and Wetland Management*, **Section 4.6.5**).

Although managing livestock grazing to meet PFC (or a combination of PFC and utilization standards in the case of the Forest Service), in riparian areas is required under Alternative A, added requirements for edge and for species richness and diversity (including in associated uplands) proposed under Alternative E would result in more acres of riparian areas and wetlands being improved, in comparison to Alternative A.

Alternative E also incorporates provisions of a plan developed by Eureka County for managing livestock on federal lands in Nevada. Under the 2010 Eureka County Master Plan, federal agencies would not be able to reduce or restrict livestock grazing on public lands or adjust seasons of permitted use until all economically and technically feasible alternatives were identified and implemented. As a practical matter, some alternatives include forage enhancement, water developments, pasture fencing, and vegetation treatments. These would need to go through the NEPA process and could conceivably take years to implement. Some of these alternatives may never be implemented as a result of litigation, conflicts with other resource uses, work load priorities, funding constraints, or other factors. Thus, the level of certainty that riparian areas would improve as a result of changes in livestock grazing practices under Alternative E compared to Alternative A is reduced by incorporating the Eureka County Plan.

Impacts from Fire and Fuels Management

Under Alternative E, fire and fuels management focuses on managing GRSG habitat both before and after occurrences of wildfire. Proactive approaches are built on managing for resistance and resiliency and fuel load reduction and on more effective fire suppression in PHMA. Post-fire management strategies are focused on restoring and maintaining good habitat conditions for GRSG. If successful, these strategies would indirectly benefit riparian resources by improving or protecting overall watershed health and function. In some circumstances (such as during drought conditions), direct loss of riparian vegetation to fire would be reduced as a result of fewer and less intense

wildfires. Compared to Alternative A, both the amount and condition of riparian and wetlands habitats would be greater under Alternative E.

Impacts from Wild Horse and Burro Management

If successful, strategies proposed under Alternative E to reduce impacts on riparian areas and wetlands from wild horses would provide more benefits to riparian habitats compared to Alternative A. Managing for levels at or below AML in areas of GRSG habitat would result in less trampling and compaction of riparian soils and less use of riparian plants. Smaller numbers of horses would also result in fewer impacts on upland plant communities, creating an indirect benefit to riparian habitats. Conflicts with livestock management fences would be reduced with fewer horses, resulting in more successful application of prescriptive grazing treatments for improving riparian habitats. A greater emphasis on evaluating impacts of wild horses on GRSG habitat would also help focus management actions on reducing conflicts with other land uses.

Impacts from Climate Change Management

If successful, climate change strategies proposed under Alternative E to build landscape level resiliency and to incentivize conservation practices would likely improve riparian and wetland habitats more than under Alternative A.

Impacts from Leasable Minerals Management (Including Split-Estate)

The strategy of a net conservation gain in GRSG habitat for all new human disturbances, including activities and infrastructure associated with leasable minerals management proposed under Alternative E, would benefit riparian areas and wetlands in comparison to Alternative A. The process for achieving a net conservation gain (avoid, minimize, and mitigate) could both reduce impacts on riparian habitats and enhance riparian habitats. Consultation requirements with the Nevada Governor's Sagebrush Ecosystem Council and the SETT to develop site-specific design features and to evaluate and prioritize issues and opportunities related to human disturbance could also benefit riparian habitats in SGMA. The impacts of these various components on riparian areas relative to leasable minerals management are discussed below.

The strategy to avoid new human disturbance in the SGMA proposed under Alternative E would likely result in fewer acres of riparian areas and wetlands being disturbed in comparison to Alternative A. Controlled surface use with timing restrictions for oil and gas as well as geothermal exploration and development (excluding nonenergy leasable minerals) in core and priority habitat would result in less direct and indirect adverse impacts on riparian habitats from leasable minerals management. Impacts from increased rates of erosion loss of plant cover and from trampling and compacting riparian plants and soils could result in increased erosion rates from adjacent uplands. Although general habitat remains open, opportunities exist to minimize or mitigate the disturbance through consultation with the SETT.

Exceptions to strategies proposed under Alternative E would add uncertainty to the assumption that impacts on riparian habitats would be less in comparison to Alternative A. Options exist for the project proponent to demonstrate that controlled surface use with timing limitations cannot be reasonably accomplished. The demonstration process is determined by the relative value of habitats types for GRSG. Generally, there is a higher burden of proof required by the project proponent that GRSG habitat cannot be reasonably avoided in core and priority management areas compared to general and nonhabitat management areas.

Under Alternative E, the strategy is to minimize impacts on GRSG habitat of site-specific, consultation-based design features. This would likely result in fewer acres of riparian areas and wetlands being impacted from leasable minerals management, compared to Alternative A. Incorporating design features would collectively benefit riparian habitats in the SGMA. Examples are reducing the disturbance footprint, implementing phased development, enhancing weed control measures, and incorporating GRSG habitat needs into reclamation planning.

Impacts such as loss of upland and riparian plant cover, soil compaction, and increased sediment loading would be reduced in comparison to Alternative A. Reclamation that promotes watershed health would also provide an indirect benefit to riparian areas. However, adopting design features is not automatically required; specific features may be added, dropped, or revised based on coordination between the SETT and the project proponent. These exceptions would add uncertainty to the assumption that impacts on riparian habitats would be less under Alternative E in comparison to Alternative A.

Under Alternative E, if impacts on GRSG habitat cannot be avoided and if minimization options have been exhausted, then impacts on riparian areas and wetlands from leasable minerals management would be offset through compensatory mitigation based on the Conservation Credit System. Compared to Alternative A, use of the Conservation Credit System would likely lead to restoration and enhancement of many additional acres of riparian and wetland habitats in SGMA.

Providing an economic incentive for habitat improvement would likely attract potential "credit developers" where none previously existed. Credits are most likely to be developed on private lands where many priority riparian habitats in SGMA are located. In addition, a number of specific requirements included as part of the compensatory mitigation program under Alternative E add a level of certainty to the assertion that more acres of riparian habitats would be improved in comparison to Alternative A. These requirements include upfront mitigation prior to project approval; requiring level of obligation to be based on impact; requiring the benefit to be equal to or greater than the impact; and, ensuring that the mitigation would be effective over the long term.

Under Alternative E, design features or other measures could also be used to reduce impacts for existing and abandoned human disturbances, including those associated with leasable minerals management. Such actions would benefit more acres of riparian and wetland habitats in comparison to Alternative A.

Note that Alternative E does not specify a strategy for leasable minerals split-estates; therefore, impacts on riparian areas and wetlands for this circumstance are assumed to be the same as for Alternative A.

Impacts from Locatable Minerals Management

Strategies proposed under Alternative E for locatable minerals management would be similar to those described for leasable minerals management, although all GRSG habitat types in SGMA would remain open. Impacts on riparian areas and wetlands would also be similar. Alternative E does not specify a strategy for locatable minerals split-estates; therefore, impacts on riparian areas and wetlands for this circumstance would be the same as for Alternative A.

Impacts from Salable Minerals Management

Strategies proposed under Alternative E for salable minerals management would be similar to those described for leasable minerals, although all GRSG habitat types in the SGMA remain open. Impacts on riparian areas and wetlands would also be similar.

Impacts from Land Uses and Realty Management

Alternative E includes a number of provisions that would reduce direct impacts on riparian areas and wetlands from land uses and realty management in SGMA, in comparison to Alternative A. Requirements for permits and leases to include stipulations to minimize impacts on GRSG habitat and to ensure no net loss would result in fewer disturbances to riparian areas than exists under the current situation. Strategies to reduce the disturbance footprint through the ROW approval, renewal, and amendment process would reduce adverse direct and indirect impacts on riparian and wetland habitats in comparison to Alternative A.

Fewer acres of riparian areas would be impacted from compaction, vegetation loss, and accelerated erosion from land uses and realty management. In addition, strategies for increasing interim reclamation on roads and well pads would indirectly benefit riparian areas by reducing sediment loading from uplands.

Impacts on riparian habitats from land uses associated with retention or disposal under Alternative E are the same as for Alternative A.

Impacts from Comprehensive Travel and Transportation Management

Alternative E includes a number of strategies for travel and transportation management that would result in positive impacts on riparian areas and wetlands in comparison to Alternative A. Reclaiming roads (where feasible), incorporating seed mixes to benefit GRSG habitat and realignment, and

removing or closing roads to reduce habitat degradation would directly and indirectly benefit riparian areas. The potential for sediment loading from roads in or next to riparian and wetlands areas would be reduced as a result of these measures.

Impacts from Recreation Management

Adverse impacts on riparian areas and wetlands from recreation management under Alternative E would be less in comparison to Alternative A. Management actions would reduce direct impacts, such as loss of vegetation and trampling and compaction of soils in riparian and wetland habitats. These actions would be incorporating stipulations into special recreation use permits to minimize impacts on GRSG habitat and adopting strategies to reduce disturbance footprints associated with recreation management. Fewer disturbances on uplands would also reduce indirect impacts resulting from loss of plant cover and increased erosion.

4.6.9 Alternative F

Alternative F is similar to Alternative B but is more comprehensive in scope. Additional restrictions on a wide range of land use activities affecting both renewable and nonrenewable resources would significantly reduce the potential to disturb riparian and wetlands habitats. In addition, designation of sagebrush reserves with further limitations on development and disturbance would result in additional protection of riparian resources. Proposed actions focused on restoration and remediation of damage or disturbance would also directly and indirectly benefit riparian areas and wetlands in the planning area. Collectively, these measures would result in more riparian and wetland habitat improvement compared with Alternative A.

Although a proposed ACEC designation overlays PHMA (as displayed in Alternative B), the allocations would be the same for both PHMA and the ACEC. Therefore, the proposed ACEC designation would have no additional effect or impact on GRSG or riparian areas and wetlands and will not be considered further.

Impacts from GRSG Management

Impacts on riparian areas and wetlands would be similar to Alternative B, except that there is additional emphasis on protecting priority GRSG habitat. Added focus on both preserving habitat and limiting disturbance would result in more acres of riparian and wetland habitat being improved or protected compared with Alternatives A and B.

Impacts from Water Resources Management

Under Alternative F, impacts on riparian areas and wetlands from proposals to restrict construction of new water developments in PHMA and GHMA and to remove existing developments are similar to those described under Alternative B. Impacts on riparian habitats would be variable compared to Alternative A. Removal of nonfunctional or poorly designed water developments would allow

for recovery of impaired systems benefiting more acres of riparian areas compared to Alternative A. Fewer acres of riparian habitats would be impacted by disturbance in comparison to Alternative A. However, indirect adverse impacts could occur if opportunities to implement better livestock grazing management practices were reduced (see Riparian Areas and Wetlands, Livestock Management, Alternative B, **Section 4.6.5**). Currently, water developments used to implement better livestock grazing practices often result in reduced use of riparian areas and better conditions on uplands.

Impacts from Vegetation and Soils Management

Increased focus on vegetation management for the benefit of GRSG habitat would indirectly benefit riparian and wetland habitat by improving overall watershed health, resulting in greater benefits to these areas compared with Alternative A.

Impacts from Riparian Areas and Wetland Management

Under Alternative F, riparian areas and wetlands in PHMA and GHMA would continue to be managed for meeting PFCs or Forest Plan standards and guidelines (refer to Alternative A). As with Alternatives B and D, riparian habitats would be managed for forb species richness, edge and potential natural communities based on ecological site descriptions. Water developments would also be limited or modified in priority GRSG habitats (refer to Alternatives B, C, and D). Additional emphasis is placed on addressing GRSG concerns and limiting land uses in priority GRSG habitat and on restricting livestock grazing practices than exists under Alternative A.

Based on similarities in impacts on portions of Alternatives A, B, C and D and on incorporation of new measures to reduce impacts on riparian habitats, condition and trend of riparian areas and wetlands in PHMA and GHMA would improve under Alternative F.

Impacts from Livestock Grazing Management

Under Alternative F, impacts on riparian areas and wetlands from incorporating GRSG habitat objectives for riparian areas into land health assessments and the livestock grazing permit renewal process would be similar to Alternatives B and D. Impacts from restrictions on new water developments and from modifying existing developments would be similar to Alternatives B, C, and D. Other proposed measures are establishing ungrazed reference areas, incorporating rest requirements, and adopting restrictive utilization limits for riparian habitats (see related proposals under Alternative C).

Condition and trend of riparian habitats would likely improve under Alternative F, compared to Alternative A, as a result of a placing greater emphasis on livestock grazing management for late summer brood-rearing habitat. Establishing ungrazed reference areas would also likely expand riparian areas (see *Riparian Areas and Wetlands*, Alternative C, *Livestock Management*, **Section 4.6.6**).

Establishing strict utilization limits (less than or equal to 25 percent of annual use) for riparian habitats may limit flexibility to achieve landscape-level grazing prescriptions. The utilization limit, along with a rest requirement (25 percent of planning area to be rested annually), is proposed, in addition to using established protocols for riparian grazing management; an example of this is controlling the frequency, timing, and duration of use. Although riparian areas and wetlands would improve in PHMA and GHMA on BLM-administered and National Forest System lands under such restrictive grazing, opportunities to develop collaborative grazing systems across jurisdictional and ownership boundaries would be more limited under this alternative than Alternatives A and E.

Impacts from Fire and Fuels Management

Impacts on riparian areas and wetlands from Fire and Fuels Alternative C would be the same as for Alternative B.

Impacts from Wild Horse and Burro Management

Wild horse and burro AMLs would be reduced by 25 percent in HMAs/WHBTs in occupied GRSG habitat. While impacts from wild horses to riparian and wetland habitats in the form of trampling and overuse of vegetation would still occur, extent and magnitude of impacts would be reduced with fewer numbers of horses under Alternative F in comparison to Alternative A. More emphasis would also be placed on meeting GRSG habitat needs including late summer brood-rearing habitat in herd management areas than currently exits.

Impacts from Climate Change Management

Impacts on riparian areas and wetlands from Climate Change Alternative F would be the same as for Alternative A.

Impacts from Leasable Minerals Management

Impacts on riparian areas and wetlands from leasable Minerals Alternative F would be the same as for Alternative B.

Impacts from Locatable Minerals Management

Impacts on riparian areas and wetlands from Locatable Minerals Alternative F would be the same as for Alternative B.

Impacts from Salable Minerals Management

Impacts on riparian areas and wetlands from Salable Minerals Alternative F would be the same as for Alternative B.

Impacts from Land Uses and Realty Management

Under Alternative F, impacts on riparian areas and wetlands from land uses and realty management would be similar to Alternative B with the exception that GHMA would be managed for exclusion rather than avoidance. Excluding PHMA would further reduce direct and indirect adverse impacts on riparian habitats and wetlands compared to Alternative A. Fewer acres of uplands or riparian areas would be affected by soil loss and compaction, increased erosion and loss

of plant cover associated with ROWs and other land uses in comparison to both Alternatives A and B.

Impacts from Comprehensive Travel and Transportation Management

Alternative F is similar to Alternative B, with the exception that there would be increased focus on closing or remediating roads in priority GRSG habitat. In addition, travel is managed as limited in GHMA rather than as open. Measures for reducing direct and indirect impacts on riparian areas from travel management under Alternative F and for mitigating existing impacts would benefit more acres of riparian habitats in comparison to Alternative A. Fewer acres would be affected by accelerated runoff and erosion, while reclamation or closure of existing roads would also reduce sediment loading and allow for re-establishment of vegetation communities.

Impacts from Recreation Management

Although recreation management under Alternative F would not close any areas to recreational activities, requirements for BLM SRPs or Forest Service SUAs to have a neutral or beneficial effect on PHMA and GHMA would result in beneficial impacts on riparian habitats. It also specifies that timing of certain recreational activities and prohibits cross-country travel in PHMA and GHMA. Neutral or beneficial impacts and no cross-country travel in GRSG habitat would result in less disturbance and fewer adverse impacts on riparian habitats compared with Alternative A.

4.6.10 The Proposed Plan

The Proposed Plan represents a very comprehensive approach to managing GRSG habitat through actions that reduce or eliminate disturbance but that are also geared to habitat enhancement at a watershed scale. Many of the actions would improve or protect many more acres of riparian areas and wetlands throughout the planning area, compared to Alternative A.

The Proposed Plan would require a 3 percent disturbance cap on human surface-disturbing activities in PHMA (see **Appendix F**). It would incorporate RDFs consistent with applicable law in PHMA, GHMA, and OHMA and would require all human disturbances to result in a net conservation gain for GRSG and their habitat. Lek buffers would also be required (see **Appendix B**).

Collectively, these GRSG conservation management actions would increase mitigation requirements for land use authorizations; this would result in more complex project designs, could exclude infrastructure placement in the most cost-effective locations, and could result in overall greater development costs. A corresponding effect could be a reduction in the number of authorization applications received for activities in PHMA and longer, more complicated review periods for those that are proposed in PHMA.

Impacts from GRSG Management

Under the Proposed Plan, comprehensive strategies to manage GRSG habitat across the planning area would result in more acres of riparian areas and wetlands being improved or protected compared with Alternative A. Numerous actions to reduce threats from invasive weeds and catastrophic wildfires and to restore degraded plant communities through focused vegetation treatments would benefit riparian habitats by improving functionality and resiliency of surrounding watersheds. Where enhanced efforts to control weeds and to reduce catastrophic fire are successful, riparian habitats that might otherwise be compromised would likely remain intact. Where vegetation treatments are focused on areas with high potential for success, direct and indirect benefits to riparian areas from reduced sediment loads would likely increase.

Where strategies under the Proposed Plan are focused on limiting or mitigating disturbance in PHMA and GHMA through a screening process, more acres of riparian habitats would be protected or enhanced than under Alternative A. In the case of SFA, all habitat (PHMA, GHMA, and OHMA) would be protected from human disturbance, while requirements for a net conservation gain for PHMA and GHMA in remaining areas would likely focus more on restoring riparian areas and wetlands than currently exists.

The Proposed Plan also provides for more of a collaborative approach to managing GRSG habitat across jurisdictional boundaries and in conjunction with state, federal, tribal, and private interests, compared with Alternative A. Habitat management at a landscape level would improve the condition of riparian areas. This is because many of these sites occur on private lands or on a combination of private and BLM-administered or National Forest System lands. In addition, increased emphasis on incorporating GRSG habitat considerations into programs—such as livestock grazing, recreation, travel and wild horses and burros—would likely improve riparian habitat conditions.

Both livestock and wild horses could adversely impact riparian habitats. Reducing impacts through targeted and prescriptive grazing (in the case of livestock) and in reducing numbers of horses would increase growth and establish riparian vegetation. Less direct impacts from travel and recreation would also increase riparian plant growth and compacted soils recovery and would lessen the opportunity for invasive weeds to become established.

The avoid, minimize, and apply compensatory mitigation strategy would reduce or eliminate both direct and indirect adverse impacts on riparian and wetland habitats in PHMA and GHMA. The strategy includes the 3 percent disturbance cap for human activities in BSUs (limited exceptions apply in Nevada but not California) and the requirement for a net conservation gain.

Where impacts on riparian areas cannot be avoided, they would be offset through compensatory mitigation programs, such as the Conservation Credit System in Nevada (this program does not apply to California). Use of mitigation,

such as the Conservation Credit System, would incentivize conservation and could improve many acres of riparian areas and wetlands across the planning area, especially on private lands.

Compared with Alternative A, the Proposed Plan would result in more riparian acres remaining intact and in more being replaced or restored in PHMA and GHMA.

Implementing the adaptive management strategy proposed under the Proposed Plan would trigger changes in land uses based on habitat and population trends. Conceivably, this would focus management planning on achieving and maintaining GRSG habitat objectives, including those identified for riparian areas and wetlands. Applying the Monitoring Framework for the Proposed Plan would also help to ensure a more consistent and effective monitoring and tracking system for both positive and negative changes to priority riparian habitats in GRSG habitat.

Impacts from Water Resources Management

The Proposed Plan would provide more benefits to riparian areas and wetlands compared to Alternative A. These would permit water developments where they benefit GRSG habitat management, would remove ponds in channels where the ponds are negatively impacting riparian habitat, and would modify developments where they are impairing riparian functions. Direct disturbance in the form of soil and vegetation loss would be reduced, while riparian habitats impacted by existing developments would be allowed to recover.

There are no policies or programs in place to remediate water developments that are adversely impacting riparian habitats. Compared with Alternative A, the Proposed Plan also emphasizes more targeted use of water developments for habitat improvement. An indirect adverse impact could conceivably occur if restrictions on new developments were to limit prescriptive livestock grazing systems designed to enhance both upland and riparian habitats.

Impacts from Vegetation Management (General Sagebrush, Invasive Species)

Under the Proposed Plan, management of vegetation resources, including riparian habitats, is much more comprehensive than under Alternative A. The following strategies would result in direct and indirect benefits to riparian areas and wetlands:

- Restoration of degraded plant communities
- Treatment and management prioritization based on GRSG habitat values
- More focused and aggressive weed control

- Design of treatments based on biological diversity and ecological site concepts
- Collaboration across jurisdictional and landownership boundaries
- Greater emphasis on pinyon-juniper control
- More emphasis on fuels treatments

Priority riparian habitats in PHMA and GHMA would be enhanced, protected, or avoided; landscape level treatments would indirectly benefit riparian areas by improving overall watershed function.

Impacts from Vegetation Management (Riparian Areas and Wetlands)
Management actions for riparian areas and wetlands under the Proposed Plan would benefit many more acres of riparian habitat, including adjacent uplands, as compared to Alternative A. The condition of surrounding uplands can greatly affect the condition of a riparian-wetland area (Prichard et al. 1998). Changes in upland conditions can affect discharge, timing, or duration of flows, potentially degrading riparian areas.

Under the Proposed Plan, riparian areas would be managed for vegetation composition and structure consistent with ecological potential and for GRSG habitat objectives (see **Tables 2-2, 2-5**, and **2-6**). Caveats for ecological site potential are important for reasons explained in **Section 4.6.5** (*Riparian Areas and Wetlands Management*, Alternative B). Habitat objectives would focus management on achieving healthy riparian ecosystems in GRSG habitat. They would be based on managing for PFC (or desired conditions in the case of the Forest Service) of both lotic and lentic areas as well as for diversity where riparian areas and uplands intersect. Actions that increase edge and expand mesic areas would further enhance the condition and trend of riparian areas and associated uplands in PHMA and GHMA.

The Proposed Plan also includes actions for enhanced weed control, as well as riparian vegetation treatments in PHMA and GHMA. Although these actions already occur to some extent under Alternative A, the Proposed Plan provides greater emphasis on targeting and improving riparian areas, especially in priority GRSG habitats. Additional actions to improve riparian areas and wetlands (either directly or indirectly) are addressed in other program areas, as discussed in the following sections.

Impacts from Fire and Fuels Management
Comprehensive actions under the Proposed Plan would both directly and indirectly benefit riparian areas and wetlands. These actions are to reduce the frequency and incidence of catastrophic fire in GRSG habitat and to effectively manage post-fire habitats for long-term stability and resilience. Reduced incidence of fire would directly benefit riparian areas where conditions are degraded or where vegetation moisture levels are low, such as in periods of

drought or low flow conditions. Under these conditions, riparian vegetation is generally more susceptible to being killed or damaged by fire.

Loss of riparian corridors along streams can lead to accelerated erosion and adverse channel adjustments. Restoration and proper management of habitat post-fire would indirectly benefit riparian areas by providing for long-term watershed health. Healthy riparian systems are at least partly a function of conditions on surrounding uplands.

Alternative A includes actions to reduce the threat of wildfires and to restore burned habitats; nevertheless, the added emphasis on the strategic and comprehensive approach to reducing catastrophic wildfire proposed under the Proposed Plan would improve or protect more acres of riparian and wetlands, compared to Alternative A.

Impacts from Land Uses and Realty Management

Lands and realty actions applicable to riparian areas and wetlands under the Proposed Plan would result in greater protection and less disturbance to these areas than under Alternative A. Certain actions would reduce both direct and indirect adverse impacts; examples are limiting opportunities for disturbance in PHMA and GHMA outside of existing designated corridors and incorporating disturbance buffers into the planning process for brood-rearing habitat.

Riparian areas and associated uplands would be protected from such impacts as soil compaction, erosion, loss of vegetation cover, and increases in invasive weeds. Where exceptions to disturbance limits are granted, requirements for reclamation, use of RDFs, and development of compensatory mitigation would reduce impacts or lead to additional acres being protected or restored. In addition, the Proposed Plan would retain priority GRSG habitat in public ownership and would acquire additional habitat where appropriate. These actions would protect more riparian areas and wetlands than would Alternative A.

Impacts from Livestock Grazing Management

In comparison to Alternative A, the Proposed Plan represents a much more focused and targeted approach to livestock management for priority riparian areas and wetlands in GRSG habitats. Although livestock grazing in PHMA and GHMA would continue to be managed under existing policies and regulations, riparian habitats in SFA, PHMA, and GHMA would receive priority consideration (in that order) in terms of evaluation, resolution of grazing conflicts, and monitoring. Examples of grazing management actions are meeting rangeland health standards on BLM-administered lands and meeting utilization standards on National Forest System lands, In SFA, land health assessments would be prioritized in areas with the most important habitat, including areas used for brood rearing in summer. Riparian habitats in PHMA outside SFA would also be considered a high priority for evaluation and management.

The Proposed Plan identifies a number of actions to resolve conflicts with current grazing practices in riparian habitats and to improve riparian habitat conditions. These actions are as follows:

- Applying prescriptive grazing practices
- Using adaptive management
- Establishing allowable utilization levels
- Requiring adjustments in AUMs and season of use
- Requiring provisions to streamline the NEPA process in terms of future adjustments based on habitat conditions

Most of these actions would be accomplished through the permit renewal process.

Where a need for changes has been identified but where a permit renewal has not been completed, the Proposed Plan requires adaptive interim measures. In the case of permit transfers, adjustments in grazing would be required if rangeland health standards were not being met. In comparison to Alternative A, all these measures would focus greater attention on resolving livestock grazing conflicts and improving condition and trend of priority riparian areas and wetlands in GRSG habitat.

As described in Chapter 3, **Section 3.4**), current policies have been only partly effective. Opportunities to apply site-specific and flexible riparian grazing protocols to achieve GRSG habitat objectives would continue to be available throughout the planning area. This would foster the development of collaborative management of both public and private lands. This is especially important because many riparian areas important to GRSG are on private lands.

As with Alternatives B, D, and E, a key feature of the Proposed Plan is the use of site-specific habitat objectives to guide livestock grazing management planning on both BLM-administered and National Forest System lands in GRSG habitat. Objectives for riparian areas and wetlands are based on achieving PFC (or Forest Service counterpart for desired conditions), managing for a diverse understory to include forbs in and near mesic habitats, and managing for edge (interspersion with adjacent sagebrush). Management for these objectives would promote ecological health and resiliency in riparian habitats.

The Proposed Plan also recognizes the need to evaluate these requirements in the context of site potential, an important consideration given that ESDs for riparian areas have not yet been developed and that species richness (including forb abundance) may not always correlate with ecological condition (refer to the discussion of this subject under *Riparian Areas and Wetlands*, Alternative B, *Riparian Areas and Wetland Management*, **Section 3.6.5**). The Forest Service would incorporate grazing guidelines (**Table 2-8**) into term grazing permits that

would likely improve vegetation structure in GRSG seasonal habitat on grazing allotments.

Managing livestock grazing to meet PFC (or a combination of PFC and grazing guidelines in the case of the Forest Service) in riparian areas is required under Alternative A; nevertheless, added requirements for edge and diversity tied to surrounding uplands under the Proposed Plan would result in more acres of riparian areas and wetlands being improved, compared to Alternative A. Healthy uplands and plant species diversity are identified as attributes of properly functioning riparian areas (Prichard et al. 1998).

The Proposed Plan also would prioritize monitoring in priority riparian habitats to ensure habitat objectives continue to be met. In comparison to Alternative A, this requirement would likely result in more acres of riparian areas and wetlands being maintained in good condition over the long term.

Finally, livestock management under the Proposed Plan includes a number of additional measures to protect or enhance riparian areas compared with Alternative A. These include modifying grazing practices during drought; more intensive monitoring and management of vegetation treatments; enhanced weed control; incorporation of RDFs, consistent with applicable law, to protect or enhance riparian habitats in PHMA, GHMA and OHMA; and, requirements for placing supplemental feeding, water or handling locations/facilities away from riparian areas. Collectively, these actions would reduce direct and indirect adverse impacts and increase beneficial impacts on more acres of riparian areas and wetlands in comparison to Alternative A.

Impacts from Wild Horse and Burro Management

Under the Proposed Plan, greater emphasis would be placed on managing wild horses and burros to meet GRSG habitat objectives, including late summer brood-rearing habitat, than currently exists. If successful, actions including prioritizing gathers based on GRSG habitat concerns and incorporating GRSG habitat objectives into management planning for wild horses and burros would benefit riparian areas in PHMA and GHMA by reducing impacts from trampling, compaction of soils, and overuse of riparian plants. Conflicts with livestock management fences would also be reduced, allowing for more effective implementation of prescriptive livestock grazing practices.

Impacts from Leasable Minerals Management

The Proposed Plan includes a number of measures for leasable minerals management, which would benefit riparian areas and wetlands, in comparison to Alternative A. By closing PHMA to nonenergy leasing and by establishing NSO in PHMA for unleased fluid minerals, both direct and indirect adverse impacts on priority riparian habitats from soil and vegetation loss, soil compaction, and increased erosion would be reduced. Establishing CSUs and TLs in GHMA would also reduce disturbance to riparian areas and wetlands, compared to Alternative A.

Protections for important riparian habitats would be even stronger for SFA, where exceptions are not allowed. In PHMA, exceptions are allowed if GRSG or their habitat would not adversely be affected. Geothermal leasing in PHMA could also occur but only under certain conditions, which could limit disturbing important riparian habitats. In the SFA, leasing would be allowed only under an NSO with no waiver, exception, or modification.

In the case of both leased and unleased fluid minerals, use of RDFs, consistent with applicable law, in all habitat types (PHMA, GHMA, and OHMA) would create both direct and indirect impacts on riparian areas and wetlands in the planning area. Where RDFs limit disturbance, consistent with applicable law, adverse direct and indirect impacts from soil and vegetation loss would be reduced. Where RDFs provide for enhanced reclamation or restoration of disturbed areas, consistent with applicable law, riparian habitats would directly or indirectly benefit from reduced sediment input and from establishment of more resilient native plant communities. Compared to Alternative A, more acres of riparian areas and wetlands would benefit by incorporating RDFs, consistent with applicable law, into the implementation process for fluid minerals management.

Under the Proposed Plan, actions for all human disturbances (including leasable minerals management) that would result in a net conservation gain and would limit disturbance to 3 percent in BSUs would enhance or protect more acres of riparian habitat than would Alternative A. Priority riparian habitats would likely be targeted for improvement as a result of mitigation, such as the Conservation Credit System (in Nevada) or other applicable mitigation strategy. This is because these areas are so responsive and so important for GRSG. The disturbance caps and application of adaptive management based on triggers would limit disturbance and direct and indirect adverse impacts from fluid minerals management on priority riparian habitats in PHMA and GHMA.

Impacts from Unleased Fluid Minerals Management

For leased fluid minerals, stipulations under the Proposed Plan would prevent surface activities from occurring in summer brood-rearing habitat. RDFs (consistent with applicable law) and COAs would reduce the overall footprint of operations and facilities. These would result in fewer acres of riparian habitats being impacted by soil erosion and compaction, loss or degradation of water supplies, and loss of vegetation, compared to Alternative A. Impacts on riparian areas from unleased fluid minerals management from other measures, including a requirement for a net conservation gain, a 3 percent disturbance cap in BSUs, and incorporation of GRSG habitat needs into reclamation plans, would be similar to leased fluid minerals.

Impacts from Locatable Minerals Management

Compared to Alternative A, the Proposed Plan provides for more focus on protecting or improving riparian areas and wetlands as a result of locatable

minerals management. All PHMA in SFA would be recommended for withdrawal from mineral entry (subject to valid existing rights). This would protect priority riparian habitats from potential future disturbance. The Proposed Plan decisions would apply to locatable minerals subject to valid existing rights and consistent with applicable law. Adverse direct and indirect impacts on riparian areas from soil and vegetation loss would also be minimized through avoidance or by adopting RDFs (consistent with applicable law) or other measures to limit disturbance. Where impacts cannot be avoided, they would be mitigated or offset, in consultation with the SETT (Nevada only) through an applicable mitigation program, such as the Conservation Credit System. Where mitigation results in a net conservation gain, the potential exits to enhance more acres of priority riparian habitats than under Alternative A. Incorporating GRSG habitat needs into reclamation planning in GRSG habitat would also create direct and indirect positive impacts on riparian areas where soils have become vegetated and stabilized.

Impacts from Salable Minerals Management

Fewer acres of riparian areas and wetlands would be disturbed under the Proposed Plan than under Alternative A. Closing new mineral material disposal in PHMA and restricting pit expansion would limit the potential for riparian habitats to be impacted from disturbance associated with salable minerals management. Application of the avoid, minimize, and compensatory mitigation strategy for salable minerals in GRSG habitat would also apply to salable minerals. This would benefit riparian areas and wetlands (see *Fluid Minerals Management*, above).

Impacts from Nonenergy Minerals Management

Impacts on riparian areas and wetlands would be reduced under the Proposed Plan, compared with Alternative A. PHMA would be closed to new leasing for nonenergy minerals. Although expanding existing nonenergy leases would be considered in PHMA, use of the avoid, minimize, and apply compensatory mitigation strategy for nonenergy minerals management under the Proposed Plan would benefit riparian areas and wetlands, compared with Alternative A (refer to discussion for *Fluid Minerals Management*, above).

Impacts from Minerals Split-estate Management

Impacts on riparian areas and wetlands would be reduced under the Proposed Plan, compared to Alternative A. Application of appropriate measures (depending on status of the split-estate) to reduce impacts would result in fewer acres of riparian habitats being directly or indirectly impacted by mineral development. Where possible, the avoid, minimize, and apply compensatory mitigation strategy would also be applied, resulting in positive effects on riparian areas and wetlands (refer to discussion for *Fluid Minerals Management*, above).

Impacts from Comprehensive Travel and Transportation Management

Direct and indirect impacts of roads on riparian areas and wetlands would be reduced under the Proposed Plan, compared to Alternative A. Depending on status of travel management plans, a number of actions designed to limit impacts of both new and existing roads would reduce direct and indirect adverse impacts on riparian habitats from the following:

- Sediment loading
- Surface flow alteration
- Loss of vegetation cover
- Channel adjustments, including incision and draining of water tables

Under the Proposed Plan, applying the avoid, minimize, and compensatory mitigation strategy in PHMA and GHMA and incorporating RDFs, consistent with applicable law, into implementation actions for all habitat types (PHMA, GHMA, and OHMA) would benefit more acres of riparian areas and wetlands. Adverse impacts from disturbance would be reduced, while riparian habitats could be enhanced through off-site mitigation.

Impacts from Recreation Management

Restricting special recreation or use permits in PHMA and GHMA and construction of recreation facilities in GRSG habitat would result in less direct and indirect impact on riparian areas and wetlands under the Proposed Plan than under Alternative A. Although managed recreation can reduce impacts on riparian systems (see *Impacts from Recreation Management*, *Nature and Type of Effects*, *Riparian Areas and Wetlands*, **Section 4.6.2**), overall reductions in recreation and facilities in GRSG habitat would result in less disturbance to riparian habitats and their associated uplands. Disturbance from recreation can compact soil, reduce vegetation cover, increase erosion, and allow invasive weeds to become established.

Impacts from Special Designations Management

Under The Proposed Plan, incorporating management actions or RDFs (consistent with applicable law) for PHMA, GHMA, and OHMA in the 29 existing ACECs would benefit riparian areas and wetlands, compared to Alternative A. In the existing ACECs, the management prescriptions, whether proposed GRSG or existing ACEC, the more restrictive would take precedence. This would result in less disturbance and more enhancement of riparian areas compared to Alternative A.

Impacts from Tribal Interests Management

Impacts would be the same as for Alternative A.

Impacts from Predation Management

Planned actions for predator management under the Proposed Plan would not appreciably affect riparian areas and wetlands.

Impacts from Climate Change Guidance

Under the Proposed Plan, condition and trend of riparian areas and wetlands would improve, compared to Alternative A. Currently, guidance for climate change is limited to incorporating these effects into current NEPA documents.

The Proposed Plan includes a more comprehensive approach to addressing and understanding climate change at a landscape level. The following planned actions would collectively and indirectly benefit riparian habitats in GRSG habitat:

- Sharing and monitoring information across jurisdictional boundaries
- Adopting a landscape approach to identifying and treating environmental stressors
- Prioritizing treatment areas based on concepts of resiliency and resistance
- Taking into consideration climate change-related impacts on management programs

As the planning area becomes predictably drier and warmer, managing for healthy riparian systems will become increasingly important. Under the Proposed Plan, actions that target watershed health would promote both resiliency and resistance in riparian ecosystems over the long term.

Impacts from Mitigation Guidance

Both condition and trend of riparian areas and wetlands in GRSG habitat would improve under the Proposed Plan, compared to Alternative A. The Proposed Plan provides for a landscape-level approach to achieving a net conservation gain for GRSG habitat by avoiding, minimizing, and compensating for impacts. No such comprehensive strategy currently exists under Alternative A.

The following components of mitigation guidance under the Proposed Plan would collectively, directly, and indirectly benefit riparian habitats in the planning area:

- Establishing a GRSG conservation team
- Developing a regional mitigation strategy
- Including GRSG mitigation in the NEPA process
- Forming a third-party system to administer compensatory mitigation funds

Because of the importance of riparian areas and wetlands as late summer brood-rearing habitat, these areas would be targeted for improvement by developing compensatory mitigation projects. In addition, many riparian habitats, especially lotic systems, transect jurisdictional and landownership boundaries, while of riparian ecosystem functionality is often tied to watershed health.

Impacts from Monitoring Guidance

The comprehensive monitoring strategy provided for under the Proposed Plan would result in more focused and effective management of riparian areas and wetlands than under Alternative A. Currently, monitoring, tracking, and reporting protocols for riparian habitats are inconsistent or lacking across the planning area. In addition, there are no specific mandates to adjust management strategies based on the results of monitoring.

Adopting a regional mitigation strategy under the Proposed Plan would not only satisfy agency policy requirements but would also address the monitoring and adaptive management components identified in various GRSG conservation strategies.

The following components of the Proposed Plan would collectively provide for effective and focused management of riparian habitats:

- Standardization of monitoring protocols
- Development of a system to monitor and track implementation and effectiveness of planning decisions
- Implementation of adaptive management strategies based on results of monitoring

Data on trends would be available at regional scales, while site-specific monitoring tied to GRSG habitat objectives would allow for adjustments in management prescriptions. Both factors would contribute to improving effectiveness of management actions or decisions on improving and understanding condition and trend of riparian areas and wetlands across the planning areas.

Impacts from Adaptive Management Guidance

The condition of riparian areas and wetlands in the planning area would improve under the Proposed Plan, compared to Alternative A. Currently, changes in management of riparian habitats based on monitoring are not consistently applied across the planning area. Many areas remain degraded although information exists to indicate a change in management.

The following strategies and actions proposed under the Proposed Plan would collectively focus and prioritize effective management on riparian areas and wetlands in the planning area:

- Establishing hard and soft triggers with habitat components
- Requiring effectiveness monitoring
- Using a mitigation strategy, such as the Conservation Credit System, in consultation with the SETT or other mitigation program

Because riparian habitats are so important for brood rearing, these measures would better identify both problems and solutions and, would ultimately result in a more accelerated pace for restoration and improvement than currently exists.

4.7 SPECIAL STATUS SPECIES

Implementing the management actions for GRSG described in **Table 2-15**, Description of Alternative Actions would have mostly negligible or beneficial impacts on varying degrees on other special status species and, therefore, impacts from each alternative are not discussed separately in detail. For analysis to Forest Service Sensitive Species and Management Indicator Species see Forest Service Biological Evaluation and Management Indicator Species Report (**Appendix P**).

Most of the management actions for GRSG under the alternatives would be beneficial for the majority of sensitive species inhabiting the planning area. The possible exception would be species that require pinyon and/or juniper woodlands for at least part of their life cycle requirements. Pinyon and/or juniper woodlands include pure to nearly pure stands of single-leaf pinyon pine and any of four species of junipers – Utah, Western, Rocky Mountain, or California (NDOW 2013). Physical features of pinyon and/or juniper woodlands are highly variable, even in a single mountain range. Pinyon and/or juniper woodlands on unproductive soils provide a variety of sheltering functions for wildlife that range from hiding cover to cavities and nest sites for birds, bats and small mammals. As an evergreen cover, such habitat provides important thermal protection for wildlife during winter and shelter from the summer's intense sun.

Two critical services of pinyon and/or juniper habitat to wildlife are structure and the pinyon nut crop. Ferruginous hawks exploit pinyon and/or juniper woodlands by relying on older trees of sufficient size and structure to support their large nest platforms, but these trees must be located at the lower edge of the forest or on upper slopes of drainages where they provide a long view of the surrounding, open sagebrush expanses where prey dwell. For birds and bats in particular, pinyon and/or juniper woodlands provide structure for nesting and roosting, and locations for foraging that would otherwise be missing from the mid-elevation cold desert were it is dominated by shrubs. Pinyon Jays and small mammals are strongly tied to the annual pinyon nut crop.

The BLM and the Forest Service acknowledge the requirements of pinyon and/or juniper obligate species may be contradictory to the restoration of sagebrush habitat for GRSG, but management decisions would need to be made

on a more local case-by-case basis and therefore is not further discussed in this programmatic document.

4.8 WILD HORSES AND BURROS

4.8.1 Methods and Assumptions

Indicators

Indicators of impacts on wild horse and burro management are as follows:

- Changes to HMAs/WHBTs AMLs in GRSG habitat.
- Changes in HMAs/WHBTs management to achieve other resource program objectives in GRSG habitat.
- Changes in ability to provide long-term management of wild horses and burros in HMAs/WHBTs due to changes in forage availability, and sufficient volume, quality and distribution (location) of water sources.

Assumptions

The analysis includes the following assumptions:

- Designated HMAs/WHBTs to meet the yearlong habitat needs and to achieve and maintain a designated AML and achieve a thriving natural ecological balance (TNEB).
- Wild horses and burros are dependent on the herbaceous component of a shrub/grass plant community. Encroachment of shrubs or pinyon and/or juniper onto established range lands are adverse, 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 and burro distribution. Water developments can improve wild horse and burro distribution. Furthermore, man-made water developments that employ some type of mechanical device (e.g., windmill and electric pump) can fail and cause horses to go without or go elsewhere for water.
- Fences and other disturbances can restrict wild horse and burro movement and access. Fences are sometimes necessary to restrict wild horse and burro distribution to areas inside HMAs/WHBTs or to protect sensitive resources in HMAs/WHBTs.
- While wild horses and burros may be found on lands outside HMAs/WHBTs, these areas have no forage allocated to wild horses

and burros and the BLM and the Forest Service have no authority to manage (except to remove) wild horses and burros outside of established HMAs and WHBTs.

- Wild horse and burro gather scheduling is a product of a national priority and budget process. Factors affecting gather priorities include determinations of excess animals, animal health issues, range condition, annual appropriations, litigation and court orders, emergency situations (e.g., disease, weather, or fire), availability of contractors, adoption market, and holding space availability for excess wild horses and burros.
- Population growth suppression (such as fertility control agents, sterilization, and sex ratio adjustments) can aid in population growth control but periodic gathers are still necessary to remove excess animals.
- Wild horse and burro distribution will and can vary by season, climatic conditions, water and forage availability, and population size.
- Population surveys will be completed every 2-3 years in order to maintain current population projections in GRSG habitat and to identify population trends and distribution.
- Intensive livestock grazing management strategies (scheduled pasture rotations) that involve project infrastructure (fences) are generally not appropriate for long-term wild horse management.

4.8.2 Nature and Type of Effects

In the sub-region, all BLM and Forest Service districts manage wild horses and burros in established HMAs (BLM) or WHBTs (Forest Service). Most HMAs or WHBTs contain GRSG habitat in a sagebrush vegetation community. Overall management direction is to manage for healthy populations of wild horse and burros to achieve a thriving natural ecological balance with respect to wildlife, livestock use, and other multiple uses. All HMAs/WHBTs are managed to achieve and maintain AML. Initially, AML is established in LUPs at the outset of planning and is adjusted based on monitoring data throughout the life of the plan. Priorities for gathering excess wild horses and burros to achieve and maintain AML are based on population inventories, resource monitoring objectives, gather schedules, holding space availability, and budget. Gathers are also conducted in emergency situations when the health of the population is at risk due to lack of forage or water and in some situations, wildland fire. Current direction for prioritizing wild horse and burro gathers for achieving and maintaining AML is not based on GRSG habitat needs, although this is implicit in the Congressional directive to maintain a thriving natural ecological balance and to protect wildlife species which inhabit such lands, particularly endangered and threatened wildlife species. Under the No Action Alternative, there are no goals, objectives, or management actions specifically identified in the management framework for the Wild Horse and Burro program.

Implementing management for the protection of GRSG generally involves reducing or otherwise restricting land uses and activities that could potentially reduce forage and water availability or disturb a wild horse and burro population which may necessitate the need to adjust the established AML in order to meet GRSG habitat protection. For example, mineral extraction, recreation and construction activities in ROW grants all may reduce forage availability, result in disturbance or prohibit the ability of wild horses and/or burros to move freely across HMAs/WHBTs. Protecting areas from these activities for the purpose of protecting GRSG would also protect forage for wild horse and burros and limit disturbance (human and surface). Impacts could occur to wild horse and burros and the ability to support AMLs when management options for HMAs/WHBTs are restricted. For example, establishment of priority for gather operations in PHMA could put HMAs/WHBTs that do not contain PHMA at risk for overpopulation; however, provisions under this plan 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 established AML.

Implementing management for the following resources would have negligible or no impact on wild horse and burro management, and are therefore not discussed in detail: air quality, visual resources, cultural resources, ACECs, socioeconomics, climate change, recreation, comprehensive travel and transportation management and tribal interests.

4.8.3 Impacts Common to All Alternatives

Impacts from Wild Horse and Burro Management

Under all alternatives, with the exception of Alternative F, management actions for wild horses and burros would not result in direct changes to HMA/WHBT status or designation, to established AMLs, or acreage designated as HMAs/WHBTs. Impacts under all alternatives, with the exception of Alternative F, would be limited to any future changes that may result in AML and/or acreage adjustment as well as reconsideration of HMA/WHBT designations that are based on achievement of GRSG habitat objectives (**Table 2-2**) for improving habitat conditions, as described in further detail below.

Wild horse and burro grazing has similar impacts as livestock grazing in their effect on soils, vegetation health, species composition, water, and nutrient availability by consuming vegetation, redistributing nutrients and seeds, trampling soils and vegetation, and disrupting microbial systems as identified in Connelly 2004.

Use of contraceptives and other population growth suppression to manage wild horse and burro numbers would be implemented to assist in the achievement and maintenance of AML.

4.8.4 Alternative A

Impacts from GRSG Management

Under Alternative A, the impacts on wild horse and burro management would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. HMAs in PHMA and GHMA would receive priority for removal of excess wild horses and burros per WO Instruction Memorandum 2012-043. Prioritizing wild horse and burro gathers to those HMAs/WHBTs and areas outside of established boundaries that overlap GRSG habitat could impact population management activities in non-GRSG HMAs/WHBTs.

Impacts from All Other Resources of Concern

Under Alternative A, the impacts on wild horse and burro management from all other resources of concern would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance.

4.8.5 Alternative B

Impacts from GRSG Management

Protections afforded to GRSG and their habitat would benefit wild horses and burros where HMAs/WHBTs overlap with GRSG habitats. However, temporary or long-term management changes to wild horses and burros (e.g., reduction in AML, designation, removals, movement patterns, and forage access) may be necessary to achieve and maintain the desired habitat condition. Alternative B would require more intense management when compared to Alternative A.

Impacts from Riparian Areas, Wetlands, and Water Resources Management

Use of management prescriptions to conserve, enhance, or restore riparian areas and wet meadows in GRSG habitat could also benefit wild horses and burros. Management techniques such as fencing could limit wild horse and burro access to riparian areas and reduce water availability resulting in potential need for reduction of wild horse and burro AMLs in an HMA/WHBT. Overall impacts would be similar to Alternative A.

Impacts from Vegetation and Soils Management

Allowance of vegetation treatments designed to conserve, enhance, or restore GRSG habitat would also benefit wild horses and burros. However, temporary or long-term management changes to wild horses and burros (e.g., reduction in AML, designation, removals, movement patterns, and forage access) may be

necessary to achieve and maintain the desired project objectives. Alternative B would require more intense management when compared to Alternative A.

Impacts from Livestock Grazing Management

Managing livestock grazing to protect and maintain priority GRSG habitat would benefit wild horses and burros where HMAs/WHBTs overlap these habitats. Allowing management treatments designed to conserve, enhance, or restore GRSG habitat that benefit livestock would also benefit wild horses and burros. Modifying or eliminating livestock watering sites could reduce water availability, resulting in the potential need for reducing wild horse and burro AMLs in an HMA/WHBT. Overall impacts would be similar to Alternative A.

Impacts from Fire and Fuels Management

Fuels projects that protect existing sagebrush ecosystems and associated GRSG habitat would benefit wild horses and burros where HMAs/WHBTs overlap with these habitats. However, temporary or long-term management changes to wild horses and burros (e.g., reduction in AML, designation, removals, movement patterns, and forage access) may be necessary to achieve and maintain the desired project objectives.

Prioritizing fire suppression activities to conserve priority GRSG habitat would also benefit wild horse and burro habitat.

Alternative B would require more intensive management when compared to Alternative A.

Impacts from Wild Horse and Burro Management

Managing wild horse and burro populations and their habitat to protect and maintain GRSG habitat could impact wild horses and burros whose HMAs/WHBTs overlap with these habitats. Prioritizing wild horse and burro gathers to those HMAs/WHBTs and areas outside of established boundaries that overlap priority GRSG habitat could impact population management activities in non-GRSG HMAs/WHBTs. Modification or elimination of watering sites in order to conserve GRSG habitat could reduce water availability resulting in potential need for reduction of wild horse and burro AMLs in a HMA/WHBT. Prioritizing the evaluation of AMLs and completing land health assessments may result in need for the reduction of wild horse and burro AMLs in and outside HMA/WHBT in order to achieve GRSG habitat objectives. Alternative B would require more intensive management when compared to Alternative A.

Impacts from Leasable Minerals Management

Leasing and surface occupancy restrictions to protect and maintain priority GRSG habitat along with reduction of disturbance (human and surface) would benefit wild horses and burros whose HMAs/WHBTs overlap with these habitats. Alternative B would result in reduced disturbance i.e. vegetation removal when compared to Alternative A.

Impacts from Locatable Minerals Management

Withdrawals of priority GRSG habitat would benefit wild horses and burros where HMAs/WHBTs overlap with these habitats. Alternative B would result in reduced disturbance i.e. vegetation removal when compared to Alternative A.

Impacts from Salable Minerals Management

Closures of priority GRSG habitat would benefit wild horses and burros where HMAs/WHBTs overlap with these habitats. Alternative B would result in reduced disturbance i.e. vegetation removal when compared to Alternative A.

Impacts from Land Uses and Realty Management

Implementation of exclusion and avoidance actions as well as limiting surface disturbance in order to protect and maintain priority GRSG habitat would benefit wild horses and burros where HMAs/WHBTs overlap with these habitats. Retention of priority GRSG habitat would also benefit wild horse and burros. Alternative B would result in reduced disturbance i.e. vegetation removal when compared to Alternative A.

Impacts from Renewable Energy Management

Implementation of exclusion and avoidance actions as well as limiting surface disturbance in order to protect and maintain priority GRSG habitat would benefit wild horses and burros where HMAs/WHBTs overlap with these habitats. Retention of priority GRSG habitat would also benefit wild horse and burros. Alternative B would result in reduced disturbance i.e. vegetation removal when compared to Alternative A.

4.8.6 Alternative C

Impacts from GRSG Management

Protections afforded to GRSG and their habitat would benefit and impact wild horse and burro populations. However, temporary or long-term management changes to wild horses and burros (e.g., reduction in AML, designations, removals, movement patterns, and forage access) may be necessary to achieve and maintain the desired habitat condition. Alternative C would require more intensive management when compared to Alternative A.

Impacts from Riparian Areas, Wetlands and Water Resources Management

Passive restoration of riparian areas would benefit wild horse and burro populations through potential increased water availability and improved habitat condition. Establishing riparian stubble height limitations could require reducing utilization levels which would likely result in need for reduction of the wild horse and burro numbers and associated AMLs for the HMA/WHBT. Elimination of livestock water developments could reduce water availability in an HMA/WHBT resulting in potential need for reduction of the wild horse and burro AML. Alternative C would require more intensive management when compared to Alternative A.

Impacts from Vegetation and Soils Management
Under Alternative C impacts would be same as Alternative A.

Impacts from Livestock Grazing Management
Eliminating livestock grazing in GRSG habitat to protect and maintain occupied GRSG habitat would benefit wild horses and burros where HMAs and WHBTs overlap these habitats. Establishing upland and riparian stubble height requirements for reducing utilization levels would likely result in the need for reducing wild horse and burro AML for the HMA and WHBT. Eliminating livestock watering sites could reduce water availability, resulting in potential need for reducing the AML in an HMA or WHBT. Alternative C would require more intensive management than would Alternative A.

Impacts from Fire and Fuels Management
Under Alternative C impacts would be same as Alternative A.

Impacts from Wild Horse and Burro Management
Evaluation of AMLs and completing land health assessments may result in need to reduce wild horse and burro populations in an HMA/WHBT as well as outside their boundaries in order to achieve GRSG habitat needs. Alternative C would not allow the use of helicopters for gathers and would lead to decreased gather efficiency, resulting in wild horse and burro populations remaining in excess of established AMLs. Establishing upland and riparian stubble height requirements that require reducing utilization levels would likely result in need for reduction of wild horse and burro AML for the HMA/WHBT. Alternative C would require more intensive management when compared to Alternative A.

Impacts from Leasable Minerals Management
Precluding leasing of occupied GRSG habitat would benefit wild horses and burros where HMAs/WHBTs overlap with these areas. Alternative C would result in reduced disturbance i.e. vegetation removal when compared to Alternative A.

Impacts from Locatable Minerals Management
Withdrawals and targeted restoration in occupied GRSG habitat would benefit wild horses and burros where HMAs/WHBTs overlap with these areas. Alternative C would result in reduced disturbance i.e. vegetation removal when compared to Alternative A.

Impacts from Salable Minerals Management
Closures in occupied GRSG habitat would benefit wild horses and burros where HMAs/WHBTs overlap with these areas. Alternative C would result in reduced disturbance i.e. vegetation removal when compared to Alternative A.

Impacts from Land Uses and Realty Management
Prohibiting new ROW corridors in ACECs and occupied habitat would benefit wild horses and burros where HMAs/WHBTs overlap with these habitats.

Retention of all BLM-administered lands in ACECs and occupied GRSG habitat would also benefit wild horse and burros. In addition, not allowing for any new ROWs/SUAs would also benefit wild horse and burros because Alternative C would result in reduced disturbance i.e. vegetation removal when compared to Alternative A.

Impacts from Renewable Energy Management

Prohibiting new site development and associated ROW corridors in ACECs and occupied habitat would benefit wild horses and burros where HMAs/WHBTs overlap with these areas. Alternative C would result in reduced disturbance i.e. vegetation removal when compared to Alternative A.

4.8.7 Alternative D

Impacts from GRSG Management

Protections afforded to GRSG and its PHMA or GHMA habitats would benefit wild horses and burros where HMAs/WHBTs overlap these areas. However, temporary or long-term management changes to wild horses and burros (e.g., reduction in AML, designations, removals, movement patterns, and forage access) may be necessary to achieve and maintain the desired habitat condition. Alternative D would require more intensive management when compared to Alternative A.

Impacts from Riparian Areas, Wetlands, and Water Resources Management

Conservation and enhancement of riparian areas would benefit wild horse and burro populations through improved habitat condition. Management techniques such as fencing could also limit wild horse and burro access to riparian areas and reduce water availability resulting in potential need for reduction of wild horse and burro AMLs in an HMA/WHBT. Alternative D would require more intensive management when compared to Alternative A.

Impacts from Vegetation and Soils Management

Evaluation and prioritization of GRSG habitat restoration treatments identified for PHMA or GHMA habitat would benefit wild horse and burro habitat. Associated landscape-scale management and surface disturbance restrictions would also benefit wild horse and burro habitat. However, temporary or long-term management changes to wild horses and burros (e.g., reduction in AML, designations, removals, movement patterns, and forage access) may be necessary to achieve and maintain these projects. Alternative D would require more intensive management when compared to Alternative A.

Impacts from Livestock Grazing Management

Managing livestock grazing to protect and maintain PHMA and GHMA would benefit wild horses and burros where HMAs and WHBTs overlap with these habitats. Allowing management treatments designed to conserve, enhance, or restore PHMA and GHMA that benefit livestock would also benefit wild horses

and burros. Authorizing new or modifying existing livestock watering sites that benefit or conserve PHMA and GHMA habitats would also benefit wild horses and burros. Eliminating water sources that may be impacting PHMA and GHMA habitats could reduce water availability, resulting in potential need for reducing wild horse and burro AML in an HMA or WHBT. Alternative D would require more intensive management than Alternative A.

Impacts from Fire and Fuels Management

Fuels projects that protect and restore existing sagebrush ecosystems and associated PHMA and GHMA habitats would benefit wild horses and burros where HMAs/WHBTs overlap with these habitats. However, temporary or long-term management changes to wild horses and burros (e.g., reduction in AML, designations, removals, movement patterns, and forage access) may be necessary to achieve and maintain these projects. Alternative D would require more intensive management when compared to Alternative A.

Prioritization of fire suppression activities to protect and conserve PHMA and GHMA habitats would also benefit wild horse and burro habitat by protecting/preserving habitat.

Impacts from Wild Horse and Burro Management

Managing wild horse and burro populations and their habitat to achieve GRSG habitat objectives in PHMA and GHMA habitats could impact wild horses and burros whose HMAs/WHBTs overlap with these habitats. Prioritizing wild horse and burros gathers to those HMAs/WHBTs as well as outside of these boundaries that overlap PHMA and GHMA habitats could impact population management activities in non-GRSG HMAs/WHBTs. Evaluation of AMLs and land health assessments may result in need for the reduction of wild horse and burro AML in an HMA/WHBT in order to achieve GRSG habitat objectives (**Table 2-2**). Alternative D would require more intensive management when compared to Alternative A.

Impacts from Leasable Minerals Management

Leasing and surface occupancy restrictions to protect and maintain PHMA and GHMA habitats along with reduction of disturbance (human and surface) would benefit wild horses and burros whose HMAs/WHBTs overlap with these habitats. Alternative D would result in reduced disturbance i.e. vegetation removal when compared to Alternative A.

Impacts from Locatable Minerals Management

Management restrictions that conserve maintain and enhance PHMA and GHMA habitats would benefit wild horses and burros. Alternative D would result in reduced disturbance i.e. vegetation removal when compared to Alternative A.

Impacts from Salable Minerals Management

Management restrictions that conserve maintain and enhance PHMA and GHMA habitats would benefit wild horses and burros. Alternative D would result in reduced disturbance i.e. vegetation removal when compared to Alternative A.

Impacts from Land Uses and Realty Management

Implementation of exclusion and avoidance actions as well as limiting surface disturbance in order to protect and maintain PHMA and GHMA habitats would benefit wild horses and burros where HMAs/WHBTs overlap with these habitats. Retention of these habitats would also benefit wild horse and burros. Alternative D would result in reduced disturbance i.e. vegetation removal when compared to Alternative A.

Impacts from Renewable Energy Management

Implementation of exclusion actions in order to protect and maintain PHMA and GHMA habitats would benefit wild horses and burros where HMAs/WHBTs overlap with these habitats. Alternative D would result in reduced disturbance i.e. vegetation removal when compared to Alternative A.

4.8.8 Alternative E

Impacts from GRSG Management

Protections afforded to GRSG and their habitat would benefit wild horses and burros where HMAs and WHBTs overlap SGMA. Temporary or long-term management changes to wild horses and burros (e.g., reduction in AML, designations, removals, movement patterns, and forage access) may be necessary to achieve and maintain the desired habitat condition. Alternative E would require more intensive management than would Alternative A.

Impacts from Riparian Areas, Wetlands, and Water Resources Management

Use of management prescriptions to conserve, enhance, or restore riparian areas and wet meadows in SGMA could also benefit wild horses and burros. Such management techniques as fencing could also limit wild horse and burro access to riparian areas and would reduce water availability. This would result in the potential need for reducing wild horse and burro AMLs in an HMA or WHBT. Alternative E would require more intensive management than Alternative A.

Impacts from Vegetation and Soils Management

Under Alternative E, the impacts on wild horse and burro management would continue to be the same as those identified in the individual LUP documents. Reducing herd size to a level to expedite recovery time and enhance habitat restoration (**Table 2-2**) could impact herd sustainability and diversity. Alternative E would require more intensive management than would Alternative A.

Impacts from Livestock Grazing Management
Under Alternative E impacts would be same as Alternative A.

Impacts from Fire and Fuels Management
Fire management activities that protect, maintain, and improve sagebrush habitat would benefit wild horses and burros whose HMAs/WHBTs overlap these habitats. Alternative E would require more intensive management than would Alternative A.

Prioritizing fire suppression to conserve GRSG habitat in SGMA would also benefit wild horse and burro habitat. Herd sustainability and diversity could be temporarily impacted by significantly reducing and temporarily removing or excluding all wild horses and burros from burned areas where HMAs and WHBTs overlap GRSG core, priority, and general management areas. This would expedite recovery time and enhance restoration.

Impacts from Wild Horse and Burro Management
Managing wild horse and burro populations and their habitat to achieve GRSG habitat objectives (**Table 2-2**) in SGMA could impact wild horses and burros whose HMAs/WHBTs overlap these habitats. Prioritizing wild horse and burro gathers and suppressing population growth in those HMAs and WHBTs, as well as outside of these boundaries that overlap SGMA habitats, could impact population management activities in non-GRSG HMAs and WHBTs. Evaluating AMLs and land health assessments may require reducing wild horse and burro AML in an HMA or WHBT in order to achieve GRSG habitat objectives (**Table 2-2**). Evaluating HMA and WHBT designations in SGMA may require reconsidering wild horse and burro HMA and WHBT designation in order to achieve GRSG habitat objectives. Alternative E would require more intensive management than would Alternative A.

Impacts from Leasable Minerals Management
Mining and mineral exploration that protects and maintains sagebrush habitat in SGMA would benefit wild horses and burros where HMAs and WHBTs overlap these habitats. Using the Conservation Credit System may result in additional habitat restoration in HMAs and WHBTs. Alternative E would require more intensive management than would Alternative A.

Impacts from Locatable Minerals Management
Mining and mineral exploration that protects and maintains sagebrush habitat in SGMA would benefit wild horses and burros where HMAs and WHBTs overlap these habitats. Using the Conservation Credit System may result in additional habitat restoration in HMAs and WHBTs. Alternative E would require more intensive management than would Alternative A.

Impacts from Salable Minerals Management
Mining and mineral exploration that protects and maintains sagebrush habitat in SGMA would benefit wild horses and burros where HMAs and WHBTs overlap

these habitats. Using the Conservation Credit System may result in additional habitat restoration in HMAs and WHBTs. Alternative E would require more intensive management than would Alternative A.

Impacts from Land Uses and Realty Management

Implementing avoidance actions for locating ROWs and facilities in order to protect and maintain GRSG habitat in SGMA would benefit wild horses and burros where HMAs/WHBTs overlap these habitats. Using the Conservation Credit System may result in additional habitat restoration in HMAs and WHBTs. Alternative E would require more intensive management than would Alternative A.

Impacts from Renewable Energy Management

Implementing avoidance actions and limiting disturbances (human and surface) in SGMA would benefit wild horses and burros whose HMAs or WHBTs overlap these areas. Using the Conservation Credit System may result in additional habitat restoration in HMAs and WHBTs. Alternative E would require more intensive management than would Alternative A.

4.8.9 Alternative F

Impacts from GRSG Management

Protections afforded to GRSG and their habitat would benefit wild horses and burros where HMAs/WHBTs overlap with PHMA or GHMA. However, the long-term management change, i.e. 25 percent reduction in HMA/WHBT AMLs would require prioritization of subsequent NEPA to implement these reductions. Alternative F would require more intensive management when compared to Alternative A. However, temporary or long-term management changes to wild horses and burros (e.g., reduction in AML, designations, removals, movement patterns, and forage access) may be necessary to achieve and maintain the desired habitat condition.

Impacts from Riparian Areas, Wetlands and Water Resources Management

Use of management prescriptions to conserve, enhance, or restore riparian areas and wet meadows in GRSG habitat could also benefit wild horses and burros. Modification or elimination of livestock watering sites could reduce water availability resulting in potential need for reduction of the wild horse and burro AML in an HMA/WHBT. Alternative F would require more intensive management when compared to Alternative A.

Impacts from Vegetation and Soils Management

Vegetation treatments designed to conserve, enhance, or restore GRSG habitat would also benefit wild horses and burros. Alternative F would require more intensive management when compared to Alternative A. Temporary or long-term management changes to wild horses and burros (e.g., reduction in AML,

designations, removals, movement patterns, and forage access) may be necessary to achieve and maintain these projects.

Impacts from Livestock Grazing Management

Managing livestock grazing to protect and maintain priority GRSG habitat would benefit wild horse and burro habitats. Establishing upland and riparian utilization level limits and prioritizing the completion of land health assessments could require reducing the wild horse and burro AML in an HMA or WHBT in order to achieve GRSG habitat needs (**Table 2-2**). Eliminating or modifying livestock watering sites could reduce water availability, resulting in the potential need to reduce the wild horse and burro AML in an HMA or WHBT. Alternative F would require more intensive management than would Alternative A.

Impacts from Fire and Fuels Management

Fuels treatments that protect existing sagebrush ecosystems and associated priority GRSG habitat would benefit wild horses and burros where HMAs/WHBTs overlap with these habitats. However, temporary or long-term management changes to wild horses and burros (e.g., reduction in AML, removals, movement patterns, and forage access) may be necessary to achieve and maintain the desired project objectives. Alternative F would require more intensive management when compared to Alternative A.

Prioritizing fire suppression activities to protect and conserve priority GRSG habitat would also benefit wild horse and burro habitat.

Impacts from Wild Horse and Burro Management

Managing wild horse and burro populations and their habitat to protect and maintain priority GRSG habitat could impact wild horses and burros whose HMAs/WHBTs overlap with these occupied habitats. While impacts from wild horses and burros would remain, reducing wild horse and burro AMLs by 25 percent would reduce the effects of wild horses and burros, as described under Alternative A. As a result, costs of wild horse and burro management would increase, due to a need for additional wild horse and/or burro gathers for removal and population growth suppression treatment to achieve and maintain the newly established AMLs. Reductions to this level could impact herd sustainability and diversity, which could lead to changes in HMA/WHBT designation and long-term management in these occupied habitats.

Prioritizing wild horse and burro gathers to those HMAs/WHBTs as well as outside their boundaries that overlap priority GRSG habitat could impact population management activities in non-GRSG HMAs/WHBTs.

Modification or elimination of watering sites could reduce water availability resulting in potential need for reduction of the wild horse and burro AML in an HMA/WHBT. More residual grasses and forbs would likely remain in the occupied GRSG habitat that overlaps HMAs/WHBTs. Prioritizing the evaluation of AMLs, HMA/WHBT designations, and completing land health assessments

may result in need for the reduction or elimination of the wild horse and burro AML in an HMA/WHBT in order to achieve GRSG habitat objectives. Alternative F would require more intensive management when compared to Alternative A.

Impacts from Leasable Minerals Management

Leasing and surface occupancy restrictions and closures to protect and maintain priority GRSG habitat along with reduction of disturbance would benefit wild horses and burros whose HMAs/WHBTs overlap with these habitats. Alternative F would result in reduced disturbance i.e. vegetation removal when compared to Alternative A.

Impacts from Locatable Minerals Management

Recommended withdrawals of priority GRSG habitat would benefit wild horses and burros and their habitat. Alternative F would result in reduced disturbance i.e. vegetation removal when compared to Alternative A.

Impacts from Salable Minerals Management

Closures of priority GRSG habitat would benefit wild horses and burros and their habitat. Alternative F would result in reduced disturbance i.e. vegetation removal when compared to Alternative A.

Impacts from Land Uses and Realty Management

Implementation of exclusion and avoidance actions as well as limiting disturbance (human and surface) in order to protect and maintain priority GRSG habitat would benefit wild horses and burros whose HMAs/WHBTs overlap with these habitats. Retention of priority GRSG habitat would also benefit wild horse and burros. Alternative F would result in reduced disturbance i.e. vegetation removal when compared to Alternative A.

Impacts from Renewable Energy Management

Closure of priority GRSG habitat would benefit wild horses and burros where HMAs/WHBTs overlap with these habitats. Alternative F would result in reduced disturbance i.e. vegetation removal when compared to Alternative A.

4.8.10 The Proposed Plan

The Proposed Plan would require a 3 percent disturbance cap on human surface-disturbing activities in PHMA (see **Appendix F**). It would incorporate RDFs consistent with applicable law in PHMA, GHMA, and OHMA and would also require all human disturbances to result in a net conservation gain for GRSG and their habitat. Lek buffers would also be required (see **Appendix B**).

Collectively, these GRSG conservation management actions would increase mitigation requirements for land use authorizations. This would result in more complex project designs, could exclude infrastructure placement in the most cost-effective locations, and would result in overall greater development costs. A corresponding effect could be a reduction in the number of authorization

applications received for activities in PHMA and longer, more complicated review periods for those that are proposed in PHMA.

Impacts from GRSG Management

Protections afforded to GRSG and their PHMA or GHMA habitats would benefit wild horses and burros where HMAs/WHBTs overlap these areas. This is because, compared to Alternative A, habitat conditions and forage would be improved, there would be less impact from human disturbances, and wildfire would be strategically managed in habitats. However, temporary or long-term management changes to wild horses and burros may be necessary to achieve and maintain the desired habitat condition. Examples are reducing AML, designations, removals, movement patterns, and forage access. The Proposed Plan, when compared to Alternative A, would require more intensive management, particularly in the boundaries of the SFA.

Impacts from Riparian Areas, Wetlands, and Water Resources Management

Conservation and enhancement of riparian areas would benefit wild horse and burro populations through improved habitat condition. Management techniques, such as fencing, could also limit wild horse and burro access to riparian areas and could reduce water availability, resulting in the potential need to reduce wild horse and burro AMLs in an HMA or WHBT. The Proposed Plan, when compared to Alternative A, would require more intensive management, particularly in the boundaries of the SFA.

Impacts from Vegetation and Soils Management

Evaluating and prioritizing GRSG habitat restoration treatments identified for PHMA or GHMA habitat would benefit wild horse and burro habitat, as would associated landscape-scale management and surface disturbance restrictions. However, temporary or long-term management changes to wild horses and burros may be necessary to achieve and maintain these projects. Examples are reducing AML, designations, removals, movement patterns, and forage access. The Proposed Plan, when compared to Alternative A, would require more intensive management, particularly in the boundaries of the SFA.

Impacts from Livestock Grazing Management

Managing livestock grazing to protect and maintain PHMA and GHMA habitats would benefit wild horses and burros where HMAs and WHBTs overlap these habitats. Allowing management treatments designed to conserve, enhance, or restore PHMA and GHMA habitats that benefit livestock would also benefit wild horses and burros. Authorizing new or modifying existing livestock watering sites that benefit or conserve PHMA and GHMA habitats would benefit wild horses and burros. Eliminating existing water sources that may be identified as impacting PHMA and GHMA habitats could reduce water availability. This could require reducing wild horse and burro AML in an HMA or WHBT. The

Proposed Plan, when compared to Alternative A, would require more intensive management, particularly in the boundaries of the SFA.

Impacts from Fire and Fuels Management

Fuels projects that protect and restore sagebrush ecosystems and associated PHMA and GHMA habitats would benefit wild horses and burros where HMAs/WHBTs overlap these habitats. However, temporary or long-term management changes to wild horses and burros may be necessary to achieve and maintain these projects. Examples are reducing AML, designations, removals, movement patterns, and forage access. The Proposed Plan, when compared to Alternative A, would require more intensive management, particularly in the boundaries of the SFA.

Prioritization of fire suppression to protect and conserve PHMA and GHMA would also benefit wild horse and burro habitat.

Impacts from Wild Horse and Burro Management

Managing wild horse and burro populations and their habitat to achieve GRSG habitat objectives in SFA, PHMA, and GHMA could impact wild horses and burros whose HMAs/WHBTs overlap these habitats. Prioritizing gathers in HMAs would directly and indirectly affect wild horses and burros. The following HMAs fall in SFA: Owyhee, Little Owyhee, Rock Creek, and Massacre Lakes. These HMAs would have the highest priority for gathers each year to achieve and maintain AML. This focused management strategy would ensure that AML is maintained, along with the necessary forage for the wild horses in these HMAs; however, it may increase the number of gathers needed to maintain AML, which could increase the disturbance to the populations and could disrupt herd dynamics. Prioritization could also put HMAs that fall in the lowest priority at risk for overpopulation; however, under this LUPA, provisions would allow for exceptions as needed for herd health-limiting impacts.

Evaluating AMLs and land health assessments could require reducing wild horse and burro AML in an HMA or WHBT in order to achieve GRSG habitat objectives (**Table 2-2**). The Proposed Plan, when compared to Alternative A, would require more intensive management, particularly in the boundaries of the SFA areas.

Under the Proposed Plan, the greatest restrictions on developing other land uses would occur in the HMAs listed above that fall in SFA. While these restrictions would provide for the greatest protection of wild horse and burro forage and water sources and would limit disturbance in SFA, it could push development to areas outside of occupied GRSG habitat. This would increase the disturbance of wild horses and burros in HMAs that fall in these areas.

Impacts from Leasable Minerals Management

Leasing and surface occupancy restrictions to protect and maintain PHMA and GHMA habitats and to reduce disturbance (human and surface) would benefit

wild horses and burros whose HMAs/WHBTs overlap these habitats. The Proposed Plan would reduce vegetation removal, when compared to Alternative A.

Impacts from Locatable Minerals Management

Management restrictions that conserve, maintain, and enhance PHMA and GHMA for locatable minerals would benefit wild horses and burros. This is particularly true in the SFA where there is a recommended withdrawal. The Proposed Plan would reduce vegetation removal, when compared to Alternative A.

Impacts from Salable Minerals Management

Management restrictions that conserve, maintain, and enhance PHMA and GHMA, while meeting the nation's and the state's needs for these minerals would benefit wild horses and burros. The Proposed Plan would reduce vegetation removal, when compared to Alternative A.

Impacts from Land Uses and Realty Management

Implementing avoidance actions for major and minor rights-of-way and limiting surface disturbance to protect and maintain PHMA and GHMA habitats would benefit wild horses and burros where HMAs/WHBTs overlap these habitats. Retaining these habitats would also benefit wild horses and burros. The Proposed Plan would reduce vegetation removal, when compared to Alternative A.

Impacts from Renewable Energy Management

The Proposed Plan would reduce vegetation removal compared to Alternative A. This is because all PHMA and GHMA would be excluded for solar development, PHMA would be excluded for wind development, and GHMA would be an avoidance area. Development would be extremely limited by the requirement for net conservation gain, the application of RDFs, consistent with applicable law, and under 3 percent disturbance cap.

4.9 WILDLAND FIRE AND FIRE MANAGEMENT

4.9.1 Methods and Assumptions

Indicators

Indicators of impacts on wildland fire ecology and management are as follows:

- Alteration of vegetation cover 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.

- Management actions that inhibit a response to wildland fire or appropriate treatments to prevent wildland fire.

Assumptions

The analysis includes the following assumptions:

- Fire is an important functional, natural disturbance in many of the ecological systems found in the planning area.
- A direct relationship exists between fuel characteristics and potential fire intensity and severity. Necessity for fuels treatments would likely increase over the life of this plan.
- There will be increased demand on suppression resources managing wildland fires to protect values at risk.
- It is commonly accepted that fire suppression costs and risk to life and property should be less when wildland fires occur where hazardous fuels have been treated compared with areas where fuels have not been treated.
- As the FRCC is improved over the planning period, there should be movement toward a natural fire regime and a reduced risk of uncharacteristic wildfire. Vegetation would become more resistant and resilient and less likely to lose key ecosystem components after a disturbance.

4.9.2 Nature and Type of Effects

Impacts on fire management result from changes in fire frequency and intensity, and the ability to employ fire-suppression methods, all of which would affect management of fire and related costs in the planning area.

Management actions which improve FRCC will move toward a natural fire regime and a reduced risk of uncharacteristic wildfire. Vegetation would become more resistant and resilient and less likely to lose key ecosystem components after a disturbance. This would benefit firefighter and public safety, as well as decrease fire risk and management costs in the long term. Additionally, treatments aimed to protect natural resources from uncharacteristic wildfire would outweigh the short-term impacts on the landscapes during treatment.

Riparian Areas, Wetlands and Water Resources Management

Riparian areas, wetlands, and water resource management could restrict suppression operations by limiting use of heavy equipment or retardant near streams or riparian areas. Riparian areas also benefit fire management by potentially slowing or stopping a fire growth, and lessening the severity of fires.

Vegetation and Soils Management

Impacts from fuel treatments that are intended to improve, create, or re-establish GRSG habitat would improve FRCC over the planning period; there should be movement toward a natural fire regime and a reduced risk of uncharacteristic wildfire. Vegetation would become more resistant and resilient and less likely to lose key ecosystem components after a disturbance. This would benefit the fire and fuels program in the long term by promoting the most efficient use of fire and fuels management program resources, reduce the size and costs of unplanned ignitions, assist in providing opportunities to stop or slow the spread of the wildfire, provide for greater firefighter safety, allow opportunities to manage unplanned ignitions for resource benefit, reduce the burn area rehabilitation needs and costs, and reduce smoke emissions. Fuel treatments create this benefit by reducing the infestation of invasive annual grasses as well as conifer encroachment that can alter fire size, frequency and intensity (USGS 2006c).

While GRSG restoration will affect FRCC, the area's most likely to benefit GRSG might not relate to the areas that would most likely benefit FRCC and hazardous fuels reduction. Furthermore, landscape patterns that most benefit GRSG may be more prone to wildfire due to lack of disturbance and in early seral areas.

Management actions that increase shrub and cover may result in increased fuel loading, which could increases the intensity of wildland fire.

Restrictions on fuels treatment could impact the ability to control fuels conditions which would result in increased fuel loading, and continuity. This could impact fire and fuels management by increasing the probability of increased fire size, intensity, and frequency. Allowing a range of fuel treatment options provides management flexibility to reduce large fire costs and achieve fire and fuels goals and objectives.

Completed restoration projects may further increase the suppression priority of that area, increasing demands for fire suppression resources. Prioritizing areas for fire suppression can limit management options and increase costs for fire management.

Livestock Grazing Management

Utilizing appropriately managed prescribed grazing treatments would reduce fuels and the potential for fire size, intensity. Discontinuing or reduced grazing strategies may increase fuel loading in the short term. Impacts would vary based on the number of AUMs discontinued or reduced. Grazing restrictions would also reduce the potential for establishment and spread of invasive, nonnative and noxious plants by livestock.

Fire and Fuels Management

Fire management is guided by the 1995 Federal Wildland Fire Management Policy and 2001 Fire Policy update. Fire management responses are also specifically pre-defined as outlined in the Unit Fire Management Plans. Employing minimum impacts suppression tactics would help reduce impacts on other resources during suppression operations. Suppression operations include one or more resource advisors as a standard practice to reduce the potential for adversely impacting high value resources. Implementing fire danger restrictions (e.g., campfire restrictions, smoking and target shooting) would reduce the potential for human caused ignitions.

Impacts from fuel treatments would improve FRCC over the planning period; there should be movement toward a natural fire regime and a reduced risk of uncharacteristic wildfire. Vegetation would become more resistant and resilient and less likely to lose key ecosystem components after a disturbance. This would benefit the fire and fuels program in the long term by promoting the most efficient use of fire and fuels management program resources, reduce the size and costs of unplanned ignitions, assist in providing opportunities to stop or slow the spread of the wildfire, provide for greater firefighter safety, allow opportunities to manage unplanned ignitions for resource benefit, reduce the burn area rehabilitation needs and costs, and reduce smoke emissions. Fuel treatments create this benefit by reducing the infestation of invasive annual grasses as well as conifer encroachment that can alter fire size, frequency and intensity (USGS 2006c).

Public education campaigns through fire prevention programs would serve to reduce the potential of human caused fire ignitions.

Wild Horse and Burro Management

Management of wild horses and burros can impact fire management due to grazing's influence on fine fuels and the potential for fire spread and intensity. A reduction or change in AML can, in turn, increase the fine fuels in site-specific locations.

Climate Change Management

Fire management may be impacted from climate change trends in the planning area. Generally, increased temperature and longer growing seasons may result in more rapid accumulation of fuels in forested and montane shrubland systems (Brown et al. 2004). This increase of fuel loading would increase FRCC departure, effecting the fire size, intensity and severity resulting in an increase in fire suppression costs, fuels treatment planning and implementation.

In the same forested and montane shrublands, climate change may increase the frequency and duration of droughts increasing fire frequency (Brown et al. 2004). The increased temperatures and longer growing season will also support the expansion of invasive annual grasses and forbs. This effect will also increase fire frequency and extent which will then promote the onslaught of invasive

annual grasses. This positive feedback loop of fire and invasive plant species may be the greatest impact on fire management and GRSG (Abatzoglou and Kolden 2011).

Minerals Management (Leasable, Locatable, and Salable)

Effects from development are dependent on the number of facilities constructed and the extent of disturbance footprints. Surface disturbance activities associated with new development increase the potential for invasive species establishment trending FRCCs higher (Gelbard and Belnap 2003). Development would increase the potential human caused ignitions, and an increase in suppression protection priorities (Shlisky et al. 2007). New road construction and maintenance would benefit fire management by providing additional access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Land Uses and Realty Management

Effects from development are dependent on the number of facilities constructed and the extent of disturbance footprints. Surface disturbance activities associated with new development increase the potential for invasive species establishment trending FRCCs higher (Gelbard and Belnap 2003). Development would increase the potential human caused ignitions, and an increase in suppression protection priorities (Shlisky et al. 2007). New road construction and maintenance would benefit fire management by providing additional access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Renewable Energy Management

Effects from development are dependent on the number of facilities constructed and the extent of disturbance footprints. Surface disturbance activities associated with new development increase the potential for invasive species establishment trending FRCCs higher (Gelbard and Belnap 2003). Development would increase the potential human caused ignitions, and an increase in suppression protection priorities (Shlisky et al. 2007). New road construction and maintenance would benefit fire management by providing additional access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Recreation Management

Providing for a trending increase for recreation use on BLM-administered and National Forest System lands would increase public visitation and the potential for human caused fire ignitions. Management of recreation areas would increase fire suppression protection to provide safety and protect recreation values and associated infrastructure. These areas may also require additional fuel treatments to protect areas from wildfire.

Dispersed recreation use such as ATV use, camping, hunting, and hiking increases the potential for human caused fire. Developed recreation areas

would be prioritized for fire suppression to protect human life and property. Recreation use could slow emergency stabilization and rehabilitation efforts post fire and impact vegetation treatments through direct damage to seeded areas.

Roads and trails are one of the main vectors of weed spread, which leads to an increase in FRCC and ecosystems moving away from natural fire regimes (CEC 2012).

Comprehensive Travel and Transportation Management

Transportation and travel management affects fire management in three main ways: 1) by providing access for fire suppression, 2) by providing an avenue for noxious weed and invasive plants spread, and 3) by providing access for increased human activities, which can lead to human-caused fires. Roads and trails that are maintained, repaired, or open for public use generally remain in a passable condition that allows access for fire suppression equipment and manpower, and they can also be used as control lines. This improved access results in faster response times leading to reduced fire size.

Roads and trails are one of the main vectors of weed spread, which leads to an increase in FRCC and ecosystems moving away from natural fire regimes (CEC 2012). This is compounded by open OHV use and increased human use increases the potential for human-caused fire ignition. Similarly, the level and type of recreation permitted can impact fire risk. Increased recreational use may increase the probability of unintentional fire starts from human-caused ignitions and the need for fire suppression.

Implementing management for the following resources would have negligible or no impact on wildfire and fire management and are therefore not discussed in detail: Fish and Wildlife, Cultural Resources, and ACECs.

4.9.3 Alternative A

Impacts from GRSG Management

There are 16,526,000 acres of identified GRSG habitat in this alternative. Under Alternative A, impacts from GRSG would be the same as the current direction for fire management in GRSG habitat on BLM-administered lands provided in WO IM-2014-114 —Sage-Grouse Habitat and Wildland Fire Management. Correlating direction of 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.

Impacts from Riparian Areas, Wetlands and Water Resources Management

All LUPs in the sub-region recognize importance of riparian areas and wetlands and include guidance for protection or enhancement of this resource in PHMA and GHMA. Under this Alternative, Riparian, Wetland and Water resource management impact Fire Management by restricting suppression operations by

limiting use of heavy equipment or retardant near streams or riparian areas. Riparian areas also benefit fire management by potentially slowing or stopping a fire growth, and lessening the severity of fires.

Impacts from Vegetation and Soils Management

Under Alternative A, the impacts from Vegetation and Soils Management would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. Vegetation treatments would continue on BLM-administered lands. Post fire stabilization and rehabilitation treatments would re-establish sagebrush/perennial grass communities in response to wildfire impacts. Other restoration projects implemented would improve sagebrush habitats, including conifer removal where encroaching into GRSG habitats. Vegetation management includes efforts to control invasive species, increase native species, replace vegetation burned in wildfires and reduce hazardous fuels risk in GRSG habitat.

Impacts from Livestock Grazing Management

Under Alternative A, current levels and seasons of use would continue in the planning area, pending completion of land health assessments. Livestock grazing would be available on existing GRSG habitat in the planning area. Construction and maintenance of range improvements would continue under this alternative. Range improvements would be allowed in the planning area when needed to support grazing systems or to improve livestock distribution. This would allow for management options for permittees and lessees when they are needed to alter grazing use to meet rangeland health standards. Examples of range improvements are fences, vegetation treatments, such as those in the Sage Steppe Ecosystem Restoration Strategy Final EIS (BLM 2008f), and water developments.

Impacts from Fire and Fuels Management

Under Alternative A, fire management is guided by the 1995 Federal Wildland Fire Management Policy and 2001 Fire Policy update. Current direction for fire management in GRSG habitat on BLM-administered lands is provided in WO IM-2014-114—Sage-Grouse Habitat and Wildland Fire Management. Correlating direction of 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. Wildland fire management in the planning area is directed by an interagency effort between BLM, Forest Service, and other federal, state, and local agencies.

Fire management responses are also specifically pre-defined as outlined in Unit Fire Management Plans. Employing minimum impacts suppression tactics would help reduce impacts on other resources during suppression operations. Suppression operations include one or more resource advisors as a standard practice to reduce the potential for adversely impacting high value resources.

Implementing fire danger restrictions (e.g., campfire restrictions, smoking and target shooting) would reduce the potential for human caused ignitions.

Implementing fuel treatments would reduce fire intensities and spread providing for public safety and protecting property and natural resources.

Public education campaigns through fire prevention programs would serve to reduce the potential of human caused fire ignitions.

Impacts from Wild Horse and Burro Management

Under Alternative A, Wild Horse and Burro Management would continue to be the same as those identified in the individual LUP documents, land health standards, and applicable agency policy or guidance. HMAs in GRSG habitat would receive priority for removal of excess wild horses and burros per WO Instruction Memorandum 2012-043.

Impacts from Climate Change Management

Management resulting from climate change is specific to individual land use plans. Many of the plans are silent with respect to climate change but do include management that addresses climate change issues, such as management of livestock during drought conditions. Alternative A could trend toward a higher FRCC as existing climate changes issues would continue to contribute invasive annual grasses expansion and encroachment of conifer woodlands. This could then result in an increase in fire size, extent and severity. This would also increase fire suppression costs, increase fuel treatment planning and costs.

Impacts from Leasable Minerals Management

Under Alternative A, there would be 14,642,300 acres open for leasable mineral development; The BLM would place some limitation on fluid mineral development, primarily subject to standard stipulations. Impacts on fire would depend on the number of facilities constructed and disturbance footprints. An increase in development, impacts on fire management would be from potential surface disturbance activities associated with new development trending FRCC higher, an increase in potential human caused ignitions, and an increase in suppression protection priorities. New road construction and maintenance would benefit fire management by providing access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Impacts from Locatable and Salable Minerals Management

Under Alternative A, there would be 16,005,000 acres open to locatable and 14,642,300 acres open for salable development. In the sub-region, all lands are generally open to mineral location under the mining law. There are specific locatable mineral withdrawals for particular ROWs, designated wilderness areas, areas of critical environmental concern and other administrative needs. There are no locatable mineral withdrawals specific to protecting GRSG habitat. All locatable mineral activities are managed under the regulations at 43 CFR, Part3800 and 36 CFR, Part228 through approval of a Notice of Intent or a Plan

of Operations. Mitigation of effects on GRSG and habitat are identified through the NEPA process approving plans of operation.

The BLM would place some limitations on mineral development. Impacts on fire would depend on the number of locatable facilities constructed and disturbance footprints. An increase in development, impacts on fire management would be from potential surface disturbance activities associated with new development trending FRCC higher, an increase in potential human caused ignitions, and an increase in suppression protection priorities. New road construction and maintenance would benefit fire management by providing access for suppression resources and fuel breaks that may stop or slow the spread of fire

Impacts from Land Uses and Realty Management

Under Alternative A, there would be 14,642,300 acres open for potential Land Use and Reality. Land and realty primarily influences permits, ROWs, land tenure adjustments, and proposed land withdraws. Many LUPs in the sub-region do not contain specific goals, objectives or management actions directly related to GRSG conservation. Recently adopted LUPs, such as those in California, identify timing restrictions and buffers for ROWs that may affect GRSG habitat. Mitigation is typically developed during the NEPA process for site-specific actions. Some LUPs and the Nevada State GRSG conservation strategy identify objectives to acquire sensitive GRSG habitat, easements where appropriate or habitat in PMUs. Impacts on fire would depend on the number of facilities constructed and disturbance footprints. An increase in development, impacts on fire management would be from potential surface disturbance activities associated with new development trending FRCC higher, an increase in potential human caused ignitions, and an increase in suppression protection priorities. New road construction and maintenance would benefit fire management by providing access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Impacts from Renewable Energy Management

Under Alternative A, 630,100 would be open for solar and 14,642,300 acres would be open for wind energy development. Where development would occur, impacts on fire management would be from potential surface disturbance activities associated with new development trending FRCC higher, an increase in potential human caused ignitions, and an increase in suppression protection priorities. New road construction and maintenance would benefit fire management by providing access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Impacts from Comprehensive Travel and Transportation Management

Under Alternative A, a potential for human-caused ignition and an increase in invasive annual grasses would be highest in the 12,145,400 acres open to cross-country use, with reduced risk in the 3,859,600 acres closed or limited to existing routes to motorized vehicles.

Impacts from Recreation Management

Existing recreation opportunities in the planning area would be maintained.

Trending increases of recreational use on lands provide the potential for more human caused fire ignitions. Management of recreation areas would increase fire suppression protection to provide safety and protect recreation values and associated infrastructure. These areas may also require additional fuel treatments to protect areas from wildfire.

Dispersed recreation use such as ATV use, camping, hunting, and hiking increases the potential for human caused fire. Developed recreation areas would be prioritized for fire suppression to protect human life and property. Recreation use could slow emergency stabilization and rehabilitation efforts post fire and impact vegetation treatments through direct damage to seeded areas.

Roads and trails are one of the main vectors of weed spread, which leads to an increase in FRCC and ecosystems moving away from natural fire regimes (CEC 2012).

4.9.4 Alternative B

Management actions under Alternative B would focus on fire suppression in PHMA and would impose some limits on fuels treatments in this area, resulting in higher level of protection but reduced management options in this area.

Impacts from GRSG Management

There are 9,573,300 acres of PHMA, and 6,953,300 acres of GHMA in this alternative. Under Alternative B, there would be 9,573,900 acres managed as PHMA, and 6,953,500 acres managed as GHMA. Impacts under Alternative B would focus on maintaining or increasing current populations by managing or restoring priority areas so that at least 70 percent of the land cover provides adequate sagebrush habitat to meet GRSG needs. This alternative would manage PHMA so that discrete human disturbances cover less than 3 percent of the total GRSG habitat regardless of ownership. This would decrease the chance for human-caused ignition in PHMA when compared to Alternative A.

Impacts from Riparian Areas, Wetlands, and Water Resources Management

Under Alternative B, riparian areas and wetlands in PHMA would be managed for functionality with an emphasis on perennial forbs, diverse species richness and edge relative to ecological site potential. The increased focus on managing for ecological health of riparian areas and wetlands in PHMA under Alternative B would result in more riparian areas. Compared to Alternative A, there would be more impact on restricting suppression operations by limiting use of heavy equipment or retardant near streams or riparian areas; however, these added areas would also benefit fire management by potentially slowing or stopping a fire growth, and lessening the severity of fires. This management could decrease

FRCCs in those areas and increase resilience and resistance to invasive annual grasses which would decrease fire risk.

Impacts from Vegetation and Soils Management

Vegetation management under Alternative B would be prioritizing 9,573,300 acres of PHMA and then 6,953,500 acres of GHMA for restoration actions. The goals would be to improve vegetation conditions and prioritize restoration efforts to benefit sagebrush vegetation. Alternative B would require the use of native seeds, removing encroaching conifers, designing post-restoration management to ensure the long-term persistence of the restoration efforts, considering changes in climate, and monitoring and controlling invasive species. As a result, the restoration and vegetation management actions would trend FRCCs to more historic levels which would decrease fire management cost and lower fire sizes, and intensity relative to Alternative A.

Impacts from Livestock Grazing Management

Under Alternatives A and B, there would be the same number of acres available for livestock grazing; however, Alternative B would limit grazing in PHMA, unless the treatment would conserve, enhance, or restore GRSG habitat. As a result, the restoration and vegetation management actions would trend FRCCs to more historic levels. This would decrease fire management costs and would lower fire sizes and intensity, relative to Alternative A.

Impacts from Fire and Fuels Management

In PHMA and GHMA, suppression to conserve habitat would be prioritized immediately after firefighter and public safety. This aggressive suppression response would require more suppression resources and would therefore increase costs for fire management programs compared with Alternative A.

Fuels management projects in PHMA would be designed to reduce wildfire threats and decrease the risk of high-intensity fire in PHMA in the long term. Restrictions on the location of fuel breaks, and location of other fuels treatments, however, would reduce management options and would increase costs of fuel management. In addition, application of RDFs, consistent with applicable law, would be required which would add to costs associated with fire activities, but would result in more effective measures for protecting GRSG habitat.

Seasonal restrictions for implementation of fuels projects may limit the amount of fuels treatments that can be accomplished therefore potentially decreasing the amount of acres that can be treated annually.

As a result, the restoration and vegetation management actions would trend FRCCs to more historic levels which would decrease fire management cost and lower fire sizes, and intensity relative to Alternative A.

Impacts from Wild Horse and Burro Management

Wild horse and burros have the potential to directly impact habitats used by GRSG by reducing grass, shrub and forb cover and increasing unpalatable forbs and exotic plants including cheatgrass (Beever and Aldridge 2011). This alternative would develop or amend HMA plans to incorporate GRSG habitat objectives and management considerations for all HMAs/WHBTs.

Although Alternative B would have the same Herd Areas, Herd Management Areas and Wild Horse Territory as Alternative A, if herd management area plans for HMAs/WHBTs were amended in PHMA with a reduction in AML, the impact would result in an increase of fine fuels and could then result in an increase in fire size, extent, and severity in the short term. However, a long-term outcome could improve FRCCs to move toward historic conditions which would decrease fire management cost and lower fire sizes, and intensity.

Impacts from Climate Change Management

Same as Alternative A

Impacts from Leasable Minerals Management

Under Alternative B, there would be an 10,120,700 acres closed to leasable development and an increase in restrictions and limitations as compared with Alternative A, There would be no leasable mineral development in PHMA (except for those associated with VERs) which would decrease potential surface disturbance. Compared to Alternative A, the decrease in potential development would benefit fire management by reducing surface disturbance activities associated with new development trending FRCC lower, a decrease in potential human caused ignitions, and a decrease in suppression protection priorities. A decrease in new road construction and maintenance would impact fire management by limiting ease of access for suppression resources and reducing the number of existing fuel breaks that may stop or slow the spread of fire. This would result in a slight decrease in suppression effectiveness and a slight increase in fire size, as compared to Alternative A.

Impacts from Locatable and Salable Minerals Management

Under Alternative B, there would be an increase in restrictions and limitations for Locatable and Salable Minerals Management as compared with Alternative A, in PHMA, all acres would be recommended for withdrawal from locatable minerals, and all acres would be closed to salable mineral development, as compared to Alternative A. This would decrease potential surface disturbance. Compared to Alternative A, the decrease in potential development would benefit fire management by reducing surface disturbance activities associated with new development trending FRCC lower, a decrease in potential human caused ignitions, and a decrease in suppression protection priorities. A decrease in new road construction and maintenance would impact fire management from limiting ease of access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Impacts from Land Uses and Realty Management

In Alternative B, all PHMA would become ROW/SUA exclusion areas, and all GHMA would become ROW/SUA avoidance areas. Compared to Alternative A, the avoidance areas would have increased restrictions and the exclusion areas will decrease the potential for development. Less development could benefit fire management by reducing surface disturbance activities associated with new development trending FRCC lower, a decrease in potential human caused ignitions, and a decrease in suppression protection priorities. A decrease in new road construction and maintenance would impact fire management from limiting ease of access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Impacts from Renewable Energy Management

Alternative B proposes ROW exclusion in PHMA. There will be fewer acres open for potential renewable energy development. The 3 percent disturbance cap could restrict further development in PHMA. Compared to Alternative A, the decrease in potential development would benefit fire management by reducing surface disturbance activities associated with new development trending FRCC lower, a decrease in potential human caused ignitions, and a decrease in suppression protection priorities. A decrease in new road construction and maintenance would impact fire management from limiting ease of access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Impacts from Comprehensive Travel and Transportation Management

In PHMA, areas previously open to cross-country motorized travel would be limited to existing routes. This would reduce opportunities for cross-country travel in the decision area.

The 3 percent disturbance cap could restrict the amount of new routes that could be constructed in PHMA; any routes constructed in excess of the disturbance cap would require mitigation necessary to offset the resulting loss of habitat.

The additional restrictions associated with limited travel could potentially have a less impact on Fire Management than Alternative A, by reducing the risks associated with human caused ignitions. The additional restrictions could also decrease accessibility to remote areas for fire suppression resources and would reduce fuel breaks in the event of wildfire

Impacts from Recreation Management

This alternative would limit the issuing of SRPs in PHMA, unless the SRP has neutral or beneficial impacts on the habitat. This could limit SRPs that are being issued, and could reduce human activities in these areas and slightly reducing human-caused wildfires.

4.9.5 Alternative C

Alternative C would have the broadest restrictions on fuel management activities extending to all occupied habitat by limiting fuel treatments to the interface of human habitation, and existing disturbances.

Although a proposed ACEC designation overlays the PHMA habitat (as displayed in Alternative B), the allocations would be the same for both PHMA and the ACEC. Therefore, the proposed ACEC designation would have no additional effect or impact on GRSG or this resource. As a result there is no reason to conduct additional analysis based on potential ACEC designation.

Impacts from GRSG Management

There are 16,526,600 acres of PHMA, and 0 acres of GHMA in this alternative. Alternative C would have broader restrictions on resource use and highest level of protection for all occupied GRSG habitat than Alternative A. Protecting remaining occupied GRSG habitats from chronic grazing disturbance and new development are proposed in this alternative. This would directly reduce opportunities for human-caused fires both in the short- and long term.

Impacts from Riparian Areas, Wetlands, and Water Resources Management

Overall condition and trend of riparian areas and wetlands in PHMA would improve under Alternative C. Acres of riparian habitat would also increase. Compared to Alternative A, there would be more impact on restricting suppression operations by limiting use of heavy equipment or retardant near streams or riparian areas; however, these added areas would also benefit fire management by potentially slowing or stopping a fire growth, and lessening the severity of fires. This management could decrease FRCCs in those areas and increase resilience and resistance to invasive annual grasses which would decrease fire risk.

Impacts from Vegetation and Soils Management

Under this Alternative, passive restoration would be prioritized and would lead to fewer acres of vegetation management being treated compared with Alternative A. However, it is likely that more acres of crested wheatgrass seedings and cheatgrass invaded areas would be treated improving vegetation conditions for GRSG habitat with success in those areas. Minimizing the use of herbicides to treat annual grasses and noxious weeds fewer acres would be completed under this alternative compared with Alternative A. Restrictions placed on Vegetation this alternative would impact the ability to efficiently manage fuels and could increase the potential for wildfire costs of fire suppression. FRCCs would slowly improve overtime in areas where natural rehabilitation is achievable.

Impacts from Livestock Grazing Management

Under Alternative C, no livestock grazing would be permitted in the PHMA, as compared to all lands being open for this use under Alternative A. In the short

term, fine fuels would increase throughout occupied habitat, and fire hazard would increase, as would FRCC (Strand et al. (2014). If fire were established, the increase in fine fuels would increase the surface rate of spread and fire intensity (Launchbaugh et al. 2007). This increased potential for large wildland fire would increase costs associated with both fire suppression and post-fire rehabilitation. An increase in fire size would increase the exposure to firefighters and public to the inherent risks of firefighting. FRCCs would slowly improve over time in areas where natural rehabilitation is achievable.

Impacts from Fire and Fuels Management

Fuel management actions under Alternative C would be more restrictive than Alternative A. Under Alternative C, fuels management activities would be limited to the interface of human habitation, and previously disturbed areas. Restrictions placed on vegetation management under this alternative would impact the ability to efficiently manage fuels and could increase the potential for wildfire costs of vegetation management and fire suppression. FRCCs would slowly improve overtime in areas where natural rehabilitation is achievable. In addition, application of RDFs consistent with applicable law would be required which would add to costs associated with fire activities, but would result in more effective measures for protecting GRSG habitat.

Impacts from Wild Horse and Burro Management

The impacts under Alternative C would be similar to that of Alternative A as HAs, HMAs, and WHBTs remain the same.

Impacts from Climate Change Management

Same as Alternative A

Impacts from Leasable Minerals Management

Under Alternative C, all PHMA would be closed to fluid mineral leasing. As a result no new leasing, no exploration or development would occur. Compared to Alternative A, the decrease in potential development would benefit fire management by reducing surface disturbance activities associated with new development trending FRCC lower, a decrease in potential human caused ignitions, and a decrease in suppression protection priorities. A decrease in new road construction and maintenance would impact fire management from limiting ease of access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Impacts from Locatable and Salable Minerals Management

Under Alternative C, all PHMA would be recommended for locatable mineral withdrawal and close to salable mineral development. As a result of no new leasing, no exploration or development would occur. Compared to Alternative A, the decrease in potential development would benefit fire management by reducing surface disturbance activities associated with new development trending FRCC lower, a decrease in potential human caused ignitions, and a decrease in suppression protection priorities. A decrease in new road

construction and maintenance would impact fire management from limiting ease of access for suppression resources and fuel breaks that may stop or slow the spread of fire

Impacts from Land Uses and Realty Management

Under Alternative C, the acres for ROW/SUA will be excluded Compared to Alternative A, the increased restrictions in the added exclusion areas will decrease the potential for development. Less development could benefit fire management by reducing surface disturbance activities associated with new development trending FRCC lower, a decrease in potential human caused ignitions, and a decrease in suppression protection priorities. A decrease in new road construction and maintenance would impact fire management from limiting ease of access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Impacts from Renewable Energy Management

Under Alternative C, all PHMA for solar and wind would be excluded. Compared to Alternative A, the increased restrictions in the added exclusion areas will decrease the potential for development. Less development could benefit fire management by reducing surface disturbance activities associated with new development trending FRCC lower, a decrease in potential human caused ignitions, and a decrease in suppression protection priorities. A decrease in new road construction and maintenance would impact fire management from limiting ease of access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Impacts from Comprehensive Travel and Transportation Management

In PHMA, areas previously open to cross-country motorized travel would be limited to existing routes. This would reduce opportunities for cross-country travel in the decision area.

The additional restrictions associated limited travel could potentially have a less impact on Fire Management than Alternative A, by reducing the risks associated with human caused ignitions. The additional restrictions could also decrease accessibility to remote areas for fire suppression resources and would reduce fuel breaks in the event of wildfire

Impacts from Recreation Management

This alternative would limit the issuing of SRPs in PHMA, unless the SRP has neutral or beneficial impacts on the habitat. This could limit SRPs that are being issued, and could reduce human activities in these areas and slightly reducing human-caused wildfires.

4.9.6 Alternative D

Alternative D management actions and related impacts would be similar to those described under 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. Alternative D would also place added emphasis to pre-suppression planning, prevention, and educational objectives for fire suppression personnel.

Impacts from GRSG Management

There are 10,021,300 acres of PHMA, and 6,505,300 acres of GHMA in this alternative. Additionally, there are 6,709,100 acres of OHMA under this alternative, where RDFs would be applied, consistent with applicable law. Alternative D would have broader restrictions on resource use. This would directly impact and reduce further opportunities for human-caused fires. However, the increase in vegetation produced by conserving sagebrush communities and habitats and restoration of native (or desirable) plants to create landscape patterns which benefit GRSG, promoting large intact sagebrush communities may increase fire threat. Establishing and maintaining fuel breaks identified under Alternative D would reduce fire threat and large-scale fires.

Impacts from Riparian Areas, Wetlands, and Water Resources Management

In comparison to Alternative A, fewer acres of riparian and wetland habitat would be disturbed under Alternative D, while more acres of riparian areas would be improved. Compared to Alternative A, there would be more impact on restricting suppression operations by limiting use of heavy equipment or retardant near streams or riparian areas; however, these added areas would also benefit fire management by potentially slowing or stopping a fire growth, and lessening the severity of fires. This management could decrease FRCCs in those areas and increase resilience and resistance to invasive annual grasses which would decrease fire risk. I

Impacts from Vegetation and Soils Management

All vegetation and soils management activities would be prioritized in PHMA and PGMAs under this alternative. Treatments would prioritize the use of native seed and establishing appropriate sagebrush species/subspecies that meet GRSG seasonal habitat requirements. This includes ESR, invasive species/noxious weed, conifer encroachment, and restoration activities. Management actions would be designed to establish and maintain a resilient sagebrush vegetation community and restore sagebrush communities to reduce habitat fragmentation and maintain or re-establish habitat connectivity over the long term. This would affect FRCCs by trending them to more historic levels. As FRCCs are improved over the planning period, there should be movement toward a natural fire regime and a reduced risk of uncharacteristic wildfire. Vegetation would become more resistant and resilient and less likely to lose key ecosystem components after a disturbance. This could decrease fire sizes, intensity, and fire management cost. Compared to Alternative A, there would be more areas improving FRCCs.

Impacts from Livestock Grazing Management

Under Alternative D, livestock grazing would be allowed on the same number of acres as Alternative A. Impacts from livestock grazing management would be similar to those described under Alternative B, but the focus would also include actions in GHMA. Focusing management activities on allotments found not to be achieving Rangeland Health Standards and that have the best opportunities for conserving, enhancing, or restoring habitat for GRSG would improve habitat. This would affect FRCCs by trending them to more historic levels. As FRCCs are improved over the planning period, there should be movement toward a natural fire regime and a reduced risk of uncharacteristic wildfire. Vegetation would become more resistant and resilient and less likely to lose key ecosystem components after a disturbance. This could decrease fire sizes, intensity, and fire management costs. Compared to Alternative A, there would be more areas improving FRCCs.

Impacts from Fire and Fuels Management

Impacts from fire management would be similar in nature to those described under 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 risk of high intensity fire would occur in these areas.

Seasonal restrictions for implementation of fuels projects may limit the amount of fuels treatments that can be accomplished therefore potentially decreasing the amount of acres that can be treated annually. Some additional flexibility would be incorporated into management, allowing for the use of prescribed fire on a site-specific level in GRSG habitat, as appropriate.

Creating and maintaining effective fuel breaks in strategic locations, prioritizing suppression of fires in PHMA and other proactive fire management activities, would reduce the size and intensity of wildland fires in PHMA but would result in an increase in both fuels management and fire suppression costs.

Alternative D would prescribe added measure 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 the awareness and encourage partnerships with other agencies and resource programs. In addition, application of RDFs consistent with applicable law would be required which would add to costs associated with fire activities, but would result in more effective measures for protecting GRSG habitat.

The added emphasis of prepositioning resources and prioritizing fire suppression immediately after firefighter and public safety would increase the use of resource, increasing firefighter exposure as well as overall program costs. However, it would result in a reduction in the loss of habitat from wildland fire.

Under Alternative D, added measures would be incorporated in overall fire management planning to include pre-suppression, educational and prevention messages on the importance of GRSG habitat. These added measures would increase planning time and costs, but would result in an increase in awareness among the fire community that would lead to an increase in GRSG habitat.

Impacts from Wild Horse and Burro Management

Under Alternative D, active HMAs, and WHBTs would be managed to achieve GRSG habitat objectives in PHMA and GHMA. In PHMA and GHMA, the AML in HMAs, and Forest Service WHBTs would be established or maintained so that they consider the life cycle requirements for GRSG populations in terms of forage and nesting cover. Wild horse and burro population levels in PHMA and GHMA would be managed in the established AML to maintain or enhance GRSG habitat objectives. In HMAs, and WHTs not meeting standards due to degradation that can be partially contributed to wild horse or burro populations, this alternative would consider adjustments to AML through the NEPA process.

Under Alternative D, maintaining current AMLs in HMAs, and WHBTs would be similar to Alternative A. If GRSG habitat was not meeting standards due to degradation and adjustments to AML were made to conserve, enhance or restore habitat, the direct effect would improve the habitat. This would affect FRCCs by trending them to more historic levels. As FRCCs are improved over the planning period, there should be movement toward a natural fire regime and a reduced risk of uncharacteristic wildfire. Vegetation would become more resistant and resilient and less likely to lose key ecosystem components after a disturbance. This could decrease fire sizes, intensity, and fire management cost. Compared to Alternative A, there would be more areas improving FRCCs.

Impacts from Climate Change Management

Alternative D would use the landscape approach and promote landscape scale, ecosystem based actions to enhance resiliency and sustainability of GRSG habitat to climate stress. Treatments would focus to restore connectivity and habitat in fragmented areas where natural recovery or restoration treatments have a moderate to high record of success and have a stable bio-climate forecast. This alternative would lessen the impacts on fire management by proactively reducing the risk associated with landscape stressors such as invasive annual grasses and the encroachment of conifer woodlands. This would affect FRCCs by trending them to more historic levels. As FRCCs are improved over the planning period, there should be movement toward a natural fire regime and a reduced risk of uncharacteristic wildfire. Vegetation would become more resistant and resilient and less likely to lose key ecosystem components after a disturbance. This could decrease fire sizes, intensity, and fire management cost. Compared to Alternative A, there would be more areas improving FRCCs.

Impacts from Leasable Minerals Management

Under Alternative D, all PHMA and GHMA would be open to fluid mineral leasing under a NSO stipulation. This would increase restrictions and limitations, as compared with Alternative A, and would decrease potential surface disturbance. In this alternative as development occurs, the need for off-site mitigation to improve, restore, or create suitable GRSG habitat would increase as the level of disturbance through activities increases. This alternative would increase treatments in PHMA and GHMA in GRSG habitat.

The increase in off-site mitigation could create opportunities to reduce fuel loading and increase resiliency on the landscape. It would do this by helping to develop plans, and place the proposed treatments where they could benefit wildland fire management and GRSG habitat. This combined effort to reduce the fuel loading and improve habitat would increase the amount of hazardous fuels and vegetation treatments possible and would reduce the impacts on the overall disturbance on the landscape even though there is a potential increase in fire suppression activities due to increased roads, equipment use, and human activities.

Impacts on fire would depend on the number of facilities constructed and the extent of disturbance footprints. Compared to Alternative A, the decrease in potential development would benefit fire management by reducing surface disturbance activities associated with new development trending FRCC lower, a decrease in potential human caused ignitions, and a decrease in suppression protection priorities. A decrease in new road construction and maintenance would impact fire management from limiting ease of access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Impacts from Locatable and Salable Minerals Management

Under Alternative D, there would be the same amount of area open for locatable mineral development as Alternative A. Salable minerals would be closed to development in PHMA and GHMA. Impacts on fire would depend on the number of locatable facilities constructed and the extent of disturbance footprints. Compared to Alternative A, the decrease in potential development would benefit fire management by reducing surface disturbance activities associated with new development trending FRCC lower, a decrease in potential human caused ignitions, and a decrease in suppression protection priorities. A decrease in new road construction and maintenance would impact fire management from limiting ease of access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Impacts from Land Uses and Realty Management

Under Alternative D, lands in PHMA and GHMA would be retained in Federal ownership to conserve GRSG habitat. Land uses in PHMA and GHMA would be managed to reduce habitat fragmentation and maintain or enhance connectivity between habitats. The direct impact of land use authorizations on PHMA and

GHMA through ROW grant stipulations would be managed to minimize negative effects. PHMA and GHMA would be managed as ROW/SUA avoidance areas. In PHMA and GHMA, no new road ROWs would be authorized except those necessary for public safety, administrative or public need tied to valid existing rights.

Impacts on fire would depend on the number of facilities constructed and the extent of disturbance footprints. Compared to Alternative A, the decrease in potential development would benefit fire management by reducing surface disturbance activities associated with new development trending FRCC lower, a decrease in potential human caused ignitions, and a decrease in suppression protection priorities. A decrease in new road construction and maintenance would impact fire management from limiting ease of access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Impacts from Renewable Energy Management

Compared to Alternative A, PHMA and GHMA would be managed as an exclusion area for wind development. However, like Alternative A, PHMA and GHMA would continue to be an exclusion area for solar development. Impacts on fire would depend on the number of facilities constructed and the extent of disturbance footprints. Compared to Alternative A, the decrease in potential development would benefit fire management by reducing surface disturbance activities associated with new development trending FRCC lower, a decrease in potential human caused ignitions, and a decrease in suppression protection priorities. A decrease in new road construction and maintenance would impact fire management from limiting ease of access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Impacts from Comprehensive Travel and Transportation Management

Under Alternative D, potential for human-caused ignition and an increase in invasive annual grasses would be reduced compared to Alternative A. This is because all lands in PHMA and GHMA would be limited to existing roads and trails, and cross-county travel would be eliminated. This is a reduction of 12,145,500 acres open to cross-country traffic, compared with Alternative A.

The additional restrictions associated limited travel could potentially have a less impact on Fire Management than Alternative A, by reducing the risks associated with human caused ignitions. The additional restrictions could also decrease accessibility to remote areas for fire suppression resources and would reduce fuel breaks in the event of wildfire.

Impacts from Recreation Management

Under Alternative D, SRPs would only be allowed in PHMA and GHMA that have neutral or beneficial effects on the GRSG. Because issuance of permits may increase exposure of the area to human activity and consequently the likelihood of human-caused ignition, wildfire risk from recreation activities may be decreased under this alternative compared with Alternative A.

4.9.7 Alternative E

The Nevada State Plan identifies one SGMA in the state. The SGMA defines the overall area where the state would like resources to be managed to maintain and expand GRSG populations. The SGMA includes core, priority, general, and nonhabitat management areas. Alternative E would not delineate PHMA or GHMA and would not apply to lands in California. Human disturbances would be permitted in these areas if the criteria listed below (also see **Table 3-1** in the Nevada State Plan) were met as part of the SETT Consultation process:

- Demonstrate that the project cannot be reasonably or feasibly accomplished elsewhere, that the purpose and need of the project could not be accomplished in an alternative location, or that locating the project elsewhere is not technically or economically feasible
- Demonstrate that project infrastructure would be collocated with existing disturbances to the greatest extent possible
- Develop site-specific, consultation-based design features to minimize impacts through consultation with the SETT
- Mitigate for unavoidable impacts through compensatory mitigation via the Conservation Credit System

BLM-administered and National Forest System lands in California would follow Alternative A. Alternative E objectives would focus on eliminating the threats to GRSG in the planning areas, including wildfire.

Management actions would allow for some level of fuels treatments, providing greater flexibility for wildfire management. This alternative places added emphasis on a comprehensive wildfire management program that engages all interagency partners (federal, state, and local), to reduce the threats of catastrophic wildfires, rapidly suppress wildfires, and rehabilitate lands damaged by wildfires.

Impacts from GRSG Management

In Nevada, there are 9,176,500 acres of core habitat, 6,577,300 acres of priority habitat, and 6,356,300 acres of general habitat under Alternative E. It would aim for "net conservation gain" of GRSG habitat by implementing a strategy to avoid, minimize, and mitigate impacts on GRSG. Unique to Alternative E would be the establishment of a Conservation Credit System (**Appendix L**). This alternative assigns the SETT with establishing policies for identifying and prioritizing landscape-scale enhancement, restoration, fuel reduction, and mitigation projects. Without knowing what actions would be taken by the Sagebrush Ecosystem Council, it cannot be determined fully what level of impacts would occur as a result of their policies.

Alternative E would maintain a mosaic of shrub cover, ranging from 20 percent to 40 percent in nesting habitat. This would provide both habitat resiliency and

preferred nesting conditions for GRSG in areas with high raven populations. Where this amount of shrub cover is not available (less than 25 percent), then perennial grass cover should exceed 10 percent (Coates et al. 2011) and annual grass cover should not exceed 5 percent (Blomberg et al. 2012). The direct effect of the increased shrub and grass cover could help move toward a historical FRCC in the long term. However, as shrub and grass cover becomes more continuous and ground cover is higher, the risk for large uncharacteristic fires increases.

This alternative would initiate landscape level treatments in SGMA to reverse the effects of conifer encroachment. It would prioritize treatments of phase I and phase II to restore healthy, resilient sagebrush ecosystems and to increase forb and grass cover. Phase I and phase II encroachment would be removed and phase III encroachment would be treated to reduce the threat of severe conflagration and restore SGMA where possible, especially in areas close to occupied and suitable habitat.

Areas would be prioritized for treating phase III conifer encroachment in strategic areas to break up continuous, hazardous fuel beds. Areas that have the greatest opportunity for recovery to SGMA would be treated, based on ecological site potential. Old growth trees would be protected on woodland sites. The direct effect of removing conifers could help move toward a historical FRCC in the long term and reduce the threat of high intensity fires. This would lower fire suppression costs in the long term.

Alternative E applies seasonal and GRSG habitat-specific restrictions on development, which would result in site-specific variation changes to habitat and associated change in FRCC and fire risks.

Impacts from Alternative E would be less than that of Alternative A because net conservation gain of GRSG habitat could occur. This would affect FRCCs by trending them to more historic levels. As FRCCs are improved over the planning period, there should be movement toward a natural fire regime and a reduced risk of uncharacteristic wildfire. Vegetation would become more resistant and resilient and less likely to lose key ecosystem components after a disturbance. This could decrease fire size, intensity, and management costs. Compared to Alternative A, there would be more areas improving FRCCs.

Impacts from Riparian Areas, Wetlands, and Water Resources Management

As described for Vegetation Revised Alternative E, improving riparian habitats would likely be accelerated because of their importance and responsiveness to restoration. In addition, use of the Conservation Credit System would incentivize improving riparian areas and wetlands on private lands where many of these important resource areas are located. Native planting and reseeding in cleared areas and degraded riparian habitats could decrease FRCC, increase resilience and resistance to invasive annual grasses, and decrease fire risk.

Compared to Alternative A, there would be more impact on restricting suppression operations by limiting the use of heavy equipment or retardant near streams and riparian areas; however, these added areas would also benefit fire management by potentially slowing or stopping fire growth, and lessening the severity of fire.

Impacts from Vegetation and Soils Management

The main goal of Alternative E is to achieve conservation through a concept of net conservation gain in GRSG Habitat in the sagebrush ecosystem for activities that can be controlled, such as a planned disturbance or development. Therefore, this alternative would limit the amount of disturbance to vegetation, but it would also mitigate any vegetation loses with treatments designed to improve vegetation.

Alternative E also strives to maintain an ecologically healthy and intact sagebrush ecosystem that is resistant to the invasion of nonnative species and resilient after disturbances such as wildfire. This would affect FRCCs by trending them to more historic levels. As FRCCs are improved over the planning period, there should be movement toward a natural fire regime and a reduced risk of uncharacteristic wildfire. Vegetation would become more resistant and resilient and less likely to lose key ecosystem components after a disturbance. This could decrease fire size, intensity, and management costs. Compared to Alternative A, there would be more areas improving FRCCs.

Impacts from Livestock Grazing Management

In Alternative E, the main goal for livestock grazing management is to ensure that existing grazing permits maintain or enhance GRSG habitat. Alternative E would use livestock grazing when appropriate as a management tool to improve GRSG habitat quantity and quality or to reduce wildfire threats. Based on a comprehensive understanding of seasonal GRSG habitat requirements, and in conjunction with the need for flexibility in livestock operations, Alternative E includes timely, seasonal range management decisions to meet vegetation management objectives. This includes fuels reduction, but no AUMs would be reduced.

As FRCCs are improved over the planning period, there should be movement toward a natural fire regime and a reduced risk of uncharacteristic wildfire. Vegetation would become more resistant and resilient and less likely to lose key ecosystem components after a disturbance. This could decrease fire size, intensity, and management costs. Compared to Alternative A, there would be more areas improving FRCCs.

Impacts from Fire and Fuels Management

Alternative E places added emphasis on a comprehensive wildfire management program that engages all interagency partners (federal, state, and local) to reduce the threats of catastrophic wildfires, rapidly suppress wildfires, and rehabilitate lands damaged by wildfires.

This alternative incorporates additional RDFs consistent with applicable law that would incorporate added emphasis to protecting GRSG habitat from fire. Alternative E also strives to maintain an ecologically healthy and intact sagebrush ecosystem that is resistant to the invasion of nonnative species and resilient after disturbances such as wildfire. Alternative E would incorporate resilience and resistance and other best available science concepts into fuels treatment planning. Fuels treatment objectives would be designed to protect existing sagebrush ecosystems, modify fire behavior, restore ecological function, and create landscape patterns that most benefit GRSG habitat.

Additional emphasis under Alternative E integrates the prepositioning of suppression resources and preventative actions similar to Alternative D and the RDFs. Prepositioning equipment and preventative actions would increase the likelihood of successful fire management but would increase overall fire management costs. Fuels reduction treatments would be similar to Alternative D, with added emphasis on coordinating state and local agencies and individual landowners.

As FRCCs are improved over the planning period, there should be movement toward a natural fire regime and a reduced risk of uncharacteristic wildfire. Vegetation would become more resistant and resilient and less likely to lose key ecosystem components after a disturbance. This could decrease fire size, intensity, and management costs. Compared to Alternative A, there would be more areas improving FRCCs.

Impacts from Wild Horse and Burro Management

The main goal of Alternative E is to achieve and maintain wild horses and burros at or below established AMLs in the SGMA. Another goal is to manage for zero horse populations in non-designated areas in SGMA to reduce impacts on GRSG habitat. Alternative E would maintain healthy and diverse wild horse and burro populations in Nevada in a manner that meets GRSG habitat objectives (see **Table 2-2**).

Alternative E would have the same herd areas, HMAs, and WHBTs as Alternative A. If herd management area plans for HMAs and WHBTs were amended in SGMA with a reduction in AML, the impact could increase fine fuels and then increase fire size, extent, and severity in the short term. This would also increase fire suppression, fuel treatment planning, and implementation costs. However, a long-term outcome would improve the natural habitat and decrease FRCC, increasing resilience and resistance and reducing the risk of high intensity fires.

Impacts from Climate Change Management

Impacts would be the same as Alternative A.

Impacts from Leasable Minerals Management

Under Alternative E, PHMA and GHMA would continue to keep 14,642,300 acres open for leasable development; however, there would be restrictions from RDFs, consistent with applicable law, that may limit the potential for development. Additionally 1,884,300 acres would remain closed due to current wilderness and WSA designations. The main goal of Alternative E is to achieve conservation through a concept of net conservation gain in the GRSG habitat in the sagebrush ecosystem for activities that can be controlled, such as a planned disturbance or development. Therefore, this alternative would limit the extent of disturbance to vegetation but would also mitigate any vegetation loses with treatments designed to improve vegetation.

Alternative E also strives to maintain an ecologically healthy and intact sagebrush ecosystem that is resistant to the invasion of nonnative species and resilient after disturbances such as wildfires. Impacts on fire would depend on the number of facilities constructed and the extent of disturbance. Compared to Alternative A, the decrease in potential development would benefit fire management by reducing surface disturbance from development, which would trend FRCC lower, decreasing the potential human-caused fires and suppression protection priorities. A decrease in new road construction and maintenance would impact fire management by limiting the ease of access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Impacts from Locatable and Salable Minerals Management

Under Alternative E, there would be the same amount of area open for potential development of locatable minerals. Alternative E, however, would incorporate the concept of net conservation gain in the GRSG habitat in the sagebrush ecosystem for activities that can be controlled, such as a planned disturbance or development. Therefore, this alternative would apply RDFs consistent with applicable law that limit the amount of disturbance to vegetation, but it would also mitigate any vegetation loses with treatments designed to improve vegetation.

Alternative E also strives to maintain an ecologically healthy and intact sagebrush ecosystem that is resistant to the invasion of nonnative species and resilient after disturbances such as wildfire. Impacts on fire would depend on the number of facilities constructed and the extent of disturbance footprints. Compared to Alternative A, the decrease in potential development would benefit fire management by reducing surface disturbance from development, which would trend FRCC lower, decreasing the potential for human-caused fires and suppression protection priorities. A decrease in new road construction and maintenance would impact fire management by limiting the ease of access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Impacts from Land Uses and Realty Management

For Nevada only, Alternative E proposes to manage GRSG habitat as ROW/LUA avoidance areas. Lands in California would be managed according to existing land use plans. This alternative seeks to achieve a net conservation gain of GRSG habitat due to restricting human disturbances, including land tenure adjustments and land uses, in the SGMA in order to stop the decline of GRSG populations.

The BLM and the Forest Service would allow ROW/SUA development in GRSG habitat subject to ROW conditions. Specific RDFs would set mitigation measures in place to avoid, minimize, and mitigate impacts on leks and nesting, brood-rearing, and wintering habitats. Infrastructure would not be located within 0.6 mile of seeps, springs, and wet meadows in brood-rearing habitat, when possible. Traveling along routes would be limited to specific times that least impact habitats. These increased measures would restrict ROW development in specific areas and would impact management and maintenance of existing and future development.

Compared to Alternative A, the avoidance areas would incur increased restrictions on development. Less development could benefit fire management by reducing surface disturbance activities associated with new development, which would trend FRCC lower, decreasing the potential for human-caused fires and suppression protection priorities.. A decrease in new road construction and maintenance would impact fire management by limiting the ease of access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Impacts from Renewable Energy Management

Alternative E would limit ROWs in SGMA. Impacts on fire would depend on the number of facilities constructed and the extent of disturbance footprints. Compared to Alternative A, the decrease in potential development would benefit fire management by reducing surface disturbance activities associated with new development, which would trend FRCC lower, decreasing the potential human-caused fires and suppression protection priorities. A decrease in new road construction and maintenance would impact fire management by limiting ease of access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Impacts from Comprehensive Travel and Transportation Management

Impacts would be the same as Alternative D.

Impacts from Recreation Management

Under Alternative E, SRPs would be allowed only in core and priority habitat that have neutral or beneficial effects on the GRSG. Because issuing permits may increase the area's exposure to human activity and consequently the likelihood of human-caused fires, wildfire risk from recreation may decrease under this alternative, compared with Alternative A.

4.9.8 Alternative F

Alternative F is very similar to Alternative B and it would impose additional limits on fuels treatments in this area, resulting in higher level of protection but reduced management options. Alternative F prioritizes fire suppression in only PHMA while Alternative B includes both PHMA and GHMA.

Although a proposed ACEC designation overlays portions of PHMA habitat, the allocations would be the same for both PHMA and the ACEC. Therefore, the proposed ACEC designation would have no additional effect or impact on GRSG or this resource. As a result there is no reason to conduct additional analysis based on potential ACEC designation.

Impacts from GRSG Management

There are 9,573,300 acres of PHMA, and 6,953,300 acres of GHMA in this alternative. Under Alternative F, impacts would be the same as Alternative B with the exception of a reduction in treatment of conifer encroachment. This may cause an increase in fire severity and size due to the increase in fuel loading over time.

Impacts from Riparian Areas, Wetlands, and Water Resources Management

In comparison to Alternative A, fewer acres of riparian and wetland habitat would be disturbed under Alternative F, while more acres of riparian areas would be improved. Compared to Alternative A, there would be more impact on restricting suppression operations by limiting use of heavy equipment or retardant near streams or riparian areas; however, these added areas would also benefit fire management by potentially slowing or stopping a fire growth, and lessening the severity of fires. This management could decrease FRCCs in those areas and increase resilience and resistance to invasive annual grasses, which would decrease fire risk. I

Impacts from Vegetation and Soils Management

Vegetation management actions under Alternative F are similar to Alternative B. Actions would aim to improve vegetation conditions and prioritize restoration efforts to benefit sagebrush vegetation. As a result, the restoration and vegetation management actions would enhance vegetation beyond the extent and condition relative to Alternative A. This would be done by requiring the use of native seeds, removing encroaching conifers, designing post-restoration management to ensure the long-term persistence of the restoration efforts, considering changes in climate, and monitoring and controlling invasive species. The emphasis on native seed and reestablishment of species-appropriate sagebrush seed would improve vegetation conditions. Therefore, these actions would be less of an impact on fire management compared to Alternative A by decreasing FRCC, increasing resilience to disturbance and resistance to invasive thus reducing the risk of high intensity fires which would reduce firefighter

exposure and suppression costs. This alternative could improve more acres of vegetation in GRSG habitat than Alternative A.

Impacts from Livestock Grazing Management

Under Alternative F, livestock grazing will be managed for vegetation composition and structure, consistent with ecological site potential and in the reference state to achieve GRSG habitat objectives. Alternative F would rest 25 percent of the lands grazed each year, thus potentially reducing AUMs. This may increase the number of fine fuels on the landscape, potentially increasing FRCC in the short term and the probability and severity of fire. However, in the long term, there would be a decrease in FRCC and an increase in resilience to disturbance and resistance to invasives, thus reducing the risk of high intensity fires, which would reduce firefighter exposure and suppression costs.

Impacts from Fire and Fuels Management

Impacts on fire management from Alternative F would be similar to Alternative B with the exception that Alternative F would only prioritize fire suppression in PHMA, resulting in potentially decreased suppression costs.

Impacts from Wild Horse and Burro Management

Under Alternative F, Wild Horse and Burro Management would reduce AMLs in HMAs and WHBTs in occupied GRSG habitat by 25 percent to meet GRSG habitat objectives. Compared to Alternative A, a 25 percent AML reduction would potentially increase grass fuel loads making areas more vulnerable to wildfire ignition and spread in the short term; however, in the long term, there would be a decrease in FRCC, an increase in resilience to disturbance and resistance to invasives thus reducing the risk of high intensity fires which would reduce firefighter exposure and suppression costs.

Impacts from Climate Change Management

Same as Alternative A

Impacts from Leasable Minerals Management

Under Alternative F, fewer acres would be open to leasable mineral development and there would be an increase in restrictions and limitations as compared with Alternative A. Leasable minerals would be closed for development in PHMA and GHMA which would decrease potential surface disturbance. For VERs, this alternative would include seasonal restrictions on vehicle traffic and human presence associated with leasable mineral development. Impacts on fire would depend on the number of facilities constructed and the extent of disturbance footprints. Compared to Alternative A, the decrease in potential development would benefit fire management by reducing surface disturbance activities associated with new development trending FRCC lower, a decrease in potential human caused ignitions, and a decrease in suppression protection priorities. A decrease in new road construction and maintenance would impact fire management from limiting ease

of access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Impacts from Locatable Minerals Management

Under Alternative F, there would be an increase in restrictions and limitations for locatable minerals management as compared with Alternative A. In PHMA, locatable minerals would be recommended for withdrawal, and GHMA would remain open. This would decrease potential surface disturbance. Compared to Alternative A, the decrease in potential development would benefit fire management by reducing surface disturbance activities associated with new development trending FRCC lower, a decrease in potential human caused ignitions, and a decrease in suppression protection priorities. A decrease in new road construction and maintenance would impact fire management from limiting ease of access for suppression resources and fuel breaks that may stop or slow the spread of fire. Alternative F decisions would apply to locatable minerals subject to valid existing rights and consistent with applicable law.

Impacts from Salable Minerals Management

Under Alternative F, there would be an increase in restrictions and limitations for salable minerals management as compared with Alternative A. In PHMA, locatable minerals would be closed to development, and GHMA would remain open. This would decrease potential surface disturbance. Impacts on fire would depend on the number of facilities constructed and the extent of disturbance footprints. Compared to Alternative A, the decrease in potential development would benefit fire management by reducing surface disturbance activities associated with new development trending FRCC lower, a decrease in potential human caused ignitions, and a decrease in suppression protection priorities. A decrease in new road construction and maintenance would impact fire management from limiting ease of access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Impacts from Land Uses and Realty Management

Under Alternative F, all PHMA and GHMA would be managed as ROWs/SUAs exclusion areas. Compared to Alternative A, the exclusion areas will decrease the potential for development. Impacts on fire would depend on the number of facilities constructed and the extent of disturbance footprints. Less development could benefit fire management by reducing surface disturbance activities associated with new development trending FRCC lower, a decrease in potential human caused ignitions, and a decrease in suppression protection priorities. A decrease in new road construction and maintenance would impact fire management from limiting ease of access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Impacts from Renewable Energy Management

Compared to Alternative A, all PHMA and GHMA would be excluded from renewable energy development. Impacts on fire would depend on the number

of facilities constructed and the extent of disturbance footprints. Compared to Alternative A, the decrease in potential development would benefit fire management by reducing surface disturbance activities associated with new development trending FRCC lower, a decrease in potential human caused ignitions, and a decrease in suppression protection priorities. A decrease in new road construction and maintenance would impact fire management from limiting ease of access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Impacts from Comprehensive Travel and Transportation Management

Under Alternative D, potential for human-caused ignition and an increase in invasive annual grasses would be reduced compared to Alternative A. This is because all PHMA and GHMA would be restricted to existing roads and trails and cross-country off-road use would be eliminated.

Impacts from Recreation Management

This alternative could have a larger impact on reducing human caused wildfire associated with recreation because it would prohibit camping within 4 miles of active GRSG leks. This could limit wildland fires ignited from unattended or abandoned campfires. However, more than likely, it would just displace camping to another area and not reduce the overall human caused fire potential.

4.9.9 The Proposed Plan

This alternative would require the application of RDFs consistent with applicable law in PHMA, GHMA, and OHMA.

Impacts from GRSG Management

There are 10,296,100 acres of PHMA and 6,516,700 acres of GHMA in this alternative. Impacts would be the same as Alternative D, with the exception that PHMA acres would increase by 274,800 acres under the Proposed Plan. These added acres of PHMA would impact fire management by adding more priority areas for fire suppression, fuels management, and post-fire rehabilitation, which would increase fuels management and fire suppression costs and possibly would increase firefighter exposure and overall risk.

Compared to Alternative A, there would be added seasonal restrictions for implementing fuels projects that could limit the level of fuels treatments that could be accomplished, thereby potentially decreasing the number of acres that can be treated annually. Some additional flexibility would be incorporated into management, allowing for the use of prescribed fire on a site-specific level in GRSG habitat, as appropriate.

Impacts from Riparian Areas, Wetlands, and Water Resources Management

Under the Proposed Plan, comprehensive strategies to manage GRSG habitat across the planning area would result in more acres of riparian areas and wetlands being improved or protected, compared with Alternative A. Under the

Proposed Plan, lotic riparian and wetlands would be managed and treated for shrub encroachment as well as natural fuel breaks. Compared to Alternative A, there would be more impact on restricting suppression operations by limiting use of heavy equipment or retardant near streams and riparian areas; however, these added areas would also benefit fire management by potentially slowing or stopping fire growth and lessening their severity. This management could decrease FRCCs in those areas, increasing resilience and resistance to invasive annual grasses, which would decrease fire risk.

Impacts from Vegetation and Soils Management

Under the Proposed Plan, management actions and related impacts would be similar to those described under alternative D, but with added emphasis on regional specific habitat needs and variations and requirements for specific GRSG habitat types, resulting in more site-specific variation in fire management impacts.

In accordance with the VDDT, this alternative proposes to improve GRSG habitat by treating 170,900 acres of annual grasses, 69,900 acres of conifer encroachment with mechanical treatment, and 2,700 acres with prescribed fire annually for the next 50 years. Additional fuels treatments and other habitat treatments would be permitted, with an emphasis in maintaining, protecting, and expanding sagebrush ecosystems.

Emphasis would be concentrated in PHMA; therefore, the long-term reduction in risk of high intensity fire would occur in these areas with particular importance to condition class II and III. This would affect FRCCs by trending them to more historic levels. As FRCCs are improved over the planning period, there should be movement toward a natural fire regime and a reduced risk of uncharacteristic wildfire. Vegetation would become more resistant and resilient and less likely to lose key ecosystem components after a disturbance. This could decrease fire sizes, intensity, and management costs. Compared to Alternative A, there would be more areas improving FRCCs.

Impacts from Livestock Grazing Management

The Proposed Plan would limit grazing treatments in PHMA unless the treatment conserves, enhances, or restores GRSG habitat. This may limit the total extent of treatment allowed on the landscape, potentially increasing FRCC and the probability and severity of fire. Monitoring invasive species and treating noxious weeds to improve GRSG habitat under this alternative would affect FRCCs by trending them to more historic levels. As FRCCs are improved over the planning period, there should be movement toward a natural fire regime and a reduced risk of uncharacteristic wildfire. Vegetation would become more resistant and resilient and less likely to lose key ecosystem components after a disturbance. This could decrease fire sizes, intensity, and fire management cost. Compared to Alternative A, there would be more areas improving FRCCs.

Impacts from Fire and Fuels Management

Under the Proposed Plan, comprehensive strategies to manage GRSG habitat across the planning area would result in more acres treated and protected than Alternative A. Impacts would be similar to those described under Alternative D but with an added emphasis on region-specific habitat needs and variations and requirements for specific GRSG habitat types, resulting in more site-specific variation in fire management impacts. Additional fuels treatments and other habitat treatments would be implemented with an emphasis in maintaining, protecting, and expanding sagebrush ecosystems. Therefore, the long-term reduction in risk of high intensity fire would occur in these areas (for BLM). The Proposed Plan would also place added emphasis on pre-suppression planning, prevention, fuels management, and educating firefighting personnel.

The Proposed Plan would include the Greater Sage-Grouse Wildfire and Invasive Annual Grass Assessment (**Appendix G**). This assessment process sets the stage for identifying important GRSG occupied habitats and baseline data layers important in defining and prioritizing GRSG habitats. It would determine potential landscape-scale management strategies by considering resilience to disturbance, resistance to invasive annual grasses, and GRSG land-cover requirements.

The management strategies considered in the assessment to increase GRSG habitat at landscape scales were conservation, prevention, restoration, and monitoring and adaptive management. The strategies are adapted for fire operations (preparedness, suppression, and prevention), fuels management, post-fire rehabilitation, and habitat restoration (Chambers et. al. 2014).

Creating and maintaining effective fuel treatments in strategic locations, prioritizing suppression of fires, in accordance with the Greater Sage-Grouse Wildfire and Invasive Annual Grass Assessment (**Appendix G**), for conservation and protection during fire operations and fuels management decision-making. Compared to Alternative A, this would reduce the size and intensity of wildland fires but would increase both fuels management and fire suppression costs.

The added emphasis of prepositioning firefighting equipment and prioritizing fire suppression immediately after firefighter and public safety would increase the use of firefighting resources and could increase firefighter exposure as well as overall program costs. These added measures would increase planning time and costs but would result increase the protection of existing GRSG habitat.

The Proposed Plan would prescribe added measures for fuels treatment effectiveness and post-fire rehabilitation and monitoring. These added measures would increase both fuels management planning and post-fire rehabilitation costs, but they would increase the awareness and encourage partnerships with other agencies and resource programs.

Impacts from Wild Horse and Burro Management

Under the Proposed Plan**,** wild horse and burro populations and their habitat would be managed to achieve GRSG habitat objectives (**Table 2-2**) in PHMA and GHMA habitats. If GRSG habitat was not meeting standards due to degradation and adjustments to AML were made to conserve, enhance, or restore habitat. Therefore, these actions would be less of an impact on fire management than under Alternative A by decreasing FRCC and increasing resilience to disturbance and resistance to invasive species. This would reduce the risk of high intensity fires, which would reduce firefighter exposure and suppression costs.

Impacts from Climate Change Management

The Proposed Plan would constrain resource use and would decrease any GHG emissions associated with a particular use compared with Alternative A. In PHMA and GHMA, the Proposed Plan would manage risks of GRSG habitat degradation or loss associated with landscape stressors of drought, invasive species, and wildfire exacerbated by climate change to maintain existing GRSG and their habitat.

The Proposed Plan would lessen the impacts on fire management the most by proactively reducing the risk associated with landscape stressors, such as invasive annual grasses and the encroachment of conifer woodlands. By placing treatment priorities on habitat quality, this could reduce the risk associated with fire by decreasing FRCCs and increasing resilience to disturbance and resistance to invasive annual grasses. This would reduce the risk of high intensity fires, which would reduce firefighter exposure and suppression costs. There would be an increase in fuel treatment and planning costs associated with the Proposed Plan compared to Alternative A.

Impacts from Leasable Minerals Management

Under the Proposed Plan, all human disturbances would be subject to a net conservation gain of GRSG habitat. This requirement would ensure that GRSG habitats in or outside of PHMA and GHMA would be restored to meet GRSG habitat objectives (**Table 2-6**) and could create additional GRSG habitats. This would affect the FRCC by trending them to more historic levels, which would decrease fire management costs and lower fire sizes, intensity, and extent.

Restrictions on development in all GRSG habitat would ensue. PHMA would be managed under a very restrictive NSO stipulation, while PHMA would be managed under a CSU and TL stipulation, and RDFs (consistent with applicable law) would be applied to OHMA. Under the Proposed Plan, there would be a 3 percent cap on discrete human disturbance in GRSG habitat. Once the cap is met, no new activities that would result in land disturbance would be authorized. With less surface disturbance more areas would trend to historic FRCC levels. Compared to Alternative A, there would be less of an impact from human-caused fires.

The increase in off-site mitigation could create opportunities to reduce fuel loading and increase resiliency on the landscape. It would do this by helping to develop plans and place the proposed treatments where they could benefit wildland fire management and GRSG habitat. This combined effort to reduce the fuel loading and improve habitat would increase the amount of hazardous fuels and vegetation treatments possible. It also would reduce the impacts on the overall disturbance on the landscape even though there is a potential increase in fire suppression due to increased roads, equipment use, and human activities.

The NSO stipulation on leasable minerals in PHMA would result in less infrastructure support. It would decrease accessibility to remote areas for fire suppression and would reduce the number of existing fuel breaks in the event of wildfire. This would result in a slight decrease in suppression effectiveness and a slight increase in fire size, as compared to Alternative A.

Impacts from Locatable Minerals Management

In the Proposed Plan, the SFA is recommended for locatable mineral withdrawal, while all other habitat remains open to location using RDFs, consistent with applicable law, including OHMAs. All human disturbances would be subject to a net conservation gain of GRSG habitat. This requirement would ensure that GRSG habitats in or outside of PHMA and GHMA are restored to meet GRSG habitat objectives (**Table 2-2**) and could create additional GRSG habitats. This would affect the FRCC by trending them to more historic levels, which would decrease fire management costs and lower fire sizes, intensity, and extent, as compared to Alternative A.

Although a 3 percent cap on discrete human disturbance in GRSG habitat is a requirement, this would not apply to locatable minerals due to the 1872 Mining Law. The BLM and the Forest Service would place more limitations on mineral development under the Proposed Plan, compared to Alternative A, which could indirectly decrease the risk of fire due to locatable mineral development, vehicle traffic, and construction equipment.

Impacts from Salable Minerals Management

In the Proposed Plan, PHMA would be closed to salable mineral development, while PHMA would remain open to development. All human disturbances would be subject to a net conservation gain of GRSG habitat. This requirement would ensure that GRSG habitats in or outside of PHMA and GHMA are restored to meet GRSG habitat objectives (**Table 2-2**) and could create additional GRSG habitats. This would affect the FRCC by trending them to more historic levels, which would decrease fire management cost and lower fire sizes, intensity, and extent, as compared to Alternative A.

Under this Proposed Plan, there would be a 3 percent cap placed on human disturbance in GRSG habitat. Once the cap is met, no new activities that would result in land disturbance would be authorized. With less surface disturbance

more areas will trend to historic FRCC levels. Compared to Alternative A, there would be less of an impact from human-caused fires.

Because the BLM and the Forest Service would place more limitations on salable mineral development in this Proposed Plan compared to Alternative A, this could indirectly decrease the risk of fire due to salable mineral development, vehicle traffic, and construction equipment. The closure to mineral material disposal infrastructure supporting minerals development would decrease accessibility to remote areas for fire suppression and would reduce fuel breaks in the event of wildland fire in PHMA.

Impacts from Land Uses and Realty Management

In the Proposed Plan, PHMA would be managed as an avoidance area for ROWs and SUAs, while GHMA would be open for new ROWs and SUAs. Both PHMA and GHMA would continue to have numerous restrictions applied to development, and OHMA would be subject to RDFs consistent with applicable law. All PHMA and GHMA would manage human disturbances subject to a net conservation gain of GRSG habitat. This requirement would ensure that GRSG habitats in or outside of PHMA and GHMA are restored to meet GRSG habitat objectives (**Table 2-2**) and could create additional GRSG habitats. This would affect the FRCC by trending them to more historic levels, which would decrease fire management cost and lower fire sizes, intensity, and extent.

Under this alternative, there would be a 3 percent cap on discrete human disturbance in PHMA and GHMA. Once the cap is met, no new activities that would result in land disturbance would be authorized. With less surface disturbance more areas would trend to historic FRCC levels. Compared to Alternative A, there would be less of an impact from human-caused fires.

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 and SUAs could decrease the potential for using roads as fuel breaks and control lines during fire suppression.

Impacts from Renewable Energy Management

In the Proposed Plan, all PHMA and GHMA would be a right-of-way exclusion area for solar development. PHMA would be a right-of-way exclusion area for wind development, while GHMA would be a right-of-way avoidance area for wind development. All human disturbances would be subject to a net conservation gain of GRSG habitat. This requirement would ensure that GRSG habitats in or outside of PHMA and GHMA are restored to meet GRSG habitat objectives (**Table 2-2**) and may provide for the creation of additional GRSG habitats. This alternative proposes ROW avoidance in PHMA and GHMA.

Under the Proposed Plan, there would be a 3 percent cap on human disturbance in GRSG habitat. Once the cap is met, no new activities that would

result in land disturbance would be authorized. Impacts on fire would depend on the number of facilities constructed and the extent of disturbance footprints. Compared to Alternative A, the decrease in potential development would benefit fire management by reducing surface disturbance from new development trending FRCC lower, a decrease in potential human-caused ignitions, and a decrease in suppression protection priorities. A decrease in new road construction and maintenance would impact fire management from limiting ease of access for suppression resources and fuel breaks that may stop or slow the spread of fire.

Impacts from Comprehensive Travel and Transportation Management

Under the Proposed Plan, PHMA and GHMA would be managed as limited to designated roads and trails. Areas that were previously closed would remain closed, and areas where travel management plans have been completed would be managed as limited to designated roads and trails at a minimum.

If upgrading existing routes would change the route category, it would be prohibited. Route construction would be limited to realigning existing routes to minimize impacts on PHMA and GHMA. The impacts from such actions as evaluating the need for permanent or seasonal road closures in PHMA and GHMA could only be evaluated during activity-level travel planning.

This reduction of acres open to cross-country traffic and increased restrictions would result in less impact on fire management, as the potential for human-caused fire starts would decrease, as well as the potential for weed infestation, compared with Alternative A.

Impacts from Recreation Management

Under the Proposed Plan, activities in recreation management would need to meet GRSG habitat objectives; this could reduce human activity in PHMA and GHMA, which would lessen the potential for human-caused fire starts. Public education Campaigns about GRSG habitat and cross-country travel would lessen the surface disturbance, which would in turn influence the FRCCs to trend toward historic levels. Impacts on fire management would be less than Alternative A.

4.10 LIVESTOCK GRAZING

4.10.1 Methods and Assumptions

The following section analyzes impacts on livestock grazing (including range facilities) from the other program management decisions. Under Alternatives A through F, the BLM and the Forest Service proposed the same livestock grazing management actions, and their analyses are combined. Under the Proposed Plan, the BLM and the Forest Service brought forward different livestock grazing management actions; as such the analyses have been separated.

Indicators

Table 4-11 provides a summary of the indicators that were used to analyze the effects on livestock grazing under each alternative.

Appendix R, Livestock Grazing, provides allotment-specific information on BLM-administered and National Forest System lands.

Assumptions

The analysis includes the following assumptions:

- All new and renewed leases and permits would be subject to terms and conditions determined by the BLM Authorized Officer to manage and achieve resource condition objectives for BLM-administered and National Forest System lands and to meet land health standards for BLM-administered lands and desired conditions on National Forest System lands.
- Range improvements (e.g., fences, pipelines, water wells, troughs, and reservoirs) could cause vegetation cover to be lost throughout the improvements' useful life. Vegetation would be reestablished through reclamation and would be consistent with adjacent vegetation along water pipelines and naturally along fence lines. Vegetation would become reestablished within five years, to the extent practicable, whereas a portion of the disturbed areas would remain disturbed during their useful life and would be revegetated only if abandoned.
- The construction and maintenance of range improvements would continue in the decision area as needed. New range improvements would be subject to limitations, as defined in the plan. Range improvements are generally intended to improve livestock distribution and management, which would maintain or improve rangeland health and could benefit the forage base and wildlife and GRSG habitat.
- By definition in this plan, livestock grazing is not considered a surface-disturbing activity, but it could affect the surface in areas where livestock concentrate, such as around range improvements.
- By definition, priority habitat means PHMA only.
- Planning area acreage—**55,078,900**
- BLM allotment acreage containing PHMA and GHMA—**36,240,779**
- GRSG habitat acreage in planning area
  - PHMA—**9,573,300** acres
  - GHMA—**6,953,300**
  - Total—**16,526,600** acres (**33** percent of planning area)

Table 4-11
Comparison of Range Management Indicators by Alternative

Indicator	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Proposed Plan
Active AUMs in allotments containing GRSG habitat (acres)	BLM: 1,972,697 Forest Service: 278,253 Total: 2,250,950	BLM: 1,972697 Forest Service: 278,253 Total: 2,250,950	0	BLM: 1,972,697 Forest Service: 278,253 Total: 2,250,950	BLM: 1,972,697 Forest Service: 278,253 Total: 2,250,950	BLM: 1,479,523 Forest Service: 208,690 Total: 1,688,213	BLM: 1,972,697 Forest Service: 278,253 Total: 2,250,950
Restrictions to the ability to construct or maintain range improvements and conduct treatments (infrastructure and vegetation)	No change	Increase	Increase	Increase	Neutral	Increase	Increase
Allotment acres unavailable to livestock grazing in PHMA and GHMA for the life of the plan	36,0000	36,000	36,240,779	36,000	36,000	9,051,195	36,000
Allotment acres available to livestock grazing that contain PHMA and GHMA[1] (acres)	BLM: 36,240,779 Forest Service: 1,792,696	BLM: 36,240,779 Forest Service: 1,792,696	0	BLM: 36,240,779 Forest Service: 1,792,696	BLM: 36,240,779 Forest Service: 1,792,696	BLM: 27,180,584 Forest Service: 1,344,522	BLM: 36,240,779 Forest Service: 1,792,696
Changes to type of livestock, timing, duration, or frequency of authorized use, including temporary closures	No change	Increase	N/A; no grazing use proposed	Increase	Increase	Increase	Increase

Source: BLM and Forest Service GIS 2015
[1]If the allotment contains any PHMA or GHMA, then the total allotment acreage was included in the acreage totals.
The following process was used to arrive at the active use by alternative in PHMA and GHMA:

- Alternative A—All or Nothing Approach. Active use in allotments, including PHMA and GHMA, reflects total use for the allotment without adjusting for extent of PHMA and GHMA in the allotment.
- Alternative C—All or Nothing Approach. Occupied habitat (PHMA and GHMA) is closed to grazing, so all active use is eliminated in the affected allotment.
- Alternative F—Twenty-five percent of the area with PHMA and GHMA is rested each year, so Alternative A is reduced by 25 percent. Reduced Alternative A level reflects 50 percent use. AUMs are reduced 25 percent to match utilization limit.

4.10.2 Nature and Type of Effects

Impacts on livestock grazing are generally the result of activities that affect forage levels, areas open to grazing, the class of livestock, the season of use and timing, the ability to construct range improvements, and human disturbance or harassment of livestock in grazing allotments. Key types of impacts are detailed below.

Impacts from GRSG Management

Protecting GRSG habitat can directly affect livestock grazing if management requires limitations on areas open to grazing or available AUMs, modification of grazing strategies, or changes to season of use. This could increase time and cost to permittees and lessees or impact the ability of permittees and lessees to fully use permitted AUMs. For example, management actions designed to enhance habitat for GRSG could affect livestock grazing by restricting grazing intensity, retiring grazing privileges in some areas, or changing livestock rotation patterns, in order to maintain residual herbaceous cover in sagebrush habitat (NTT 2011).

Impacts from Vegetation and Soils

Management of vegetation resources may impact livestock grazing in the short term if vegetation treatments were to include restrictions on available grazing acreage or changes to permitted AUMs, grazing strategies, or season of use, which could increase costs to permittees. Required rest periods following treatments may also impact the ability of livestock operators to fully use permitted AUMs.

However management of vegetation resources may also impact livestock grazing in the long term by increasing vegetation productivity and improving forage, especially in cases where current conditions are not meeting land health standards. For example, in allotments with a history of intensive grazing, transitions in the composition of sagebrush communities may have occurred that have reduced cover or forage for GRSG (Cagney et al. 2010) and grazing livestock. However, when grazing management is put into place to promote health and vigor of the herbaceous community for livestock, this would generally result in sufficient herbaceous cover to meet habitat requirements for breeding GRSG (Connelly et al. 2000a).

Similarly, vegetation management designed to curb incursion of nonnative annual grasses, such as cheatgrass, and encroachment of shrubs or woody vegetation could remove forage in the short term. However, these treatments generally enhance rangeland conditions in the longer term (NTT 2011).

Impacts from Riparian Areas, Wetlands, and Water Resources Management

Managing riparian habitat can directly impact livestock grazing through excluding livestock at specific sites, increasing herding, adding range improvements (such as cross fences and water gaps), and adjusting season of use and livestock

numbers. Managing riparian habitat to maintain PFC would directly impact grazing livestock by providing cleaner and more reliable water sources and more dependable forage availability.

Protecting water quality and watershed health could require changes in livestock management, such as deferring or shortening grazing periods, adding range improvements, excluding grazing from riparian areas, establishing riparian pastures, and increasing livestock herding. In areas requiring exclusion of grazers or other restrictions on livestock management, these limitations would result in increased costs to permittees and lessees if changes were to reduce AUMs or increase livestock management costs.

Impacts from Recreation

Recreation can affect livestock grazing directly through human disturbance and indirectly through rangeland degradation. Direct disturbance can be from the following:

- Undesired animal dispersing or trespassing due to gates left open by recreational users
- Animal displacement, harassment, or injury from collisions or shooting
- Damage to range improvements, particularly from the use of recreational vehicles or from recreational shooting

Disturbance could occur during the hunting season due to increased presence of people, vehicles, and noise and due to livestock shooting. In addition, OHV use results in indirect impacts, such as increased dust on forage in high use areas, leading to lower forage palatability.

Limitations on recreation in GRSG habitat could indirectly impact livestock by reducing direct disturbances. Another direct long-term recreation impact is disturbance caused by increased levels of human activities. The degree of impacts would vary with the intensity of recreation (that is, large numbers of people for SRP use would likely have a higher level of disturbance, as compared with frequent use by a small number of visitors), the timing of recreation activities (livestock could be more susceptible to disturbance during the spring when young are present), and location of recreation in the allotment (a higher level of disturbance could occur near areas frequented by livestock, such as water sources or salt licks).

Impacts from Comprehensive Travel and Transportation

In general, road construction and use of roads and trails may cause forage to be lost and livestock to be harassed and displaced. Therefore, any limits on construction or use of transportation routes may affect livestock grazing practices by reducing disturbance.

Impacts from Wildland Fire Management

Wildland fire removes vegetation and forage and displaces livestock over the short term but can result in forage increases post-fire. Prescribed burn areas could temporarily reduce available forage in the short term but improve conditions in the long term. Impacts on livestock operations could also occur when a rest period is required following rehabilitation and before grazing resumes; this could impact the ability of permittees to fully use permitted AUMs.

Additional impacts on livestock operations could occur when management actions or RDFs (consistent with applicable law) require a rest period following rehabilitation and before grazing is reestablished. Wildland fire suppression and fuels management have varying effects on livestock grazing.

Wildland fire alters sagebrush habitat due to the long time required for sagebrush to regenerate, which allows time for cheatgrass and other invasive species to spread (NTT 2011). Measures to protect sagebrush habitat might reduce the spread of wildland fire and the associated livestock disruption. Managing habitat for GRSG using natural disturbance regimes, such as fire, and using vegetation treatments could accomplish biodiversity and improve plant community resilience. It could also impact livestock grazing in the long term by maintaining a balance of seral stages. In general, selectively thinning woodland species impacts livestock grazing in the long-term by creating a healthier grass, forb, and shrub community.

Impacts from Lands and Realty

Development of ROWs and SUAs can impact livestock grazing operations in the short and long term. Development creates disturbance, which can reduce forage, introduce noxious weeds, create dust that reduces forage palatability, and inhibit access for the BLM, Forest Service, and grazing operators. Development can also harass or displace livestock. Restrictions placed on ROW and SUA development can reduce these impacts.

Impacts from Energy and Minerals

Energy and mineral development could impact grazing. During the exploration and testing phase of energy and mineral development, the footprint of disturbance is usually small and localized, so minimal acres available for grazing would be directly impacted. However, during the exploration phase, impacts on livestock dispersal and trespass could occur, increasing time and costs to permittees and lessees. Outside of the exploration and testing phase, surface-disturbing development directly affects areas of grazing in the short term during construction of well pads, roads, pipelines, and solar and wind energy facilities.

Potential short-term impacts are changes in available forage, reduced forage palatability because of dust on vegetation, limited livestock movement, harassment, temporarily displaced livestock, and an increased potential for the introduction and proliferation of noxious weeds that lack nutritional value. In

the long term, a smaller grazing acreage is permanently lost from mining following rehabilitation.

Improving roads for energy and mineral development could facilitate livestock management by maintaining or improving access to remote locations in allotments. Properly implemented, RDFs (consistent with applicable law) and reclamation mitigation measures would likely improve rangeland health and forage levels for livestock. Reduction in energy and mineral development in GRSG habitat could reduce potential impacts on grazing, described above. Management for energy and mineral development on split-estate would not impact permittees or lessees with leases of BLM-administered and National Forest System lands; however, impacts could occur on livestock grazing on private, state, or lands of other ownership, as stated above.

Impacts from Livestock Grazing Management

On BLM-administered lands, all grazing permits and leases are required to meet or make progress toward meeting rangeland health standards, defined in the Standards for Rangeland Health and Guidelines for Livestock Grazing Management (BLM 1997d). Allotments are monitored for compliance with Standards for Rangeland Health through land health assessments.

When allotments are not meeting or making progress toward meeting land health standards and livestock grazing has been determined to be the cause, changes in livestock grazing management are implemented. This could impact grazing opportunities in a variety of ways. For example, implementing particular livestock grazing management requirements to protect GRSG habitat could affect livestock grazing by increasing operators' costs or changing grazing practices. Short-term and long-term costs to permittees and lessees could increase, or AUMs could decrease for some permittees and lessees due to the following:

- Implementation of a grazing strategy
- Change in season-of-use or livestock class
- Modification to grazing systems
- Construction or modification of range improvements

These management requirements would result in economic impacts on individuals and the community at large, both directly and indirectly. For example, if a rancher were to depend seasonally on federal forage, a reduction or elimination of federal AUMS may create forage imbalances. This could produce a greater reduction in grazing capacity than just the loss of federal AUMs (Torell et al. 2005).

Some management changes may require a short-term output of cost for permittees and lessees but would result in long-term benefits. For example,

constructing range improvements for livestock distribution and allowing use of a larger portion of the rangeland would generally enhance rangeland health in the long term; however, it could impact the livestock permittees and lessees economically in the short term.

Constructing off-site water sources and fencing riparian and spring sources could keep livestock away from sensitive riparian areas and provide a cleaner more reliable source of water for livestock but would similarly represent an increased cost for permittees and lessees. If a permit or lease were retired from grazing, the BLM or Forest Service would have to compensate the permittee or lessee for the range improvement projects, in accordance with 43 CFR, Part 4120.3-6(c).

Impacts from Wild Horse and Burros

When livestock and wild horses occupy the same area, their needs for water and forage are competitive. In extreme circumstances, wild horses could outcompete livestock temporarily and could preclude livestock access to certain water sources. Livestock and wild horse and burro conflicts could include fence damage.

4.10.3 Impacts Common to All Action Alternatives

Impacts from GRSG Management

In general, management actions to protect GRSG involve limiting surface disturbance and fragmentation of habitat from other land uses. Such actions are likely to decrease disturbance on livestock grazing from other land use activities. Restrictions on surface disturbances may also limit construction of rangeland improvements by limiting livestock grazing management options and livestock use opportunities. Grazing allotments containing sagebrush habitat would be managed to maximize cover and forage for GRSG, not to maximize livestock forage, which could necessitate change in livestock management.

Impacts from Comprehensive Travel and Transportation Management

Access to allotments for authorized use for BLM and permittees/lessees would be permitted under all alternatives; therefore travel management restrictions would have limited impacts on the ability of operators to manage livestock grazing.

4.10.4 Alternative A

Impacts from GRSG Management

Under Alternative A, special provisions for GRSG protection are limited. There are few direct limitations on resource uses specifically for GRSG protection. A few LUPs (e.g., the Alturas, Eagle Lake and Surprise RMPs) include detailed habitat objectives for GRSG habitat, which could impact suitability of lands for livestock grazing, but such provisions are not present in most LUPs. There is also limited potential for site-specific restrictions on range management as a

result 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 in GRSG breeding and nesting habitat and, in some cases, winter habitat, in a certain distance and between certain dates. The level of impacts on grazing management would depend on site-specific restrictions in place under current LUPs, but is likely to be the lowest under Alternative A.

Livestock grazing will be managed to meet or make significant progress toward meeting current rangeland health standards particularly, the wildlife habitat/ special status species and riparian standards.

Site specific grazing management changes would include the timing, duration, or frequency of permitted use, including temporary closures. Management changes designed to address non-attainment of wildlife habitat standards would likely reduce annually permitted AUMs.

Impacts from Livestock Grazing Management

Livestock grazing would continue to be allowed on 38,033,475 allotment acres in existing GRSG habitat, for a total of 2,250,950 AUMs in the planning area.

Under Alternative A, current levels and seasons of use would continue in the planning area, pending completion of land health assessments. These include an analysis of the current condition of wildlife habitat against established rangeland health standards. Current policy is to prioritize land health assessments and grazing permit processing on "Improve" category allotments as well as focusing on those allotments with critical habitat and conflicts with GRSG (W.O. IM 2009-018).

Current conditions could be lacking, and permitted grazing use could be determined to be a significant cause for nonattainment or failure to make significant progress to meet rangeland health standards. In such cases, changes to existing grazing management must be implemented as soon as practicable but not later than the start of the next grazing season, in accordance with current grazing regulations (43 CFR, Part 4180.1).

Management changes designed to address nonattainment of wildlife habitat standards would likely change current timing, duration, or frequency of permitted use, including temporary closures. These changes would especially occur in areas where drought has affected vegetation, based on recent drought management direction.

Permitted AUMs would most likely change in those areas found to be not meeting land health standards, especially the Wildlife Habitat/Special Status Species and Riparian Standards.

Drought management actions are directed to allotments with resource concerns.

Constructing and maintaining range improvements would continue under this alternative. Range improvements include fences, vegetation treatments, such as those in the Sage Steppe Ecosystem Restoration Strategy Final EIS (BLM 2008f), and water developments. These would be allowed in the planning area when needed to support grazing systems or to improve livestock distribution. They would allow for options for management for permittees and lessees when needed to alter grazing use to meet rangeland health standards. Range improvement projects would be designed to maintain or improve GRSG habitats, which would likely reduce the number of constructed range improvements. In some instances, improvements may be removed to help attain standards.

Impacts from Wild Horse and Burros

Overall management direction is to manage for healthy populations of wild horses and burros to achieve a thriving natural ecological balance with respect to wildlife, livestock use, and other multiple uses. Under Alternative A, wild horses and burros would continue to be managed in established HMAs or WHBTs and under established AMLs. Existing competition between wild horses and livestock would continue at current levels. In the Nevada portion of the planning area, wild horse and burros management is included in the Multiple Use Decision Process for forage allocation. This process would result in decreases to current permitted use in the planning area due to re-allocation of forage resources to livestock, wild horse and burros, and wildlife. Range improvement construction and maintenance could be increased if a need for additional water sources is identified for current populations of wild horse and burros.

Impacts from Vegetation and Soils Management

Under Alternative A, there would be few vegetation restoration treatments implemented specifically to maintain or improve GRSG habitat. Current management implements the Integrated Vegetation Management Handbook policies (BLM 2008j), Land Health Standards, Vegetation Treatments Using Herbicides Programmatic EIS (BLM 2007a) and the Sage Steppe Ecosystem Restoration Strategy Final EIS (BLM 2008f), as well as other policies and plans. Vegetation treatments are focused on reducing hazardous fuels, ESR, controlling noxious weeds and invasive plants, and managing for sensitive species habitat to some degree. Management actions would be prioritized to meet land health and riparian standards and to control invasive plants and noxious weeds under the direction of current LUPs.

Vegetation restoration may directly affect livestock grazing if treatments include restrictions on available grazing acreage or changes to permitted AUMs, grazing strategies, or season of use, which would result in increased cost to permittees. Required rest periods following treatments may impact the ability of livestock

operators to fully use permitted AUMs. However, Forage availability may increase in the long term due to improved land health and forage productivity. Weed control treatments would also increase forage availability in the long term by improving native plant productivity.

Impacts from Climate Change

Impacts from climate change on grazing are manifested as drought conditions. Under Alternative A, there would be no additional restrictions to livestock grazing based on drought conditions in PPH other than those already specified in permit terms and conditions. Authorized grazing use in allotments may be changed due to drought conditions on an annual basis. Changes are related to the start and completion dates of grazing periods, which may result in a reduction of permitted AUMs for that year.

Impacts from Riparian Areas, Wetlands, and Water Resources Management

As described under Nature and Type of Effects, managing riparian and wetland habitat can directly impact livestock grazing through excluding livestock at specific sites, increasing herding, adding range improvements (such as cross fences and water gaps), and adjusting season of use and livestock numbers. Such changes in grazing management options may result in an increase in costs and time required for permittees/lessees in these areas. Permitted use would decline based on specific actions taken to improve riparian areas to PFC especially on allotments in existing GRSG habitat with hot season grazing. Range improvement construction/maintenance could increase or decline based on specific situations. Additional range improvements, such as upland water sources and riparian protection fences, would be constructed to facilitate riparian management. In areas where existing range improvements are contributing to riparian/water resource concerns, these improvements would be modified or removed.

Impacts from Recreation Management

Under this alternative, there would be no restrictions to SRPs related to GRSG in the decision area; therefore, livestock could be disturbed by recreational activities or groups in the planning area; however, due to the current low level of SRPs and limited interest in future SRPs in the planning area, impacts would likely be minimal. Impacts from general recreational activities would be as described under Nature and Type of Effects.

Impacts from Comprehensive Travel and Transportation Management

Under Alternative A, approximately 12,145,400 acres in PHMA and GHMA would remain open to unrestricted cross-country motorized travel. Effects would be the same as those described in Nature and Type of Effects.

Impacts from Fire and Fuels Management

Under Alternative A, wildfire suppression is not specifically prioritized in GRSG habitat. After firefighter safety, prioritization of suppression would be

implemented for multiple resources protection. Wildfire alters sagebrush habitat due to the long time required for sagebrush to regenerate, which may allow for the invasion of invasive species (NTT 2011). Wildfire would remove livestock forage over the short term but can result in increases in forage post-fire. Impacts on livestock operations could also occur when a livestock grazing rest period is required following vegetation stabilization and rehabilitation treatments post-fire. These required rest periods may impact the ability of livestock operators to fully use permitted AUMs. The specific impacts on livestock operators would be short-term increased costs to provide alternative forage resources to livestock. The amount of impact on livestock permittees would depend on the location and intensity of the fire in relation to grazing allotments.

Under this alternative, no restrictions or priorities would be applied to fuels management in GRSG habitat. Areas treated to remove hazardous fuels would be prioritized to protect life, property, and sensitive resources. Treatment methods would include the use of manual, mechanical, chemical, and prescribed fire. Treatments typically are designed to remove western juniper and other shrubs and trees to prevent wildfire. Treatments implemented under this alternative may increase forage production for livestock in the long term due to increased herbaceous understory due to a decline in the cover of shrubs and trees. This would depend on the amount of tree cover removed from the plant community. On sites where additional sunlight would reach the herbaceous understory, there would also be an increase in forage quality and nutritional content.

Impacts from Renewable Energy Management

Under Alternative A, outside of solar energy zones, no new Renewable Energy ROW/SUA exclusion or avoidance areas would be implemented in the decision area. Disturbance of livestock would result from development of ROWs. This alternative has the fewest acres subject to restrictions on renewable energy ROW locations. Alternative A causes the highest level of disturbance for livestock grazing. Reductions in permitted use and range improvement construction could occur.

Impacts from Salable Minerals

Under Alternative A, the fewest acres are subject to restrictions for mineral material disposal. Under Alternative A, the majority of the planning area and existing GRSG habitat is open to mineral material disposal on a case by case basis. Impacts from salable mineral management on livestock grazing would be as identified under Nature and Type of Effects however, management under Alternative A causes the highest level of disturbance for livestock grazing. Disturbance of livestock grazing would result from development of sites. Reductions in AUMs and range improvement construction could occur.

Impacts from Locatable Minerals

Under Alternative A, few acres have been petitioned for withdrawal from mineral entry. Under Alternative A, the majority of the planning area and existing GRSG habitat is open to locatable mineral exploration or development. Impacts from locatable mineral development on livestock grazing would be as identified under Nature and Type of Effects however, management under Alternative A causes the highest level of disturbance for livestock grazing. Disturbance of livestock grazing would result from development of sites. Reductions in AUMs and range improvement construction could occur.

Impacts from Nonenergy Leasable Minerals

Under Alternative A, the majority of the planning area and existing GRSG habitat is open to nonenergy mineral exploration or development. Impacts from nonenergy leasable mineral development on livestock grazing would be as identified under Nature and Type of Effects however, management under Alternative A causes the highest level of disturbance for livestock grazing. Disturbance of livestock grazing would result from development of sites. Reductions in permitted use and range improvement construction would occur.

Impacts from Fluid Minerals (Oil, Gas, Geothermal)

Under Alternative A, lands in existing GRSG habitat would generally be open to fluid mineral development. Conflicts between grazing and mineral development would be more likely to occur in this area. While some decrease in disturbance to range management could occur as a result of surface use restrictions, there is the potential for disturbance. Impacts from fluid mineral development on livestock grazing would be as identified under Nature and Type of Effects however, due to the limited reasonably foreseeable development of oil and gas and geo-thermal, impacts on range management from fluid mineral development would to be minimal. Permitted use and opportunity to construct range improvements would be slightly reduced in areas open to development.

Impacts from Unleased Fluid Mineral

In the sub-region, all LUPAs contain fluid mineral lease stipulations for oil and gas and geothermal resources, as well as nonenergy leasable minerals that occur in GRSG habitat. These stipulations range from No Surface Occupancy in 0.25 mile of a lek to appropriate seasonal timing limitations based on GRSG biology. Timing limitations vary by type of habitat (e.g., lek, brood-rearing, winter) and are typically applied to a 2-mile buffer around leks. The more recent LUPs (e.g., Ely, Alturas, Eagle Lake, and Surprise LUPs) contain explicit exception, modification, and waiver language for each stipulation per BLM policy to address any special circumstances that would alter the lease stipulation requirements. Older LUPs typically do not provide exception, modification and waiver language. Forest Service plans contain similar direction; however, actual leasing on Forest Service-administered lands is delegated to the BLM.

While some decrease in disturbance to range management could occur as a result of these surface use restrictions, there is the potential for disturbance in the majority of the decision area. Due to the limited reasonably foreseeable development of oil and gas and geo-thermal, impacts on range management from fluid mineral development would to be minimal. Permitted use and opportunity to construct range improvements would be slightly reduced in areas open to development.

Impacts from Land Uses and Realty Management

Under Alternative A, no new ROW/SUA exclusion or avoidance areas would be designated in the decision area. Disturbance of livestock would result from development of ROWs. Impacts from the development of ROW/SUAs on livestock grazing would be as identified under Nature and Type of Effects; however this alternative has the most acreage identified for disposal. Land tenure adjustments would directly affect permitted use levels as those lands are no longer available for grazing use. Therefore this alternative would have the highest potential for impacts from lands and realty on livestock grazing.

4.10.5 Alternative B

Impacts from GRSG Management

Additional restrictions to protect and enhance GRSG and their habitat under Alternative B would reduce disturbance on livestock and forage as compared with Alternative A. On BLM-administered lands, land health assessments would be conducted on all allotments open to grazing as in Alternative A; however, under this alternative, allotments in PHMA would be highest priority. Changes to current livestock grazing would occur when grazing is identified as a significant cause for non-attainment of rangeland health standards. Changes to permitted AUMs could occur in PHMA first. Restrictions on construction and maintenance of range improvements would occur.

Impacts from Livestock Grazing Management

Effects would be similar to Alternative A but would focus on allotments containing PHMA. Livestock grazing would be managed to benefit GRSG populations and habitat in PHMA.

Under Alternative B, the acres open to grazing and AUM allocations would be the same as under Alternative A. However, all GRSG habitat objectives and management would be incorporated into AMP and permit renewals; therefore, impacts would occur at a site-specific level during the permit renewal process or NEPA analyses on National Forest System lands.

On BLM-administered lands, completion of land health assessments and processing grazing permits would be prioritized to those allotments and grazing permits in PHMA, particularly those with the best opportunity to conserve, enhance, or restore habitat for GRSG. As a result, impacts on range management would be most likely to occur in these areas.

Under Alternative B, management actions (grazing decisions, AMP/conservation plan developments, or other agreements) to modify grazing management would be made to meet seasonal GRSG habitat requirements (Connelly et al. 2011a). As described under *Nature and Type of Effects*, this could require changes to management of a given allotment, such as in the class of livestock permitted, changes to livestock rotation, or season of grazing permitted. Such changes could decrease management options and, therefore, increase time and costs for permittees and lessees.

The BLM and the Forest Service would work with ranchers so that operations in GRSG habitat could be planned as single units; therefore, the time and cost required to implement these changes could be reduced, although they would still be higher than under current conditions where no change would be required.

In addition, retirement or cancellation of grazing privileges would be an option in PHMA. As described under *Nature and Type of Effects*, compensation for authorized range improvements on these lands would be given, conflicts with other land uses would be reduced, and land health and forage could be improved.

Vegetation treatments that provide for sustainable forage could only be completed if these treatments would also conserve, enhance, or improve GRSG habitat; therefore, the management options in PHMA could be reduced when treatments would not benefit GRSG, and the ability to fully use permitted AUMs could be impacted in such cases.

Specific objectives to conserve, enhance, or restore PHMA, based on ESDs, would be developed and land health would be assessed to measure progress toward these objectives. If it were found that allotments were not meeting standards, changes to grazing systems or AUM levels could be required and could increase costs or time for permittees and lessees.

Under Alternative B, structural range improvements, such as fences and exclosures, would be allowed in PHMA, but they would have to be developed to conserve or enhance GRSG habitat. In addition, fences would require flagging to lessen risk for GRSG impacts. The cost of building or maintaining these structures may be increased, compared to Alternative A. Similarly, new water developments diverted from springs or seeps would be permitted only when GRSG habitat would also benefit. The ability to construct these developments could be limited.

Impacts from Wild Horse and Burros Management

Under Alternative B, HMAs and WHBTs in PHMA would be categorized a higher priority for gathers. For the livestock grazing allotments that overlap HMAs and WHBTs in PHMA, wild horse and burro numbers would stay within AMLs, providing for more sustainable forage for livestock. HMAs and WHBTs

that do not contain PHMA would be categorized as a low priority for future gathers. As a result, sustainable forage would decrease due to growing populations of wild horses that have not been gathered in those areas.

Impacts from Vegetation and Soils Management

Under Alternative B, meeting GRSG habitat objectives in PHMA is the highest restoration priority. In addition, implementation of restoration projects would be based on seasonal habitats that are thought to be limiting GRSG distribution and abundance. Post restoration management to ensure long-term persistence could include changes in livestock grazing management, to achieve and maintain the desired conditions. Vegetation restoration may directly affect livestock grazing if treatments include restrictions on available grazing acreage or changes to permitted AUMs, grazing strategies, or season of use, which would result in increased cost to permittees. Required rest periods following treatments may impact the ability of livestock operators to fully use permitted AUMs. Impacts could occur should treatments for GRSG habitat not match with vegetation objectives for livestock grazing; however, in most cases, treatment would improve sustainable forage conditions in the long term.

Management actions that control invasive species would be prioritized in PHMA. Unless treatments involve large acres, there would be limited short-term impacts on livestock grazing. Weed control treatments would increase sustainable forage in the long term by improving native plant productivity.

Impacts from Climate Change

Impacts under Alternative B would be the same as impacts described under Alternative A.

Impacts from Riparian Areas, Wetlands and Water Resources Management

Impacts on livestock grazing would be similar to those identified under Nature and Type of however greater restrictions on grazing would be required to protect riparian and water resources. Modifications, where necessary, would need to be required and limited opportunities would be provided to develop new water sources unless they would benefit GRSG. Permitted livestock use could decline under Alternative B. Range improvements in PHMA would be constructed, modified, or removed to facilitate riparian management.

Impacts from Recreation Management

Under this Alternative, SRPs would only be authorized if they have a neutral or beneficial effect on PHMA. This would result in fewer disturbances from recreational activities on livestock than Alternative A.

Impacts from Comprehensive Travel and Transportation Management

Under Alternative B, motorized travel would be limited to existing or designated routes in PHMA and GHMA and the potential for disturbance to livestock grazing activities would be less than under Alternative A.

Travel plans to be completed would analyze PHMA for the need for road closures, and limitations would be implemented during development of new roads. Some reductions in routes and limitations on new routes as well as upgrades to existing routes would be added compared with Alternative A, which would result in indirect reduction in disturbance to livestock in PHMA.

Impacts from Fire and Fuels Management

Under Alternative B, wildfire suppression in PHMA would be prioritized, with the focus on protection of GRSG habitat. Fuel breaks, fuels reductions, and other fire prevention techniques would be implemented to reduce the risk of wildfires in PHMA. As a result, there could be fewer disturbances to livestock grazing in PHMA, as there would be fewer wildfires in the long term. Measures to protect sagebrush habitat might reduce the spread of wildfire and the associated disruption to livestock operations. Forage availability would be maintained or increased long term. Emergency Stabilization and Rehabilitation treatments following a wildfire would be focused on restoring habitat consistent with GRSG habitat needs. These treatments would use locally selected native seeds where available, and may include temporary restrictions on livestock grazing, motorized travel, and other uses. Livestock management may be adjusted to support successful restoration post-rehabilitation, which would result in a temporary or permanent reduction in permitted AUMs and forage availability in areas seeded post-fire. The level of impacts would depend on size, location, and intensity of fire and related level of restoration needed. Fine fuels management projects using livestock grazing have the potential to result in site-specific, temporary increases in available forage in PHMA, but impacts would be small and localized.

Fuels management would be prioritized to maintain and improve GRSG habitat. Mechanical, manual, and chemical treatments would be used to prevent conifer encroachment and prevent the spread of undesirable annual grass and weed species. These actions could improve forage in the long term.

Emphasis would be placed on ensuring that sagebrush cover is not reduced due to fuels treatment activities. Under this alternative, forage availability may decrease over time in areas of high sagebrush cover, due to a restricted ability to remove sagebrush through fire, mechanical, or chemical means to reduce fuel and increase herbaceous plants in PHMA. A minimum rest period from livestock grazing of two growing seasons may be required following fuels treatments, depending on the nature of the treatment. The specific timing, type of rest, as well as any modification needed to livestock grazing use would be determined at the site-specific environmental assessment phase.

Impacts from Renewable Energy Management

Under Alternative B, PHMA would be managed as exclusion areas for new ROWs and SUAs with some exceptions; GHMA would be managed as ROW/SUA avoidance areas. Because renewable energy projects are typically

large in size and create major surface disturbance, excluding or restricting this type of activity would maintain existing AUMs provide for sustainable forage and reduce disturbance to livestock grazing.

Impacts from Salable Minerals

Disturbance from mineral material disposal on livestock grazing is less than Alternative A. More acres are closed to mineral material disposal. Fewer reductions in permitted livestock use would occur because of fewer disturbances to available forage.

Impacts from Locatable Minerals

Disturbance from locatable minerals management on livestock grazing under Alternative B would be less than Alternative A. Recommending withdrawal in PHMA will minimize disruption of livestock grazing operations in PHMA. When compared to Alternative A, this would result in more sustainable forage for grazing. However, GHMA remains open to locatable mineral development. Habitat mitigation and vegetation reclamation requirements would reduce the potential impacts on permitted livestock use.

Impacts from Nonenergy Leasable Minerals

Disturbance from nonenergy leasable management on livestock grazing under Alternative B would be less than Alternative A. Closing nonenergy leasable minerals to development in PHMA would minimize disruption of livestock grazing operations in PHMA and, when compared to Alternative A, would result in more sustainable forage for grazing. GHMA would remain open to development, and has the potential to reduce available forage if development occurs.

Impacts from Fluid Minerals

Under Alternative B, fluid minerals would be closed in PHMA and managed with a NSO stipulation in GHMA. This would reduce the amount of surface disturbance associated with this activity and protect sustainable vegetation for livestock more than under Alternative A.

Impacts from Land Uses and Realty Management

Disturbance on livestock grazing from lands and realty management would be less than under Alternative A. This alternative manages PHMA as exclusion areas for new ROWs/ SUAs with some exceptions (such as where proposed infrastructure could be collocated in an existing disturbance area) and GHMA ROW/SUA as avoidance areas. ROW/SUA avoidance/exclusion acreage is increased which would reduce disturbance to vegetation and permitted livestock use as compared to Alternative A. Less acreage is identified for disposal than under A.

4.10.6 Alternative C

Impacts from GRSG Management

The impact on livestock grazing would be substantially greater than Alternative A, because allotments that intersect with PHMA would be unavailable for grazing. Occupied GRSG habitat (16,526,600 acres PHMA) could be improved through passive restoration which relies on the elimination of livestock grazing in PHMA. Removal of livestock grazing could allow natural ecological processes to improve the quality and quantity of GRSG habitat. However, making PHMA unavailable for livestock grazing could add to demands for additional AUMs/forage outside of PHMA.

Impacts from Livestock Grazing Management

Effects on livestock grazing would be substantially greater than under Alternative A. No livestock grazing would be allowed on 38,033,475 allotment acres in GRSG habitat, so there would be no AUMS in GRSG habitats. Permitted use would be eliminated on all allotments containing PHMA acres.

Livestock grazing operations dependent on these allotments would be economically compromised to varying degrees, depending on their reliance on BLM-administered and National Forest System land grazing privileges. Associated revenue to state and local government would decrease. Socioeconomic grazing impacts can be found in the socioeconomic impact section of Chapters 4 and 5.

Constructing and maintaining range improvements in PHMA would be eliminated under this alternative.

Restoration associated with the impacts of range improvements would be implemented in PHMA. Livestock water troughs, pipelines, and wells would be removed. Where possible, without further damaging springs and water sources, waterline piping would be removed, maximizing water at springs and streams that support diverse riparian and meadow vegetation. In the case of BLM-administered lands, permittees would be compensated for this loss.

Impacts from Wild Horse and Burros Management

There would be no impacts on livestock grazing, as livestock grazing is eliminated in PHMA.

Impacts from Vegetation and Soils Management

There would be no impacts on livestock grazing, as livestock grazing is eliminated in PHMA.

Impacts from Climate Change

There would be no impacts on livestock grazing, as livestock grazing is eliminated in PHMA.

Impacts from Riparian Areas, Wetlands, and Water Resources Management

There would be no impacts on livestock grazing, as livestock grazing is eliminated in PHMA.

Impacts from Recreation Management

There would be no impacts on livestock grazing, as livestock grazing is eliminated in PHMA.

Impacts from Comprehensive Travel and Transportation Management

There would be no impacts on livestock grazing, as livestock grazing is eliminated in PHMA.

Impacts from Fire and Fuels Management

There would be no impacts on livestock grazing, as livestock grazing is eliminated in PHMA.

Impacts from Renewable Energy Management

There would be no impacts on livestock grazing, as livestock grazing is eliminated in PHMA.

Impacts from Salable Minerals

There would be no impacts on livestock grazing, as livestock grazing is eliminated in PHMA.

Impacts from Locatable Minerals

There would be no impacts on livestock grazing, as livestock grazing is eliminated in PHMA.

Impacts from Nonenergy Leasable Minerals

There would be no impacts on livestock grazing, as livestock grazing is eliminated in PHMA.

Impacts from Fluid Minerals (Oil, Gas, Geothermal)

There would be no impacts on livestock grazing, as livestock grazing is eliminated in PHMA

Impacts from Unleased Fluid Mineral

There would be no effect on livestock grazing under Alternative C. Permitted use would be eliminated in PHMA under this alternative.

Impacts from Land Uses and Realty Management

There would be no impacts on livestock grazing, as livestock grazing is eliminated in PHMA.

4.10.7 Alternative D

Impacts from GRSG Management

Restrictions on disturbance in GRSG habitat would be greater under Alternative D than under Alternative A, reducing impacts from disturbance on livestock grazing. Alternative D differs from Alternative A in the requirement to meet GRSG-specific objectives and guidelines contained in **Tables 2-2** and **2-12** under Alternative D of Chapter 2. This alternative affects 16,526,600 PHMA and GHMA acres over time.

Rangeland health assessments would be prioritized for allotments in PHMA and GHMA.

For allotments not meeting GRSG objectives and current livestock grazing is determined to be a significant factor, appropriate changes in grazing management will be implemented as soon as practicable or prior to the start of the next grazing year in accordance with current grazing regulations.

Changes would include the timing, duration, or frequency of permitted use, including temporary closures. Management changes considered during land health evaluations and permit renewals designed to address non-attainment of GRSG habitat objectives would likely reduce permitted AUMs. Changes to permitted AUMs could occur on up to all PHMA and GHMA habitat acres.

Impacts from Livestock Grazing Management

Permit renewal would be prioritized for allotments in PHMA and GHMA under Alternative D. Changes to permitted grazing level and grazing systems are more likely to occur in allotments in PHMA and GHMA.

All PHMA and GHMA acres are required to meet all rangeland health standards, especially wildlife and special status species habitat and riparian standards.

For allotments not meeting rangeland health standards or conforming to the guidelines and where livestock grazing is determined to be a significant factor, appropriate changes in grazing management would be implemented as soon as practicable or before the start of the next grazing year, in accordance with current grazing regulations.

Grazing management changes designed to address nonattainment of GRSG habitat-specific objectives (**Table 2-2**) are the timing, duration, or frequency of permitted use. These would likely reduce permitted active use AUMs on BLM-administered and National Forest System lands.

Temporary closures of livestock grazing would also likely occur. Prescriptive grazing would be implemented when feasible to achieve GRSG habitat objectives.

In the long term, Alternative D could improve rangeland habitat conditions for livestock and wildlife by focusing management on those lands that are in most need of improvement, as compared to Alternative A.

Constructing and maintaining range improvements would continue under this alternative but at a much reduced level, when compared to Alternative A. Existing range improvements would be evaluated to make sure they conserve, enhance, or restore GRSG habitat. New range improvement projects would be designed to conserve, enhance, or restore GRSG habitats. Consideration of GRSG habitat needs would likely limit the number and types of constructed range improvements. In some instances, improvements may be removed to help attain standards.

Impacts from Wild Horse and Burros Management

Under Alternative D, HMAs and WHBTs in PHMA and GHMA would be categorized as a higher priority for gathers. For the livestock grazing allotments that overlap HMAs and WHBTs in PHMA and GHMA, wild horse and burro numbers would stay in AMLs, resulting in more sustainable forage for livestock. HMAs and WHBTs outside of GRSG habitat would be categorized as a low priority for future gathers. As a result, sustainable forage would decrease due to growing populations of wild horses that have not been gathered in those areas.

Impacts from Vegetation and Soils Management

Alternative D would implement treatments more specifically designed to improve seasonal habitats for GRSG than under Alternative A. Wet meadows would be managed to maintain a component of perennial forbs with diverse species to facilitate brood rearing. Wet meadow complexes would be maintained to increase the amount of edge, and cover in that edge, to minimize elevated mortality during the late brood-rearing period. These treatments may result in more restrictions to livestock grazing and the ability to continue existing terms and conditions of permits. Additional acres may be closed to grazing temporarily in allotments to allow for riparian areas and meadows to rest from grazing in order to improve vegetation composition for GRSG habitat.

Under Alternative D, changes in livestock management may be required to protect GRSG habitat due to drought conditions. Changes to current terms and conditions of permits would be changed to prevent over use of plant resources during periods of extremely dry weather and poor growing conditions, in order to maintain GRSG habitat. Changes could include delayed turnout dates, reduced grazing periods, temporary closures of riparian areas and meadows, a reduction in AUMs or livestock numbers for a specified period, or other adjustments to livestock operations. These changes would reduce forage availability and increase the cost of livestock operations. The specific impacts on livestock operators would be short-term increased costs to provide alternative forage resources to livestock, or increased labor costs to herd or move livestock more frequently. The long-term impacts of protecting vegetation

during drought conditions would be an increase in plant community stability and an increase in sustainable forage.

Impacts from Climate Change

Impacts would be the same as under Alternative A.

Impacts from Riparian Areas, Wetlands, and Water Resources Management

Restrictions on livestock grazing would be greater than under Alternative A to protect riparian areas, wetlands and water resources. Alternative D may cause changes to current permitted use, based on specific actions taken to return riparian areas to PFC and improve plant community species richness. Changes to permitted use are most likely to occur in allotments with current hot season grazing use on riparian areas. Additional range improvements could be constructed to facilitate riparian management during allotment evaluations, permit renewals, land health assessments, or through other separate implementation planning following the EIS process.

Impacts from Fire and Fuels Management

Impacts under Alternative D would be the same as impacts described under Alternative B.

Impacts from Recreation Management

Under Alternative D, PHMA and GHMA would contain restrictions on the construction of recreation facilities. This would reduce disturbance and conflicts with livestock grazing as compared with Alternative A.

Impacts from Comprehensive Travel and Transportation Management

Under Alternative D, impacts would be similar to those described under Alternative B but with additional restrictions on upgrades, realignment of roads, and requirements for site-specific travel management planning completion applied to PHMA and GHMA. As a result, disturbance from travel management on livestock grazing would be limited and less than under Alternative A.

Impacts from Renewable Energy Management

Alternative D would designate PHMA and GHMA habitat as ROW/SUA exclusion for utility-scale commercial wind energy facilities and solar energy facilities. Therefore impacts from disturbance during renewable energy development on livestock grazing would be less than Alternative A. Fewer potential reductions in permitted livestock use (due to forage destruction/quality reduction) would occur.

Impacts from Salable Minerals

Disturbance from salable minerals on livestock grazing would be less than Alternative A. All of PHMA and GHMA are closed to mineral material disposal. Therefore, fewer potential reductions in permitted livestock use (due to forage destruction/quality reduction) would occur.

Impacts from Locatable Minerals

The impact from locatable mineral management would be the same as under Alternative A.

Impacts from Nonenergy Leasable Minerals

Under Alternative D, disturbance from nonenergy mineral leasing on livestock grazing would be less than Alternative A. PHMA and GHMA would be closed to leasing so less acreage would be subject to development than under A. Fewer potential reductions in permitted livestock use (due to forage destruction/quality reduction) would occur.

Impacts from Fluid Mineral

Under Alternative D, disturbance from fluid mineral leasing and development on livestock grazing would be less than Alternative A. PHMA and GHMA would be closed to leasing so less acreage would be subject to development than under A. Fewer potential reductions in permitted livestock use (due to forage destruction/quality reduction) would occur.

Impacts from Land Uses and Realty Management

Under Alternative D, impacts on livestock grazing would be the same as identified under Nature and Type of Effects except that there are more acres identified as ROW/SUA avoidance areas than A and less acreage identified for disposal than A. Therefore fewer disturbances would occur on livestock grazing as compared to A. Fewer potential reductions in permitted livestock use (due to forage destruction/quality reduction) would occur.

4.10.8 Alternative E

Impacts from GRSG Management

California

Effects under Alternative E would be the same as Alternative A for California lands. The State of California currently has no GRSG management plan in place, so management defaults to Alternative A, current management.

Nevada

Effects under Alternative E would be similar Alternative A for Nevada lands; it differs in the requirement to meet GRSG habitat objectives contained in **Table 2-2** on PHMA and GHMA.

The overarching objective of Nevada's plan is to achieve conservation through net gain of GRSG habitat due to new human disturbances in the SGMA in order to stop the decline of GRSG populations.

Existing grazing permits would be evaluated to ensure that they maintain or enhance core, priority, and general habitats in the SGMA. Based on an understanding of seasonal GRSG habitat requirements, and in conjunction with

livestock operators, land management agencies would be encouraged to make timely, seasonal, range management decisions. These decisions would be to respond to vegetation management objectives, including fuels reduction. Livestock grazing would be used as a tool, when appropriate, to improve core, priority, and general habitat quantity and quality or to reduce wildfire threats. Riparian areas would be managed for PFC.

Grazing management changes could include the timing, duration, or frequency of permitted use; however, the Nevada plan specifically identifies that there would be no net loss of AUMs.

Constructing and maintaining range improvements would continue under Alternative E. Range improvement projects would be designed to enhance GRSG habitats or to minimize impacts and to meet GRSG habitat objectives (see **Table 2-2**).

Impacts from Livestock Grazing Management

California
Impacts would be the same as under Alternative A.

Nevada
Under Alternative E, livestock grazing would be managed to achieve conservation strategies; however, there would be no net loss of AUMs, unlike under Alternative A.

Under Alternative E, the principle livestock grazing action in core, priority, and general habitats in the SGMA is to incorporate GRSG habitat objectives (see **Table 2-2**) and management considerations into all BLM and Forest Service grazing allotments. This would be done through AMPs, multiple use decisions, or permit renewals. It would follow Forest Service Annual Operating Instructions to "implement appropriate prescribed grazing conservation actions at scales sufficient to influence a positive population response in occupied and suitable GRSG habitat acres such as NRCS Conservation Practice Standard 528 for prescribed grazing" (NRCS 2011).

Under Alternative E, current levels and seasons of use would continue in the Nevada portion of the planning area, pending completion of land health assessments, monitoring evaluations, and grazing permit evaluations. Livestock grazing would be allowed on 38,033,475 acres in the SGMA, for a total of 2,250,950 AUMs in the planning area. Lands are managed to maintain healthy native plant communities and wildlife habitats.

All permittees and lessees would be required to meet or progress toward meeting conditions described in Standard Practice 528 and GRSG habitat objectives in **Table 2-2**. They also would have to meet rangeland health

standards defined in the Standards for Rangeland Health and Guidelines for Livestock Grazing Management (BLM 1997d).

Alternative E would incorporate terms and conditions into grazing permits and would adjust these as needed through monitoring and adaptive management to meet GRSG habitat objectives. Integrated ranch planning would be used when possible to manage private and BLM-administered and National Forest System lands as a single unit to achieve GRSG habitat objectives.

Alternative E requires grazing management to be modified to meet seasonal GRSG habitat objectives (see **Table 2-2**), where current livestock grazing is identified as the cause of not meeting those objectives.

Constructing and maintaining range improvements would continue under Alternative E. Range improvements, including fences, vegetation treatments, and water developments, would be allowed in the planning area when needed to support grazing systems or to improve livestock distribution. Permittees and lessees would have options for management when needed to alter grazing use to meet GRSG habitat objectives. Range improvement projects would be designed to maintain or improve GRSG habitats.

Impacts from Wild Horse and Burros Management

California
Impacts on livestock grazing would be the same as under Alternative A.

Nevada
Under Alternative E, AMLs could be reduced below current levels due to GRSG habitat conditions or drought. This action could affect the nature and type of grazing management changes needed in these areas to meet GRSG habitat objectives. However, competition for forage and water with wild horses and burrow would be less than under Alternative A.

Impacts from Vegetation and Soils Management

California
Impacts on livestock grazing would be the same as under Alternative A.

Nevada
Restrictions on livestock grazing under Alternative E would be greater than under Alternative A. Vegetation restoration and weed control are targeted in GRSG habitat. Post restoration and grazing management location, timing, and intensity would be altered to meet vegetation project objectives. Treatment areas may be temporarily closed to grazing to ensure project success.

Impacts from Climate Change
Impacts on livestock grazing would be the same as under Alternative A.

Impacts from Riparian Areas, Wetlands and Water Resources Management

California
Impacts on livestock grazing would be the same as under Alternative A.

Nevada
Restrictions on livestock grazing to protect riparian areas, wetlands, and water resources would be greater than under Alternative A. Alternative E requires riparian areas and wet meadows, at a minimum, to maintain or achieve riparian PFC and to promote brood rearing/summer habitat objectives in GRSG habitat, as described in **Table 2-2**. This could affect the grazing management strategies by requiring more intense management by the permittee.

Impacts from Recreation Management
Impacts on livestock grazing would be the same as under Alternative A.

Impacts from Comprehensive Travel and Transportation Management

California
Impacts on livestock grazing would be the same as under Alternative A.

Nevada
Under Alternative E, in the SGMA, successful programs would continue to follow the strategy to avoid, minimize, and mitigate recreation and OHV impacts on GRSG habitat. This action would minimize disturbance to livestock operations in SGMA compared to Alternative A.

Impacts from Fire and Fuels Management

California
Impacts on livestock grazing would be the same as under Alternative A.

Nevada
Impacts on livestock grazing would be the same as those identified under Alternative D.

Impacts from Renewable Energy Management

California
Impacts on livestock grazing would be the same as under Alternative A.

Nevada
The strategy to avoid, minimize, and mitigate used in Alternative E would minimize disruption of livestock grazing in allotments in SGMA; however, actions in nonhabitat would increase disruptions in those areas. Overall, this approach would reduce disturbance to livestock more than under Alternative A.

Focusing on reclaiming GRSG habitat would provide sustainable forage for livestock grazing in the long term.

Impacts from Salable Minerals

California
Impacts on livestock grazing would be the same as under Alternative A.

Nevada
The strategy to avoid, minimize, and mitigate used in Alternative E would minimize disruption of livestock grazing in allotments in SGMA; however, actions in nonhabitat would increase disruptions in those areas. Overall this approach would reduce disturbance to livestock more than under Alternative A. Focusing on reclaiming GRSG habitat would provide sustainable forage for livestock grazing in the long term.

Impacts from Locatable Minerals

California
Impacts on livestock grazing would be the same as under Alternative A.

Nevada
The strategy to avoid, minimize, and mitigate used in Alternative E would minimize disruption of livestock grazing in allotments in SGMA; however, actions in nonhabitat would increase disruptions in those areas. Overall this approach would reduce disturbance to livestock more than under Alternative A. Focusing on reclaiming GRSG habitat would provide sustainable forage for livestock grazing in the long term.

Impacts from Nonenergy Leasable Minerals

California
Impacts on livestock grazing would be the same as under Alternative A.

Nevada
The strategy to avoid, minimize, and mitigate used in Alternative E would minimize disruption of livestock grazing in allotments in SGMA; however, actions in nonhabitat would increase disruptions in those areas. Overall this approach would reduce disturbance to livestock more than under Alternative A. Focusing on reclaiming GRSG habitat would provide sustainable forage for livestock grazing in the long term.

Impacts from Fluid Minerals

California
Impacts on livestock grazing would be the same as under Alternative A.

Nevada
The strategy to avoid, minimize, and mitigate used in Alternative E would minimize disruption of livestock grazing in allotments in SGMA; however, actions in nonhabitat would increase disruptions in those areas. Overall this approach would reduce disturbance to livestock more than under Alternative A. Focusing on reclaiming GRSG habitat would provide sustainable forage for livestock grazing in the long term.

Impacts from Land Uses and Realty Management

California
Impacts on livestock grazing would be the same as under Alternative A.

Nevada
The strategy to avoid, minimize, and mitigate used in Alternative E would minimize disruption of livestock grazing in allotments in SGMA; however, actions in nonhabitat would increase disruptions in those areas. Overall this approach would reduce disturbance to livestock more than under Alternative A. Focusing on reclaiming GRSG habitat would provide sustainable forage for livestock grazing in the long term.

4.10.9 Alternative F

Impacts from GRSG Management
Impacts on livestock grazing would be similar to those identified under Alternative C because under Alternative F PHMA covers less acreage.

Impacts from Livestock Grazing Management
Livestock grazing would be managed to benefit GRSG populations and habitat. Livestock grazing would be allowed on 28,525,106 acres in GRSG habitat annually, for a total of 1,688,213 AUMs in the planning area.

Under Alternative F, impacts from disturbance on livestock and forage would be less than under Alternative A; however, this alternative would rest 25 percent of PHMA and GHMA acreage each year. Also, utilization levels would be limited to 25 percent. These actions combined would reduce permitted use more than under Alternative A in PHMA and GHMA. Range improvement construction could increase due to the need to fence PHMA and GHMA from being grazed by livestock adjacent areas. Range improvements would be designed to benefit GRSG. This could affect the grazing management strategies by requiring more intense management by the permittee.

Impacts from Wild Horse and Burros Management
Under this alternative, there would be a greater competition for forage and water from wild horse and burros as compared to A.

The 25 percent AML reduction would result in additional forage available for livestock grazing in those allotments that contain both GRSG habitat and HMAs. The reduction in AML would likely result in a decrease in direct competition for forage between permitted livestock and WHBs. This could allow grazing to occur for a somewhat longer period before meeting utilization standards as envisioned by Alternative F. However this effect is mitigated by Alternative F's requirement that 25 percent of PHMA be rested annually and that utilization of forage by livestock on acreage that is grazed be limited to 25 percent.

Impacts from Vegetation and Soils Management

Restrictions on livestock grazing practices to conserve vegetation and soils would be greater than under Alternative A.

Vegetation treatments/restoration would focus on establishing/restoring Potential Natural Communities (PNC) as described in applicable ESDs or other vegetation objectives associated with increased GRSG populations. Coupled with this is a preference for "passive restoration" of disturbed habitats.

Managing livestock grazing to achieve PNC would require rest periods and utilization levels appropriate to the plant community. Reductions in livestock numbers and seasons of use would result in reduced permitted AUMs.

Range improvement construction opportunities would be limited due to the need to limit disturbance.

Impacts from Climate Change

Restrictions on livestock grazing would be greater than Alternative A.

A system of sagebrush reserves comprised of PHMA would be established with the intent of buffering the effects of climate change on GRSG habitat on a landscape scale. Protection of these reserves would likely reduce livestock grazing levels from current levels. Permitted AUMs would likely be reduced from current levels. Grazing use would be designed to maintain the vegetation integrity of the reserve.

Range improvement construction opportunities in sagebrush reserves would be limited due to the need to limit disturbance.

Impacts from Riparian Areas, Wetlands, and Water Resources Management

Restrictions on livestock grazing would be greater than Alternative A to protect riparian and water resources.

Riparian areas would be managed for PFC and for PNC or a desired plant community. Passive restoration strategies would be employed to achieve improvement. Rest periods and restricted seasons of use would be

implemented. Reductions in permitted use would likely occur especially in allotments with current hot season grazing use on riparian areas.

Additional range improvements would be constructed to facilitate riparian management. These could include upland water sites such as wells and troughs designed to reduce grazing pressure on riparian areas and fencing designed to control livestock access to riparian areas. Implementing these changes in range improvement practices would increase operators' costs.

Range improvements such as spring developments, reservoirs in stream channels, etc. which affect riparian resources would be assessed and modified or removed if adversely impacting the riparian resource. Implementing these changes in range improvement practices would increase operators' costs.

Impacts from Recreation Management
Impacts on livestock grazing would be the same as under Alternative B.

Impacts from Comprehensive Travel and Transportation Management
Impacts on livestock grazing would be the same as under Alternative B.

Impacts from Fire and Fuels Management
Impacts on livestock grazing would be the same as Alternative B.

Impacts from Renewable Energy Management
Excluding renewable energy development in PHMA and GHMA for both wind and solar would minimize disruption of livestock grazing operations in PHMA. When compared to Alternative A, this would result in more sustainable forage for grazing. Siting of actions in nonhabitat will increase disruptions in those areas.

Impacts from Salable Minerals
Closing salable minerals to development in both PHMA and GHMA would minimize disruption of livestock grazing operations in PHMA and, when compared to Alternative A, would result in more sustainable forage for grazing. Siting of actions in nonhabitat will increase disruptions in those areas.

Impacts from Locatable Minerals
Impacts on livestock grazing would be the same as under Alternative B.

Impacts from Nonenergy Leasable Minerals
Impacts on livestock grazing would be the same as under Alternative B.

Impacts from Fluid Minerals
Closing fluid minerals to exploration and development in both PHMA and GHMA would minimize disruption of livestock grazing operations and, when compared to Alternative A, and would result in greater sustainable forage for grazing. Siting of actions in nonhabitat will increase disruptions in those areas.

Impacts from Land Uses and Realty Management

Effects from lands and realty management on livestock grazing under Alternative F would be greater than Alternative A. Excluding ROW and SUAs in both PHMA and GHMA would minimize disruption of livestock grazing operations when compared to Alternative A, and would result in more sustainable forage for grazing. Siting of actions in nonhabitat will increase disruptions in those areas.

4.10.10 The Proposed Plan

Impacts from GRSG Management

One way the Proposed Plan differs from Alternative A is its requirement to meet GRSG-specific habitat objectives contained in **Table 2-2**, on 16,812,800 acres in PHMA and GHMA, as well as other actions to achieve desired GRSG habitat conditions. In addition to restricting management in PHMA and GHMA, 2,797,400 acres are designated as SFA, which provide additional restrictions on development and disturbance.

These management actions, designed to enhance GRSG habitat on BLM-administered and National Forest System lands, could affect livestock grazing by the following:

- Modifying grazing strategies or rotation schedules
- Changing duration and the season of use
- Changing the kind and class of livestock
- Reducing livestock numbers

These modifications could reduce AUMs on some allotments.

Management to achieve these desired conditions would also impact permittees by increasing the amount of time permittees spend to manage livestock on BLM-administered lands and the total costs to a livestock operation. However, restricting development in SFA would reduce disturbance on livestock and their forage.

Indirectly, implementing management direction to achieve desired conditions in GRSG seasonal habitat could impact livestock grazing in the long term, particularly on allotments in the improve category. It would do this by implementing management that improves rangeland conditions. Improved rangeland condition could also contribute to increased forage production.

Additionally, because of the GRSG habitat objectives, improvement projects would be designed to maintain or improve GRSG habitats. Consideration of GRSG habitat needs would likely reduce the number of constructed range improvements. In some instances, improvements may be removed to assist in attainment of GRSG habitat objectives.

Finally, the Proposed Plan would include a 3 percent cap on human disturbance, which would be applied in PHMA at both the BSU and project levels. The Proposed Plan also would limit the density of energy and mining facilities.

Human disturbances in PHMA and GHMA would also be mitigated to ensure a net conservation gain for GRSG. In addition, conservation measures would be implemented in PHMA and GHMA, such as adaptive management and defined monitoring protocols (**Appendix E**), RDFs (**Appendix D**), and lek buffers (**Appendix B**). As a result, indirect disturbance of livestock grazing or livestock forage from other new mineral or road development could be reduced, as compared with Alternative A.

Under the Proposed Plan on National Forest System lands, livestock grazing would be managed to achieve or maintain desired conditions in GRSG seasonal habitats, as described in **Section 2.6.3**, **Tables 2-5** and **2-6**. Livestock grazing would be managed to maintain grass height for concealing GRSG nesting and early brood-rearing. This would come about by implementing grazing use guidelines, as described in **Section 2.6.3**, **Table 2-8**.

Wet meadows and riparian areas would be managed to sustain a rich diversity of perennial forb species relative to site potential. Winter habitat would provide sufficient sagebrush height and density for food and cover for GRSG during this seasonal period.

Implementing this management direction would directly impact livestock grazing on National Forest System lands. These impacts could include modifying grazing strategies or rotation schedules, changing duration and the season of use, changing the kind and class of livestock, or reducing livestock numbers. These modifications could reduce AUMs on some allotments. Management to achieve these desired conditions would also impact permittees by increasing the amount of time permittees spend managing livestock on National Forest System lands as well as their total costs.

Indirectly, implementing management direction to achieve desired conditions in GRSG seasonal habitat could be beneficial to livestock grazing in the long term, particularly on allotments where rangeland conditions could be improved. This would come about by implementing management that improves rangeland conditions, which could also increase forage production.

Impacts from Livestock Grazing Management

BLM Proposed Plan

The effect of livestock grazing management would increase the management actions necessary to maintain GRSG objectives in PHMA and GHMA, in comparison to Alternative A.

Impacts could include modifying grazing strategies or rotation schedules, changing the season of use, changing the kind and class of livestock, closing a portion of an allotment, or reducing livestock numbers. Implementing this management direction could reduce AUMs on some allotments and possibly overall operation viability.

Impacts would be similar to those described under Alternatives B and D, which would result in a decline in permitted grazing, anticipated over time as permits are modified to meet objectives. Under the Proposed Plan, priority for land health assessment and permit renewal on BLM-administered and National Forest System lands would include SFA first, followed by PHMA outside the SFA. Existing permittees and lessees in these areas not meeting Land Health Standards would be given precedence, with a specific focus on those containing riparian areas, including wet meadows. The timeline for changes in management would follow this priority. In the long term, this prioritization could improve rangeland conditions for livestock and wildlife by focusing management on PHMA that are in most need of improvement.

Constructing and maintaining range improvements would continue under this alternative but at a reduced level. Construction of new range improvements would be subject to Objective SSS4, which requires the application of avoid, minimize, and mitigate human disturbances. New range improvement projects would be designed to conserve, enhance, or restore GRSG habitats. Existing range improvements would be evaluated to make sure they conserve, enhance, or restore GRSG habitat. Consideration of GRSG habitat needs would likely limit the number and types of constructed range improvements. In some instances, improvements may be removed to help attain GRSG habitat objectives.

Forest Service Proposed Plan

Under the Proposed Plan on National Forest System lands, livestock grazing would be managed to achieve or maintain desired conditions in GRSG seasonal habitats, as described in **Section 2.6.3**, **Tables 2-5** and **2-6**. Livestock grazing would also be managed to maintain perennial grass height for adequate GRSG nesting cover, according to the guidelines described in **Section 2.6.3**, **Table 2-8**.

Current direction for livestock grazing under Alternative A is generally less restrictive than direction described under the Proposed Plan, therefore, grazing use guidelines under the Proposed Plan would directly impact livestock grazing management on National Forest System lands. Impacts could include modifying grazing strategies or rotation schedules, changing the season of use and the kind and class of livestock, closing a portion of an allotment, or reducing livestock numbers. Implementing this management direction could reduce AUMs on some allotments and possibly overall operation viability. The level and intensity of impacts could vary on a site-specific basis. Permitted grazing would decrease

over time as permits are modified to achieve desired conditions and to meet annual grazing use guidelines.

Implementing Forest Service grazing guidelines could also directly impact permittees by increasing the amount of time permittees spend to manage livestock on National Forest System lands as well as the total costs to a livestock operation. Impacts would occur at the allotment scale as management direction is incorporated into permits, allotment management plans, and annual operating instructions.

Grazing use guidelines under the Proposed Plan would impact about 188 allotments, 2,055,075 acres, and 279,085 permitted AUMs in nesting and brood-rearing seasonal habitats in active grazing allotments on the Humboldt-Toiyabe National Forest.

Under the Proposed Plan on National Forest System lands, sheep camps would not be located within 1.2 miles of the perimeter of a lek during lekking season. Livestock trailing would be minimized during breeding and nesting seasons. This management direction would result in the need to modify grazing practices, with increased costs for permittees in these areas.

Additional constraints under the Proposed Plan on National Forest System lands would also apply to structural range improvements in priority GRSG habitat, compared to current plan direction. These constraints include prohibiting fence construction or reconstruction within 1.2 miles of the perimeter of occupied leks. The exception would be if the collision risk could be mitigated through the following:

- Design features or markings
- Not constructing new permanent livestock facilities (e.g., windmills, water tanks, and corrals) within 1.2 miles of the perimeter of occupied leks
- Not constructing water developments in PHMA unless they are beneficial to GRSG

Prohibitions on new structural improvements could limit the ability of permittees to effectively distribute livestock, resulting in increases in time and costs to permittees and potentially the full use permitted AUMs. Although these constraints could increase the amount of time permittees spend to manage livestock on National Forest System lands, it should allow sufficient flexibility so that permittees could continue to use structural range improvements to effectively distribute livestock.

Under the Proposed Plan, the Forest Service would consider closing grazing allotments, pastures, and portions of pastures or managing the allotment as a forage reserve where removing livestock would achieve desired habitat

conditions. These actions would occur according to applicable regulations and, when implemented, would reduce overall available AUMs.

Managing livestock grazing to achieve the desired conditions in **Section 2.6.3**, **Tables 2-5** and **2-6**, and livestock use guidelines in **Section 2.6.3**, **Table 2-8**, may indirectly benefit rangeland conditions by increasing vegetation productivity and increasing forage in the long term. This in turn would provide managers and permittees with better management options, especially on those allotments where livestock numbers are approaching a sustainability threshold or during drought and other disturbances such as wildfire.

Impacts from Wild Horse and Burros Management

Managing wild horse and burro populations within AMLs, or adjusting AMLs, to restore, enhance, or maintain GRSG desired habitat conditions would impact livestock grazing in the long term. This would come about by increasing vegetation productivity and sustainable forage, particularly where rangeland conditions could be improved. Prioritizing gathers in HMAs in SFA, followed by PHMA and GHMA, to meet established AMLs would reduce any current levels of forage competition between wild horses and burros and livestock on allotments in PHMA and would aid in meeting GRSG habitat objectives.

Livestock grazing would benefit from managing HMAs, HAs, and WHBTs within established AML in PHMA and GHMA in order to meet GRSG habitat objectives.

Under the Proposed Plan on National Forest System lands, wild horse and burro populations would be managed within appropriate management levels, or they would be adjusted to restore, enhance, or maintain GRSG desired habitat conditions, as described in **Section 2.6.3**, **Tables 2-5** and **2-6**. This management direction would increase vegetation productivity and forage production in the long term, particularly where rangeland conditions could be improved.

Impacts from Vegetation and Soils Management

Impacts from vegetation and soil management on livestock grazing could increase timing restrictions associated with vegetation treatments; however, over the long term, they would provide more sustainable forage than under Alternative A. The Proposed Plan would implement treatments through VDDT modeling. This is specifically designed to establish, maintain, or enhance sagebrush vegetation communities that exhibit vegetation composition and structure that are consistent with ecological site potential, while improving seasonal habitats for GRSG. Establishing these types of vegetation communities would impact livestock grazing in the long term by providing permanent forage and improved soil conditions. In the short term, these treatments may restrict current livestock grazing to help implement treatments. Such restrictions as reduced stocking or temporary closures to grazing may be necessary to implement successful projects.

Wet meadow complexes would be maintained to increase the amount of edge, and cover within that edge, to minimize GRSG deaths during the late brood-rearing period. These treatments may result in more restrictions to livestock grazing and the ability to continue existing terms and conditions of permits. Additional acres may be closed to grazing temporarily within allotments to allow for riparian areas and meadows to rest from grazing and to improve vegetation composition for GRSG habitat.

Impacts from Climate Change

Impacts from climate change on livestock grazing would be the same as Alternative A.

Impacts from Riparian Areas, Wetlands, and Water Resources Management

The Proposed Plan may change current permitted use, based on specific actions taken to return riparian areas to PFC, improve plant community species richness, and meet GRSG habitat objectives, as outlined in **Table 2-2**. Changes to permitted use are most likely to occur in allotments in GRSG habitat with current hot season grazing use on riparian areas.

Wet meadows would be managed to maintain a component of perennial forbs with diverse species to facilitate brood rearing. Wet meadow complexes would be maintained to increase the amount of edge, and cover within that edge, to minimize GRSG deaths during the late brood-rearing period. These treatments may result in more restrictions to livestock grazing and the ability to continue existing terms and conditions of permits, compared to Alternative A. Additional acres may be closed to grazing temporarily within allotments to allow for riparian areas and meadows to rest from grazing in order to improve vegetation composition for GRSG habitat.

Additional range improvements could be constructed to facilitate riparian management. This could require that additional water sources be built in uplands, away from riparian areas and wetlands, potentially increasing time and costs for permittees in these areas.

Impacts from Fire and Fuels Management

The Proposed Plan emphasizes management of fire and fuels to minimize adverse effects on native sagebrush communities and to protect and enhance PHMA and GHMA. This would maintain native plant communities that provide sustainable forage for livestock. In the short term, fuels treatment projects would temporarily reduce permitted use, such as reduced and altered seasons of use or temporary closures to allow successful implementation of fuels treatments and post-fire rehabilitation. However, in the long term, fuels treatments would provide more sustainable forage for livestock grazing than under Alternative A.

Under the Proposed Plan on National Forest System lands, measures to protect GRSG habitat from fire and associated fire operations would be beneficial to livestock grazing, especially in the 12-inch or less precipitation zone. This is because it would help prevent the expansion of nonnative invasive species, such as cheatgrass.

Although management to suppress and control the spread of wildfire under the Proposed Plan would decrease the risk of disturbance from wildfire in GRSG habitat, fires outside of GRSG habitat could be at risk of decreased suppression efforts. Management direction to protect GRSG habitat from fire in higher elevation mountain big sagebrush could indirectly negatively impact livestock grazing in the long term, as sagebrush increases and forage production decreases.

Impacts from Recreation Management

Under the Proposed Plan, recreation would be limited in GRSG habitat in PHMA. New or expanded recreation facilities, such as roads, trails, and campgrounds, would be limited unless they were to result in a net conservation gain for GRSG or their habitats.

In addition, issuing SRPs on BLM-administered and National Forest System lands would be restricted in PHMA; terms and conditions that protect or restore GRSG habitat would be included in new permits and authorizations, and existing permits and operating plans would be modified to protect or restore GRSG habitat.

Temporary recreation uses that result in the loss of GRSG habitat would not be authorized on National Forest System lands. Impacts on livestock from these restrictions would be similar to those discussed under Alternatives A and D. These impacts would be reduced disturbance of livestock and their forage and reduced unwanted dispersal.

Under the Proposed Plan on National Forest System lands, new or expanded recreation special use authorizations would be restricted in PHMA. In addition, terms and conditions that that protect or restore GRSG habitat would be included in new special use authorizations, and existing permits and operating plans would be modified to protect or restore GRSG habitat.

Impacts from Comprehensive Travel and Transportation Management

Under the Proposed Plan, travel management planning and route evaluations would result in less disturbance to livestock grazing during certain seasons and in certain areas in allotments. This alternative would designate the most acres as limited and the least acres as open to OHV use. Under the Proposed Plan, impacts would be similar to those described under Alternative B. There would be additional restrictions on upgrades, realignment of roads, and requirements for site-specific travel management planning completion applied to PHMA and GHMA. As a result, disturbance from travel management on livestock grazing

would be more limited than under Alternative A. Access for range improvement maintenance and livestock management would be subject to travel management planning on allotments in PHMA and GHMA.

Under the Proposed Plan on National Forest System lands, new road or trail construction would be prohibited in GRSG habitat, and road construction would be restricted in riparian and mesic meadows. This direction would reduce impacts from roads to rangeland and riparian areas. This could indirectly improve forage production and improve overall rangeland conditions. However, impacts from roads and transportation could be disproportionately concentrated in areas outside of priority and general GRSG habitats.

Impacts from Renewable Energy Management

Increased restrictions on renewable energy development under the Proposed Plan would reduce impacts on forage and harassment of livestock more than under Alternative A. The Proposed Plan would designate PHMA as ROW or SUA exclusion for utility-scale commercial wind and solar energy facilities. There would be fewer potential reductions in permitted livestock use due to forage destruction and quality reduction. Fewer acres would be subject to restrictions on range improvement construction.

Management direction prohibiting solar and wind development in PHMA and restricting development in GHMA would limit any impacts of ground disturbances from developing these resources. This management direction would limit the direct impacts of development and surface disturbances on rangelands, which would be beneficial to livestock grazing. However, this may shift impacts in areas outside of priority and general GRSG habitats.

Impacts from Locatable Minerals

Under the Proposed Plan, SFA would be recommended for withdrawal from the General Mining Act of 1872, subject to valid existing rights. In addition, locatable mineral development in PHMA and GHMA would be subject to Objective SSS 4 and, to the extent allowed by law, to Actions SSS 1 through SSS 4. These restrictions on locatable mineral development would reduce impacts on livestock grazing (reduction in forage and harassment of livestock from disturbance), as compared to Alternative A; the greatest reduction would be in allotments in SFA.

Impacts from Salable Minerals

Under the Proposed Plan, PHMA would be closed to new mineral materials sales but GHMA would be open. While these restrictions would limit livestock and forage disturbance more than under Alternative A, they could push development to allotments outside of PHMA.

Impacts from Nonenergy Leasable Minerals

Under the Proposed Plan, the impact on livestock grazing from nonenergy mineral leasing would be less than under Alternative A. PHMA would be

managed as closed to new nonenergy leasable mineral leasing. Less acreage would be subject to development than under Alternative A.

Impacts from Fluid Minerals

Under the Proposed Plan, the priority would be to develop outside PHMA and GHMA. This approach would reduce disturbance to livestock and would maintain forage condition in allotments that fall in GRSG occupied habitat. Implementing the GRSG disturbance cap, mitigation strategy, monitoring framework, and hard trigger adaptive management responses under the Proposed Plan would ensure that this reduction in disturbance of livestock and sustainable forage would be maintained. Therefore, impacts from fluid mineral development on livestock grazing would be less than under Alternative A because of the restrictions that are placed on fluid mineral development.

Impacts from Unleased Fluid Mineral

Under the Proposed Plan, SFA would be managed as NSO without waivers, exceptions, or modifications. Unleased fluid mineral actions would be subject to objectives and screening criteria in GRSG habitat. This approach would not increase disturbance to livestock and forage in allotments that fall in GRSG-occupied habitat, but it would result in the fewest reductions in permitted use and the fewest restrictions on range improvement construction. Therefore, potential disturbances from fluid mineral development on livestock grazing would be less than under Alternative A because of the restrictions that are proposed. This approach would also result in the fewer reductions in permitted livestock use.

Impacts from Land Uses and Realty Management

Under the Proposed Plan, ROW development would be limited in the 2,724,400 acres of PHMA designated avoidance areas and 10,500 acres of PHMA as exclusion areas. This would maintain forage sustainability and would not increase disturbance to livestock. Most of GHMA (528,700 acres) would remain open to ROW development. As a result, ROW development and associated disturbance to livestock and their forage are likely to be concentrated in designated corridors and GHMA. Implementing the GRSG mitigation strategy, monitoring framework, and hard trigger adaptive management responses under the Proposed Plan would maintain livestock forage.

Under the Proposed Plan, all public lands would be retained in public ownership; therefore, there would be no effect on current grazing operations. As discussed under *GRSG Management*, above, limits on human disturbance, mitigation strategy, lek buffers, and other conservation measures under the Proposed Plan would further limit disturbance, as compared to Alternative A. This would result in reduced indirect impacts on livestock and their forage in PHMA.

Under the Proposed Plan on National Forest System lands, special use authorizations, landownership adjustments, and land withdrawals would be restricted or mitigated. This would be done to avoid or reduce adverse impacts

on GRSG in PHMA and GHMA. This management direction would limit the direct and indirect impacts of development and surface disturbance on rangelands where livestock grazing is permitted.

4.11 RECREATION

4.11.1 Methods and Assumptions

Indicators

Indicators of impacts on recreation are as follows:

- Change in the number and type of BLM SRPs and Forest Service recreation permits issued in the planning area.
- Change in the types of recreation activities and opportunities in the planning area.

Assumptions

The analysis includes the following assumptions:

- The demand for general recreation on BLM-administered and National Forest System lands would continue to increase over the life of the Resource Management Plan and the Land and Resource Management Plan.
- Outdoor recreation will continue to be an important component of the local economy.
- Management actions to preserve GRSG habitat would affect a variety of resources and uses, which may improve some recreation opportunities and experiences, depending on the type of recreation.
- Outside of SRMAs, the BLM will manage for recreation activities that consist mostly of dispersed activities where users informally participate in activities individually or in small groups. This could include camping, hiking, bike riding, etc.
- Demand for SRPs will remain steady or gradually increase over time.
- The BLM will continue to issue SRPs on a discretionary basis.

4.11.2 Nature and Type of Effects

This section analyzes potential impacts on recreation resources from proposed management actions of other resources and resource uses. Existing conditions concerning recreation are described in **Section 3.9**, Recreation.

Direct impacts on recreation are those that allow, restrict, or prohibit opportunity, including both the opportunity for access (e.g., public closure) and opportunity to engage in specific activities (e.g., camping, shooting, and all-

terrain vehicle riding). Indirect impacts are considered to be those that alter the physical, social, or administrative settings. Impacts on settings can either be the achievement of a desired setting or the unwanted shift in setting, such as to either a more primitive or urban environment. Physical, social, and administrative settings are not specifically managed for in areas not designated as Recreation Management Areas, although these areas do still provide intrinsic recreation values and opportunities.

The indicator typically used to describe the impact on these areas is the availability of opportunities as described by either acreage restrictions or specific activity prohibitions. For areas managed as SRMAs, both availability of recreation opportunities (activities and desired outcomes) and changes to physical, social, and administrative settings are used as indicators of impacts.

This discussion analyzes the impacts that proposed management decisions would have on managing recreation settings and the targeted outcomes. For areas managed as ERMAs, both availability of activity opportunities and changes to the qualities and conditions (settings) are used as indicators of impacts. This discussion also analyzes the impacts that proposed management decisions would have on managing recreation and the prescribed setting conditions. Since visitor use patterns are difficult to estimate and depend on many factors beyond the scope of management (e.g., recreation trends and economy), qualitative language—for example, "increase" or "decrease") is generally used unless quantitative visitor use data is available to describe anticipated impacts.

Implementing management for the following resources would have negligible or no impact on Recreation and are therefore not discussed in detail under some of the alternatives: riparian and water resources, lands and realty, vegetation and soils management, fire and fuels management, and, climate change.

4.11.3 Impacts Common to All Alternatives

Impacts from Special Designations Management

Recreation management objectives would follow the appropriate management actions from Wilderness, WSAs, NHTs, NCAs, or WSR management plans.

4.11.4 Alternative A

Impacts from GRSG Management

Under Alternative A, existing recreation opportunities in the planning area would be maintained.

Impacts from Leasable Minerals Management

Under Alternative A, wilderness areas and WSAs are closed to leasing, but the rest of the planning area would continue to be open to leasing; allowing for the greatest potential development. The majority of GRSG habitat would be open to leasing. Recreational activities in the developed areas would be reduced. The

impact on recreation would vary depending on the footprint of the actual site, any accompanying infrastructure and the visual impact from the surrounding area. New or improved access roads to new leasable mineral development could offer increased recreational access to the area.

Impacts from Locatable Minerals Management

Under Alternative A, wilderness areas are withdrawn from locatable minerals, leaving the majority of GRSG habitat available for hard rock mining activities. Recreational activities in and around those areas would be reduced. The impact on recreation would vary depending on the footprint of the actual site, any accompanying infrastructure and the visual impact from the surrounding area. New or improved access roads to new sites could offer increased recreational access to the area.

Impacts from Salable Minerals Management

Under Alternative A, wilderness areas and WSAs are closed to salable mineral development, but the leaving the majority of GRSG habitat open to leasing; allowing for the greatest potential development. Recreational activities in the developed areas would be reduced. The impact on recreation would vary depending on the footprint of the actual site, any accompanying infrastructure and the visual impact from the surrounding area. New or improved access roads to new leasable mineral development could offer increased recreational access to the area.

Impacts from Comprehensive Travel and Transportation Management

Under Alternative A, existing motorized recreational opportunities in the planning area would be maintained.

4.11.5 Alternative B

Impacts from GRSG Management

Under Alternative B, only BLM SRPs and Forest Service recreation permits that have neutral or beneficial effects would be allowed in approximately 9,573,300 acres of PHMA. This may restrict some types of permitted uses. As a result, some types of permitted activities (e.g., OHV races) that could negatively affect PHMA may be impacted resulting in fewer opportunities to engage in those types of events and activities in those areas.

Impacts from Leasable Minerals Management

Alternative B closes 9,573,300 acres to leasing; and manages GHMA under a NSO stipulation. These restrictions would preserve the existing recreational opportunities on those acres. Recreational activities in and around the developed areas would be reduced. The impact on recreation would vary depending on the footprint of the actual site, any accompanying infrastructure and the visual impact from the surrounding area. New or improved access roads to new sites could offer increased recreational access to the area.

Impacts from Locatable Minerals Management

Alternative B would recommend all of PHMA for locatable mineral withdrawal on 9,573,300 acres, thereby preserving the existing recreational opportunities. In PHMA, recreational activities in and around areas of development would be reduced, because it would continue to be open for development. The impact on recreation would vary depending on the footprint of the actual site, any accompanying infrastructure and the visual impact from the surrounding area. New or improved access roads to new sites could offer increased recreational access to the area.

Impacts from Salable Minerals Management

Alternative B closes 9,573,300 acres of PHMA to mineral material sales, but leaves 6,953,300 acres open for development in GHMA. Recreational activities in and around the developed areas would be reduced. The impact on recreation would vary depending on the footprint of the actual site, any accompanying infrastructure and the visual impact from the surrounding area. New or improved access roads to new sites could offer increased recreational access to the area.

Impacts from Comprehensive Travel and Transportation Management

Under Alternative B, the OHV designation in PHMA would change from open to limited to existing roads and trails on 9,599,100 acres. The restriction on cross-country travel may impact some motorized recreation, such as OHV exploration which depends on unrestricted travel. Opportunities for non-motorized recreation, such as hiking, horseback riding, and hunting, in a more natural or primitive setting may be expanded and enhanced. There would be no change in OHV designation on the 6,405,900 acres that are currently open to cross-country travel, and impacts would be the same as in Alternative A

4.11.6 Alternative C

Impacts from GRSG Management

Impacts from Alternative C would be the most restrictive to human uses, and continue to preserve the recreational opportunities that are currently in place.

Impacts from Livestock Grazing Management

Under Alternative C, allotments would be unavailable to grazing on at least 16,526,600 acres of PHMA. Removing livestock would likely lead to an overall improvement of riparian ecosystems and enhancement of recreation opportunities and experiences in those areas. However, management under this alternative would remove livestock, roads, water developments, fences, and other range infrastructure. The elimination of roads would reduce access to the area, thereby reducing recreation, such as camping and hunting.

Impacts from Leasable Minerals Management

Alternative C would close 16,526,600 acres to leasing. This would afford the highest level of protection of all the alternatives, preserving the recreation opportunities in those acres.

Impacts from Locatable Minerals Management

Alternative C recommends withdrawing 16,526,600 acres. This would afford the highest level of protection of all the alternatives, thereby preserving the recreation opportunities in those acres.

Impacts from Salable Minerals Management

Alternative C would close 16,526,600 acres of PHMA to mineral materials sales. This would afford a high level of protection, compared to Alternative A, thereby preserving the recreation opportunities in those acres.

Impacts from Comprehensive Travel and Transportation Management

Under Alternative C, the OHV area designation for all PHMA would change from open to limited to existing roads and trails. More existing restrictions that are already in place would remain, such as wilderness areas being closed, and National Forest System lands as well as lands administered by California being limited to designated roads and trails. The restriction on cross-country travel may impact some motorized recreation, such as OHV exploration which depends on unrestricted travel. Opportunities for non-motorized recreation, such as hiking, horseback riding, and hunting, in a more natural or primitive setting may be expanded and enhanced.

4.11.7 Alternative D

Impacts from GRSG Management

Under Alternative D, only BLM SRPs and Forest Service recreation permits that have neutral or beneficial effects in approximately 16,526,600 acres of both PHMA and GHMA would be allowed. As a result, some types of permitted activities (e.g., OHV races) that could negatively affect PHMA and GHMA may be impacted, resulting in fewer opportunities to engage in those types of events and activities in those areas. Alternative D would also prohibit construction of new recreation facilities such as campgrounds, day-use areas and trailheads in PHMA and GHMA.

Impacts from Leasable Minerals Management

Alternative D manages fluid minerals in PHMA and GHMA under a NSO stipulation. Although surface placement of facilities could not occur on PHMA or GHMA, additional pressure could be placed on lands outside of the habitat to extract this mineral. This could reduce recreational activities and opportunities in in areas outside of habitat. The impact on recreation would vary depending on the footprint of the actual site, any accompanying infrastructure and the visual impact from the surrounding area. New or improved access roads to new sites could offer increased recreational access to the area.

Impacts from Locatable Minerals Management

Impacts from locatable minerals management under Alternative D would be similar to Alternative A, because there are no lands recommended for withdrawal.

Impacts from Salable Minerals Management

Alternative D closes 16,526,600 acres of PHMA and GHMA to mineral material sales. This management action would afford a very high level of protection compared to Alternative, preserving the existing recreational opportunities on those acres.

Impacts from Comprehensive Travel and Transportation Management

Impacts from Alternative D would be the same as or similar to those under Alternative C.

4.11.8 Alternative E

Impacts from GRSG Management

Impacts from Alternative E would be the same as or similar to those under Alternative D.

Impacts from Leasable Minerals Management

Alternative E implements an avoidance strategy on 16,526,600 acres. Leasing would be subject to the policy to avoid, minimize, and mitigate. The impact on recreation would vary, depending on the footprint of the actual site, any accompanying infrastructure, and the visual impact from the surrounding area. New or improved access roads to new sites could increase access for recreation.

Impacts from Locatable Minerals Management

Impacts from Alternative E would be similar to Alternative A, as no lands are recommended for withdrawal.

Impacts from Salable Minerals Management

Alternative E implements an avoidance strategy on 16,526,600 acres. Leasing would be subject to the policy to avoid, minimize, and mitigate. The impact on recreation would vary, depending on the footprint of the actual site, any accompanying infrastructure, and the visual impact from the surrounding area. New or improved access roads to new sites could increase access for recreation.

Impacts from Comprehensive Travel and Transportation Management

Impacts from Alternative E would be the same as or similar to those under Alternative C and D.

4.11.9 Alternative F

Impacts from GRSG Management

Under Alternative F, only BLM SRPs and Forest Service recreation permits that have neutral or beneficial effects on approximately 16,526,600 acres in both PHMA and GHMA would be allowed. As a result, some types of permitted activities (e.g., OHV races) that could negatively affect PHMA and GHMA may be impacted, resulting in fewer opportunities to engage in those types of events and activities in those areas. Additional management actions that would seasonally prohibit camping and other non-motorized recreation activities within four miles of active leks would decrease the area available for recreational opportunities such as camping, mountain biking, and hiking, resulting in seasonal reductions in recreational opportunities.

Impacts from Livestock Grazing Management

Under Alternative F, the same number of acres would remain open to livestock grazing as found under Alternative A. Management would rest 25 percent of each GRSG planning area annually, keeping utilization levels at or below 25 percent. Condition of riparian habitats would likely improve under Alternative F, thereby enhancing the experience for recreation in those areas. However, management actions under Alternative F would include increased range improvements; this would be due to the need to fence out PHMA and GHMA from grazing use on adjacent areas, which may impede certain recreation activities, such as hunting.

Impacts from Wild Horse and Burro Management

Under Alternative F, wild horse and burro AMLs would be reduced by 25 percent in HMAs/WHBTs with occupied GRSG habitat. Condition of riparian habitats would likely improve under Alternative F enhancing the recreational experience for activities conducted in those areas. There would be fewer opportunities for recreational viewing of wild horses and burros.

Impacts from Leasable Minerals Management

Impacts from Alternative F would the same as under Alternative C.

Impacts from Locatable Minerals Management

Impacts from Alternative F would the same as under Alternative B.

Impacts from Salable Minerals Management

Impacts from Alternative F would the same as under Alternative B.

Impacts from Comprehensive Travel and Transportation Management

Impacts from Alternative F would be the same as or similar to those under Alternatives C and D.

4.11.10 The Proposed Plan

This alternative would require a 3 percent disturbance cap on surface-disturbing activities in PHMA (see **Appendix F**), and it would incorporate RDFs (consistent with applicable law) in PHMA, GHMA, and OHMA. It would also require all human disturbances to result in a net conservation gain for GRSG and their habitat. Lek buffers would also be required (see **Appendix B**).

Collectively, these GRSG conservation management actions would increase mitigation requirements for land use authorizations. This would result in more complex project designs, potentially excluding infrastructure placement in the most cost-effective locations and potentially resulting in overall greater development costs. A corresponding effect could be a reduction in the number of authorization applications received for activities in PHMA and longer, more complicated review periods for those that are proposed in PHMA.

Impacts from GRSG Management

Impacts from GRSG on recreational uses under the Proposed Plan would be the same as or similar to those under Alternative D. The exception is that the Proposed Plan would allow the construction of new recreation facilities in GHMA, such as campgrounds, day-use areas, and trailheads. The Proposed Plan would allow construction of new recreation facilities having a net conservation gain for GRSG habitat, such as diverting use away from critical areas.

Impacts from Leasable Minerals Management

Impacts from leasable minerals management on recreation under the Proposed Plan would be the same as or similar to those under Alternative D.

Impacts from Locatable Minerals Management

Under the Proposed Plan, the SFA would be recommended for locatable mineral withdrawal, while the rest of the PHMA and GHMA would remain open to location. The 2,797,400 acres in the SFA would preserve existing recreation opportunities from being impacted by mining. Impacts on recreation on those lands outside of the SFA would be the same as under Alternative A.

Impacts from Salable Minerals Management

Impacts from salable minerals management on recreation under the Proposed Plan would be the same as or similar to those under Alternative B.

Impacts from Comprehensive Travel and Transportation Management

Impacts from comprehensive travel and transportation management on recreation under the Proposed Plan would be the same as or similar to those under Alternative C.

4.12 TRAVEL AND TRANSPORTATION MANAGEMENT

4.12.1 Methods and Assumptions

Indicators

Indicators of impacts on CTTM are as follows:

- Change in the acreages designated as open, limited, or closed to motorized travel.
- Change in the types of transportation activities occurring on routes that may impact GRSG or habitat.
- Change in the number of acres where new authorized road development would be allowed.
- Change in management activities or public use that would necessitate changing the size of the disturbance footprint of routes.

Assumptions

The analysis includes the following assumptions:

- The demand for general access to travel routes on BLM-administered and National Forest System lands would continue to increase over the life of the LUP.
- Administration of updated agency travel management policy, rules and planning and design guidelines will change public land travel systems through planning and design, making them more sustainable and minimizing potential impacts on resources.
- The designation of individual routes is an implementation-level process and not considered as part of a planning level process.
- Travel systems are dynamic and will be changed through subsequent implementation level planning efforts in order to respond to the needs of the BLM and Forest Service multiple-use mission.
- Implementation of a travel management plan would include increased public education, signing, enforcement, and resource monitoring in regard to travel management.
- There would be no change to areas where travel management has been completed.

4.12.2 Nature and Type of Effects

This section discusses impacts on CTTM from proposed BLM management actions. Existing conditions concerning CTTM are described in **Section 3.10**, Comprehensive Travel and Transportation Management. Travel and transportation management supports and helps achieve the objectives of other resource programs. Consequently, the travel designations would adhere to the

management prescriptions included under each alternative, while following the theme of each alternative.

At the resource management planning level, impacts on CTTM are those that restrict travel (e.g., managing areas as closed or limited to motorized travel and seasonal travel limitations). New CTTM actions in response to GRSG habitat protection strategies would impact the number of acres where motorized travel is allowed.

Travel management decisions may impact other resource areas, such as the closure or limitation of travel to protect sensitive resources. As such, impacts of travel management actions on other resources and uses are discussed in the respective resource sections of this chapter. Impacts on CTTM from other program areas do occur and are considered as part of implementation level transportation management planning.

Implementing management actions for the following resources would have negligible or no impact on CTTM and are therefore not discussed in detail: riparian and water resources, vegetation and soils management, livestock grazing, wildland fire and fuels management, wild horse and burro management, climate change, lands and realty, leasable, salable and locatable minerals, renewable energy, recreation, and ACECs,.

4.12.3 Impacts Common to All Alternatives

Impacts from Special Designations Management

Comprehensive travel and transportation management objectives would follow the appropriate management actions from Wilderness, WSAs, NHTs, NCAs, or WSR management plans.

4.12.4 Alternative A

Impacts from GRSG Management

Under Alternative A, existing travel opportunities in the planning area would be maintained. Approximately 12,145,400 acres would remain open to unrestricted cross-county motorized travel. Approximately 3,859,600 acres would remain limited to existing or designated routes. Approximately 521,600 acres would remain closed to motorized use. New road construction, upgrading of existing roads and realignments of roads would continue to be allowed in the planning area.

4.12.5 Alternative B

Impacts from GRSG Management

Under Alternative B, GRSG management actions are focused primarily in PHMA. The management action that limits motorized travel to existing roads, primitive roads, and trails would change 5,739,500 acres from an open OHV

category to a limited category in PHMA. OHV enthusiasts that enjoy riding cross-country would lose this opportunity in PHMA. There would also be a prohibition on upgrading of existing routes that would change the route category. Route construction would be limited to realignments of existing routes that minimize impacts on PHMA. The 3 percent disturbance threshold could restrict the amount of new routes that could be constructed; any routes constructed would require mitigation necessary to offset the resulting loss of habitat. The impacts from implementation actions, such as evaluating the need for permanent or seasonal road closures, activity-level travel plans, limiting new route construction, and restoration of routes in PHMA could only be evaluated during implementation. The impacts from these implementation actions would be analyzed in subsequent NEPA documents.

4.12.6 Alternative C

Impacts from GRSG Management

Under Alternative C, GRSG restrictive management actions would occur in all PHMA. The management action that limits motorized travel to existing road, primitive roads and trails would change 12,145,400 acres from open to limited in PHMA. OHV enthusiasts that enjoy riding cross-country would lose this opportunity in PHMA. Upgrading of existing routes that would change the route category would be prohibited. Route construction would be limited to realignments of existing routes that minimize impacts on PHMA and GHMA. The impacts from implementation actions, such as evaluating the need for permanent or seasonal road closures in PHMA could only be evaluated during activity-level travel planning. The impacts from these implementation actions would be analyzed in subsequent NEPA documents.

4.12.7 Alternative D

Impacts from GRSG Management

Under Alternative D, GRSG management actions would occur on PHMA and GHMA. The management action that limits motorized travel to existing road, primitive roads and trails would change 12,744,900 acres from open to limited in PHMA and GHMA. OHV enthusiasts that enjoy riding cross-country would lose this opportunity in PHMA and GHMA. Upgrading of existing routes that would change the route category would be prohibited. Route construction would be limited to realignments of existing routes that minimize impacts on PHMA and GHMA. The impacts from implementation actions, such as evaluating the need for permanent or seasonal road closures in PHMA and GHMA could only be evaluated during activity-level travel planning. The impacts from these implementation actions would be analyzed in subsequent NEPA documents.

4.12.8 Alternative E

Impacts from GRSG Management

Impacts from Alternative E would be the same as those under Alternatives C and D.

4.12.9 Alternative F

Impacts from GRSG Management

Impacts from Alternative F would be the same as or similar to those under Alternative D, except Alternative F would further restrict the construction of new routes by not allowing new routes within a four-mile buffer from leks.

4.12.10 The Proposed Plan (Proposed Plan)

This alternative would require a 3 percent disturbance cap on human surface-disturbing activities in PHMA (see **Appendix F**). It would incorporate RDFs (consistent with applicable law) in PHMA, GHMA, and OHMA and would require all human disturbances to result in a net conservation gain for GRSG and their habitat. Lek buffers would also be required (see **Appendix B**).

Collectively, these GRSG conservation management actions would increase mitigation requirements for land use authorizations. This would result in more complex project designs, potentially excluding infrastructure placement in the most cost-effective locations and potentially resulting in overall greater development costs. A corresponding effect could be a reduction in the number of authorization applications received for activities in PHMA and longer, more complicated review periods for those that are proposed in PHMA.

Impacts from GRSG Management

Impacts from GRSG management on travel and transportation in the Proposed Plan would be the same as under Alternative D.

4.13 LAND USE AND REALTY

4.13.1 Methods and Assumptions

This section discusses impacts on lands and realty from proposed management actions of other resources and resource uses. Existing conditions concerning lands and realty are described in **Section 3.11**, Lands and Realty.

Indicators

- Acres of BLM-administered and National Forest System surface ownership, which includes federal surface with private minerals, in the planning area.
- Acres of BLM-administered and National Forest System surface ownership affected by ROW and SUA restrictions (i.e., avoidance or exclusion areas).

- Number, acres/miles, and types of surface-disturbing ROWs, leases and permits in PHMA and GHMA.
- Number/acres and type of land tenure adjustments/landownership adjustments (i.e., lands identified as suitable for disposal, withdrawal, acquisition, exchange, purchase, donation, or easement acquisition) in PHMA and GHMA.
- Number of BLM and Forest Service proposed ROWs, leases, permits and SUAs in PHMA and GHMA.

Assumptions

- "ROW Avoidance" and "ROW Exclusion" areas are identified throughout this document. The term "ROW" would encompass all land use authorizations such as ROWs, leases, permits and Forest Service special use authorizations. See definition of ROW avoidance and exclusion.
- Authorized ROWs and communication sites would be managed to protect valid existing rights, as long as those ROWs are in compliance with the terms and conditions of their ROW grant.
- On renewal, assignment, or amendment of existing ROWs, leases and permits, additional stipulations could be included in the authorization.
- Existing ROWs, designated utility corridors, permits and communication sites would be managed to protect valid existing rights.
- Demand for small distribution facilities to extend and upgrade services, such as communication sites and utilities, is anticipated to increase as rural development occurs on dispersed private parcels and parcels identified for disposal in the planning area.
- Private parcels in the planning area and parcels identified for disposal would continue to require new or upgraded services such as power distribution facilities, including communication sites, roads, and any appurtenant utilities.
- Mitigation in the form of burying lines or including non-perching design features on lines reduces perching opportunities and subsequent impacts on GRSG (Connelly et al. 2000a).
- The number of ROW applications for new communication and computer technology, such as fiber optic cable would continue to increase.
- Management of all previously withdrawn land from entry, appropriation, or disposal under the public land laws on BLM-administered and National Forest System lands would continue. The BLM and the Forest Service would review withdrawals as needed

and when necessary, make recommendations for extensions, modifications, revocations, or terminations. All existing withdrawals initiated by other agencies, such as the US Bureau of Reclamation or the Department of Energy, would be continued unless the initiating agency or BLM or Forest Service requests that the withdrawal be revoked.

- Any lands that become unencumbered by withdrawals or classifications will be managed according to the decisions made in the LUP. If the LUP has not identified management prescriptions for these lands, they will be managed in a manner consistent with adjacent or comparable BLM-administered or National Forest System lands in the decision area. If the unencumbered lands fall in two or more management scenarios where future-planning criteria may not be clear, a plan amendment may be required.
- Linear ROW widths vary based on the nature of the development contained in the ROW, as well as potential impacts on resources.
- The existing designated ROW corridors in the decision area include the Western Utility Group updates to the Western Regional Corridor Study, Section 368 Energy Policy Act of 2005, and West-wide Energy Corridor Programmatic EIS (BLM 2009a), which are adopted. Designated transportation and utility corridors include linear ROWs (e.g., electric transmission facilities, pipelines, communication lines, and transportation systems.
- Existing LUA holders may continue their authorized use as long as they are in compliance with the terms and conditions of their authorization.
- The demand for both energy and nonenergy types of ROWs are anticipated to remain steady or gradually increase over time.
- Little to no solar energy ROWs are anticipated due to low solar energy potential in the planning area.
- Demand for small distribution facilities to extend and upgrade services, such as communication sites and utilities, is anticipated to increase as rural development occurs on dispersed private parcels in the planning area.
- BLM-administered lands would continue to be available for regional and interstate transmission lines, particularly those needed to transport renewable energy.
- Maintaining and upgrading existing utilities, communication sites, and other ROWs and colocation of new infrastructure in existing ROWs is preferred before construction of new facilities in the planning area, but only if the upgrading can be accommodated in the existing ROW.

- The BLM and the Forest Service recognize that colocation does not eliminate the possibility of new temporary or permanent surface disturbance.
- ROW and SUAs in avoidance areas typically result in mitigation to offset the impact of the proposed development. Mitigation can include design criteria, on-site surface disturbance mitigation, off-site mitigation, or a combination thereof.

4.13.2 Nature and Type of Effects

Resources and resource uses affect the lands and realty program by prescribing ROW exclusion and avoidance areas, and stipulations in order to protect resources, and permit conditions associated with Forest Service SUA and BLM LUAs. Forest Service forest plan prescriptions would be 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 grants SUAs, while the BLM grants ROW's on their respective agency lands. A ROW exclusion area is one that is not available for new ROW location (including leases and permits); SUA authorization would be prohibited on National Forest System lands.

Management that restricts ROW development in a certain area will eventually increase the concentration of ROW development in adjacent areas where restrictions are not present. Increased ROW density can limit new siting options in non-restricted areas, decrease service reliability to rural areas, increase conflict among facilities, and intensify impacts on other resources and uses.

A ROW avoidance area may be available for ROW location but may require special stipulations. ROW applications or SUAs could be submitted in ROW avoidance areas; however, a project proposed in these areas may be subject to additional requirements, such as resource surveys and reports, construction and reclamation engineering, long-term monitoring, special design features, special siting requirements, timing limitations, and rerouting. Such requirements could restrict project location or they could delay availability of energy supply (by delaying or restricting pipelines, transmission lines or renewable energy projects), limit future access, delaying or increasing the cost of energy supplies, or they could delay or restrict communications service availability. As a result of special surveys and reports, alternative routes may need to be identified and selected to protect sensitive resources, such as GRSG habitat. Designating ROW exclusion and avoidance areas and applying special stipulations would result in increased application processing time and costs due to the potential need to relocate facilities or due to greater design, mitigation, and siting requirements.

Collocating transmission development infrastructure in existing ROWs or Forest Service easements and existing disturbed areas reduces land use conflicts

and additional land disturbance. Collocation policies also clarify the preferred locations for utilities and simplify processing on BLM-administered and National Forest System lands. However, collocating can limit options for mineral development and selection of preferable locations for ROWs.

Travel management actions may involve closing areas or specific routes to motorized or mechanized travel, thereby creating areas that are impractical for some types of land uses, such as transmission lines or communication sites.

Surface-disturbing activities may contribute to route restrictions and alterations as some area and existing routes and trails become more heavily traveled; in addition, non-motorized opportunities may be reduced as more development occurs. New routes could increase access to remote areas that were previously inaccessible by motorized vehicles. Accessibility to BLM-administered and National Forest System lands may change as land acquisitions and disposals continue.

Land tenure adjustments/landownership adjustments are intended to maintain or improve the efficiency of BLM and Forest Service management, including management of GRSG habitat. Land disposal as well as exchange, purchase, donation, and easement acquisition can result in a more contiguous decision area, thus increasing BLM-administered and National Forest System lands management efficiency. However, while consolidation may be beneficial for certain resources and uses, it may not necessarily reduce effects on GRSG habitat.

Implementing management for the following resources would have negligible or no impact on land use and realty and are therefore not discussed in detail: range management, mineral split-estate, fire and fuels management, and habitat restoration/vegetation management.

4.13.3 Impacts Common to All Alternatives

Impacts from Special Designations Management

The designation of BLM ACECs and Forest Service Zoological Special Interest Areas would create ROW/SUA exclusion and avoidance areas and SUA prescription areas that could limit the siting of renewable energy development projects and the transmission lines required to connect them to the grid.

The BLM and the Forest Service would continue to manage special designation areas as either ROW avoidance or exclusion areas across all alternatives. Limitations on ROW development in wilderness areas impact the ability of the BLM and the Forest Service to accommodate ROW demands in the planning area, particularly in locations where special designation areas separate energy sources (e.g., wind or geothermal) from likely demand centers. Routing transmission lines around exclusion areas would result in a longer ROW with

greater surface disturbance and extended BLM and Forest Service processing times.

Impacts from Renewable Energy Management - Solar

Under all alternatives, the Solar PEIS would continue to restrict all utility-scale solar energy development in the sub-region (BLM-administered lands only). The BLM would manage GRSG habitat as exclusion areas under all alternatives. The Forest Service would prohibit renewable energy development in GRSG habitat.

4.13.4 Alternative A

Impacts from Land Use and Realty Management

Authorizations

Under Alternative A, the BLM and the Forest Service would continue to administer ROWs under current management systems and existing ROWs in the decision area would continue to provide access and utilities for permittees and lease-holders. No acres would be designated as ROW avoidance, while 1,884,300 acres would continue to be designated exclusion. All other lands in the decision area would continue to be open for land use authorization development.

BLM-administered and National Forest System lands would continue to be available for multiple-use and single-use communication sites and road access ROW (or SUAs) on a case-by-case basis pursuant to Title V of FLPMA, and 43 CFR, Part 2800 and 2900 regulations (BLM) and 36 CFR, Part 251, Subpart B (Forest Service). All new linear ROWs, fiber optic cables, transmission lines, pipelines, and communication sites would be encouraged to locate in designated corridors and existing sites.

All LUA applications would be reviewed using the criteria of following existing corridors wherever practical and avoiding the proliferation of separate authorizations. Collocation reduces land use conflicts and additional land disturbance and demarcates the preferred locations for utilities; therefore simplifying processing on BLM -administered and National Forest System lands. Where existing development is not present, collocation requirements can limit options for new development.

Utility Corridors

Widths in existing corridors vary from 0.5 mile wide up to 3 miles wide. The widths of these corridors would allow for more ROWs to be granted in the major north-south corridor through the planning area. Currently there are 1,322,800 acres of utility corridors, including 209,500 acres of Section 368 corridors, in the sub-region. There would be no new corridors designated.

Land Tenure

Under Alternative A, approximately 766,300 acres of BLM-administered lands (in PHMA and GHMA) would continue to be available for disposal. Land disposal, which must meet the criteria under FLPMA Section 203 and applicable LUPs, would improve BLM-administered lands and realty program and overall BLM management efficiency. The Forest Service has not identified specific lands for exchange or disposal. Disposal or sale of these lands could prevent the BLM and the Forest Service from granting ROWs across those properties, and would result in increasing the density of ROWs in other areas intended for retention. Land tenure and landownership adjustments are intended to maintain or improve the efficiency of BLM and Forest Service management. The Forest Service completes landownership adjustments (purchase, exchange, donation, and easement acquisition), while the BLM conducts land tenure adjustments (withdrawals, disposals, and acquisitions).

For Nevada BLM-administered lands, this alternative allows flexibility in acres available for acquisition, disposal, or exchange because there is no management action proposed to retain public ownership of GRSG habitat.

Impacts from Leasable Minerals Management

Mineral development indirectly impacts the lands and realty program through the requirement for new infrastructure development, such as roadways and communication facilities. Under Alternative A, fluid mineral leasing (subject to stipulations) would continue to be open to new leasing. New mineral development in open areas would continue to place a demand on the lands and realty program for new authorizations.

Impacts from Locatable Mineral Management

Under Alternative A, 16,005,000 acres would continue to be open to locatable mineral development. New mineral development in open areas would continue to place a demand on the lands and realty program.

Impacts from Salable Mineral Management

Mineral development indirectly impacts the lands and realty program through the requirement for new infrastructure development, such as roadways and communication facilities. Under Alternative A, 14,642,300 acres would continue to be open to new mineral development. New mineral material disposals in open areas would continue to place a demand on the lands and realty program.

Impacts from Comprehensive Travel and Transportation Management

Under Alternative A, 12,145,400 acres would be open to motorized travel while the BLM would manage 3,859,600acres as limited to existing or designated routes and 521,600 acres would be closed. Accordingly, existing transportation routes and those routes designated for motorized travel on National Forest System lands would continue to provide motorized access to ROW infrastructure and communication sites for construction and maintenance with no additional impacts on lands and realty from CTTM. On BLM-administered

lands, there are the fewest restrictions on travel under Alternative A and, thus, the least impact on lands and realty. On National Forest System lands CTTM would be the same under all alternatives. Also, this alternative would not impact the lands and realty program on both BLM- and National Forest System administered lands.

Impacts from Renewable Energy Management

Under Alternative A, no new Renewable Energy ROW exclusion or avoidance areas would be proposed. This alternative has the fewest acres subject to restrictions on renewable energy ROW locations, which would result in the greatest number of land and realty actions.

4.13.5 Alternative B

Alternative B would exclude PHMA from new BLM ROWs or Forest Service SUAs. The BLM and the Forest Service would manage GHMA as ROW avoidance areas.

Impacts from GRSG Management

Management actions under Alternative B to protect GRSG habitat would impact lands and realty through the closure of areas to ROW, application of additional criteria for land exchanges, limitations on new mineral development and road construction. Limitations on disposals in designated critical habitat for threatened and endangered species would allow better resource management in these sensitive areas.

Impacts from Land Uses and Realty Management

Authorizations

Under Alternative B, ROW exclusion areas would increase by 8,171,700 acres compared to Alternative A. Avoidance areas on BLM-administered lands would increase by 6,470,600 acres; this would be a 591 percent increase in exclusion areas in PHMA and GHMA compared with Alternative A. The BLM and the Forest Service would also take advantage of opportunities to remove, bury, or modify existing power lines in existing ROWs in PHMA, if possible.

As noted above in Nature and Types of Effects, limitations on new ROWs and aboveground linear features, such as transmission lines and pipelines, could restrict the availability of energy or service availability and reliability for communication systems. While management under Alternative B would allow for collocation in exclusion and avoidance areas, there are limitations as to the amount of infrastructure that can be collocated in a given ROW. Often collocation is not feasible. Therefore, in PHMA under Alternative B, there would be limited to no opportunity for new ROW development. Exclusion areas would result in reconfigurations of line locations and re-engineering of infrastructure such as electrical transmission lines and pipelines, which would result in increased project costs as well as potentially increased cost to consumers, development delays, and limitations.

Currently, there are 795 pending authorizations in the Nevada and northeast California subregion (BLM 2015). For those pending authorizations located in PHMA and GHMA, proposed management under Alternative B could preclude, limit, or alter the development of pending LUAs in GRSG habitat.

In addition, ROW exclusion and avoidance designations could extend processing time for renewals of existing LUAs, and make siting of new linear or block LUAs more difficult than under Alternative A.

Exclusion and avoidance designations under Alternative B would also result in impacts on the location and design of communication towers on both BLM-administered and National Forest System lands. To be effective, communication towers are constructed to meet specific height standards as necessary to have line-of-sight with adjacent repeaters. Under Alternative B, modifications to the communication tower network in PHMA would be limited to expansion of existing facilities. New facilities would be excluded in PHMA and conditions on tower design (e.g., tower height) applied to towers in GHMA may prevent the effective transmittal of communication signals to adjacent towers.

Utility Corridors

No new utility corridors would be designated in PHMA and GHMA. Existing utility corridors that are not occupied would be relocated outside of PHMA or if not relocated they would be undesignated. These actions toward corridors would reduce the available lands open to entry for linear ROWs and could cause new linear ROWs to concentrate uses in existing corridors. Over time, corridors could become overcrowded with ROW development and could become unfeasible for additional development, which would result in costly retrofitting of existing infrastructure to increase capacity or redirect new development to areas outside of GRSG habitat. This could impact the utility market by potentially reducing the service availability to customers.

Land Tenure

Under Alternative B, the BLM and the Forest Service would retain public ownership in PHMA except where land exchanges would result in more contiguous federal ownership patterns or where disposal accompanied by a habitat mitigation agreement or conservation easement would result in more effective management of GRSG habitat. In GHMA, the amount of land available for disposal (480,500 acres in habitat) would be the same as Alternative A. Land disposal would be subject to the criteria in FLPMA Section 203. The Forest Service has very limited authority to sell or otherwise dispose of National Forest System lands. Most authorities allowing the sale of lands have specific criteria or identify only a small number of properties for sale or disposal in a limited geographical area. The tool used most often for conveyance of lands within National Forest boundaries is land exchange.

Additionally, under Alternative B, the BLM would propose an additional 9,342,600 acres for locatable mineral withdrawal totaling of 9,864,200 acres

withdrawn in PHMA. However, withdrawal would be subject to congressional approval. The BLM would not recommend approval of withdrawals for reasons other than mineral activity. Having these areas identified or withdrawn would facilitate the disposal of land for promoting community development. In withdrawn areas, BLM-administered and National Forest System lands would not be available for mineral extraction for a defined time period. Impacts on mineral development are described in **Section 4.15**, Minerals.

Limitations on BLM and Forest Service land tenure and landownership adjustments, for example restrictions on land disposal to retain GRSG habitat in public ownership, would result in decreased management efficiency. Mineral withdrawal would reduce the number of new ROWs requests for infrastructure to support mineral activity.

Impacts from Renewable Energy Management

Under Alternative B, the BLM would manage majority of PHMA and GHMA as ROW exclusion for all ROWs, including utility-scale wind (10,056,000 acres) and solar energy (13,957,800 acres). Management of ROW exclusion would eliminate the BLM's and the Forest Service's ability to accommodate any new wind and solar energy development demand in those areas. Where renewable energy resource areas exist in ROW exclusion areas, the likelihood of the same energy development occurring on BLM-administered or National Forest System lands elsewhere in the sub-region is minimal to none.

Alternative B would designate some habitat as ROW avoidance areas (6,470,600 acres). In avoidance areas, mitigation requirements for renewable energy could direct renewable energy development from federal to non-federal lands. Renewable energy development on adjacent private lands would impact the lands and realty program if transmission lines are required to cross BLM-administered or National Forest System lands.

Impacts from Leasable, Locatable, and Salable Minerals Management

Under Alternative B, BLM and Forest Service management to protect GRSG habitat would result in the closure of PHMA to nonenergy leasable minerals, surface coal mining, new sub-surface mining, mineral material sales, and oil and gas leasing. This would decrease the demand for new ROW infrastructure to support new mineral development. ROWs serving existing mineral development sites would continue to place a small demand on the lands and realty program (e.g., for renewals and applications to upgrade or maintain infrastructure).

Impacts from Comprehensive Travel and Transportation Management

Under Alternative B, the BLM and the Forest Service would only allow new roads where access to valid existing rights is necessary and does not currently exist. Construction of new roads to access valid existing rights that are not yet developed would be done using minimum specifications. Limitations on new road construction could make certain areas impractical for new ROW

authorizations, particularly in areas not readily accessible via existing roadways as well as the potential for increased cost of construction of the ROW.

4.13.6 Alternative C

Alternative C would designate PHMA as ACECs. Alternative C would have the greatest impact on the lands and realty program.

New BLM ROWs or Forest Service SUAs would be prohibited in these areas. This alternative places limitations on road construction and prohibits road construction within a four-mile buffer from leks.

Impacts from GRSG Management

Under Alternative C, new ROWs, including those for wind and solar, would be excluded in all PHMA (16,526,600 acres); therefore, no areas in GRSG habitat would be open to new ROW development. GRSG management under Alternative C would eliminate the ability of the BLM and the Forest Service to accommodate new demand for ROWs in GRSG habitat unless new ROWs could be collocated with no new disturbance.

Impacts from Land Uses and Realty Management

Authorizations

Impacts would be similar to Alternative B, but would apply to a larger land area and there would be no ROW avoidance areas that could accommodate new ROW infrastructure. For linear ROWs (e.g., pipelines and transmission lines) this could increase the length of these projects to avoid GRSG habitat, thus increasing project costs. Costs also would be incurred as a result of requirements for mitigation in areas with limits on surface disturbance.

In some areas, there is a high concentration of intermixed landownership, corridors, oil, gas, and geothermal development, and existing authorizations. In these areas, restrictions on the ability to authorize ROWs and land tenure/landownership adjustments would have a greater impact than in areas with lesser degrees of intermixed ownership, ROW corridors, minerals development, and existing authorizations. Despite these restrictions, the existing network of developed ROWs could provide opportunities for the collocation of compatible authorizations however these could be limited due to size and availability.

Utility Corridors

Under Alternative C, the BLM would manage 1,322,800 acres of existing utility corridors as exclusion areas for new ROWs. Alternative C would eliminate the potential for future ROW development in GRSG habitat, including the 368 energy corridor and other locally designated corridors.

Land Tenure

Under Alternative C, the BLM and the Forest Service would retain public ownership in PHMA. Impacts from land tenure would be the same as Alternative B, with the exception that BLM and the Forest Service would propose all PHMA, including mineral split-estate for mineral withdrawal.

Land tenure and landownership adjustments would have more restrictions in GRSG habitat and would not allow the disposal of lands to occur. This could reduce the flexibility for consolidation and effective management of other lands and resources.

Impacts from Leasable, Locatable, and Salable Minerals Management

Impacts under Alternative C from mineral development would be the same as Alternative B, with the exception that mineral closures would only apply to all PHMA, including surface and split-estate areas.

Impacts from Comprehensive Travel and Transportation Management

Alternative C would have the greatest impact on the lands and realty program as new road construction would be prohibited through exclusion areas. Because of the density PHMA, new road construction on BLM-administered and National Forest System land in the planning area would be limited to existing roads in PHMA. Limitations on new road construction would make certain areas unfeasible for new ROW development, including areas outside PHMA where ROW development would be excluded. It has the most potential for increased cost of construction of ROWs and increased difficulty to access public and private lands.

Impacts from Renewable Energy Management

Under Alternative C, 16,526,600 acres of PHMA would be excluded from solar and wind development ROW applications. Since solar and wind energy development is managed through the ROW program, all of these acres would be completely unavailable for solar and wind development through ROW exclusion designations.

While the acreage of moderate to high potential for wind energy may occur along mountain ridge tops, potential future development of renewable energy would be reduced or eliminated in PHMA designated lands. This would force development to occur outside PHMA and/or on private lands.

Management of PHMA as a ROW exclusion would eliminate the BLM's ability to accommodate any new wind energy development demand in those areas.

4.13.7 Alternative D

Alternative D would manage PHMA and GHMA to reduce fragmentation and enhance connectivity between habitats.

Impacts from GRSG Management

PHMA and GHMA would be designated as ROW avoidance areas (14,642,900 acres). New projects in PHMA and GHMA would be managed for a net conservation gain of GRSG habitat. As a result, ROW activities (e.g., roads, permits, leases and power lines) may be impacted and result in fewer opportunities for the public to acquire needed authorizations in those areas.

Impacts from Land Uses and Realty Management

Authorizations

Under this alternative, PHMA and GHMA would be designated as ROW avoidance areas. The BLM and the Forest Service would allow ROWs in these areas to occur if development incorporates specific mitigation measures and stipulations that would result a net conservation gain of GRSG habitat. These additional restrictions would impact processing time for the BLM and the Forest Service and increased cost for the applicants. Alternative D would have greater impacts on the lands and realty program than Alternative A and E, but fewer impacts than Alternatives B and C.

Under Alternative D, ROW authorizations in GRSG habitat would be required to apply RDFs consistent with applicable law to minimize impacts on GRSG and their habitat. Application of RDFs (consistent with applicable law) such as retrofitting with anti-perching devices, would result in increased development costs and construction timelines.

Utility Corridors

Impacts on utility corridors would be the similar to Alternative A, however new authorizations would be required to apply certain RDFs consistent with applicable law to minimize impacts on GRSG habitat. This would result in the same impacts listed above in the authorization section.

Land Tenure

Management actions that prioritize GRSG habitat for acquisition and limit disposal of these lands would assist the BLM and the Forest Service in prioritizing future land tenure and landownership adjustments. Land tenure and landownership adjustments are intended to maintain or improve the efficiency of the BLM's and the Forest Service's management. However, these same actions could reduce the BLM's and the Forest Service's flexibility for consolidating BLM-administered and National Forest System lands for effective management of other resources.

Under Alternative D, approximately 766,300 acres would no longer be available for disposal compared to Alternative A. Lands in habitat would be reclassified for retention. Disposal and/or acquisitions of BLM-administered and National Forest System lands would allow for more contiguous federal ownership patterns in the GRSG habitat, or where a land tenure adjustment would result in a net gain in amount or quality of GRSG habitat.

Impacts from Leasable, Locatable, and Salable Minerals Management

Mineral development indirectly impacts the lands and realty program through the requirement for new infrastructure development, such as roadways and communication facilities.

Although land use authorizations (ROWs or SUAs) are not necessary for surface occupancy of leased federal lands, ROWs are often required for infrastructure (e.g., pipelines and centralized facilities). In areas closed to mineral entry, the need for ROWs to manage mineral sites would be eliminated. In areas open to mineral entry, where surface occupancy restrictions would result in decreased development, overall demand for ROWs would also be decreased. In those cases, the demand would continue, but may result in increased length and cost of construction of ROWs, due to the requirement to find alternative routes or sites for infrastructure to support development.

Impacts from Comprehensive Travel and Transportation Management

Under Alternative D, 0 acres would be open to cross-country motorized travel while the BLM would manage 16,005,000 acres as limited to existing or designated routes. No new roads would be allowed in PHMA or GHMA, which could restrict motorized access to ROW infrastructure and communication sites for construction and maintenance. No upgrades of existing routes that would expend the existing disturbance footprint would be allowed, except for resource protection or public safety purposes.

Impacts from Renewable Energy Management

Impacts under Alternative D, PHMA and GHMA lands would be designated exclusion areas for utility scale wind and solar development. 16,526,600 acres of BLM-administered and National Forest System lands would be managed as solar and wind ROW exclusion areas and would not be open for renewable energy ROW applications. This represents 15,048,000 fewer acres open to wind energy development than under Alternative A. Solar energy development would be excluded from GHMA and PHMA similar to Alternative C.

Potential future development of renewable energy would be eliminated in PHMA and GHMA. This would force development to occur outside PHMA and GHMA and/or on private lands.

These limitations on new renewable energy ROWs/SUAs, would limit the BLM and the Forest Service's ability to accommodate demand for ROW/SUA development, which in turn could restrict the availability of energy or service reliability for communication systems.

4.13.8 Alternative E

This alternative would reduce the impact on GRSG habitat (core, priority, and general) by applying the strategy of avoid, minimize, and mitigate, with the addition of the Conservation Credit System managed by the State of Nevada.

For Nevada only, Alternative E would manage GRSG habitat as ROW avoidance areas. This alternative would reduce the impact on GRSG habitat (core, priority, and general) by applying the strategy of avoid, minimize, and mitigate, with the addition of the Conservation Credit System managed by the State of Nevada.

Lands in California would be managed according to existing land use plans. Alternative E would result in no net unmitigated loss of GRSG habitat due to human disturbances, including land tenure adjustments and land uses, in the SGMA. The purpose would be to stop the decline of GRSG populations.

The BLM and the Forest Service would allow ROW development in GRSG habitat, subject to ROW conditions. Specific mitigation measures would be set in place to avoid, minimize, and mitigate impacts on leks and nesting, brood-rearing, and wintering habitats. Travel along routes would be limited to specific times that least impact habitats.

These increased measures would restrict ROW development in specific areas and would impact management and maintenance of existing and future development.

Impacts from GRSG Management

On federal lands in Nevada with pre-approved activities, no new mitigation would take place beyond previously approved development or drilling plans or ROWs. General guidance would be to avoid when possible, to minimize adverse effects as practicable, and to mitigate adverse effects in occupied or suitable habitat in Nevada.

Whenever possible, Alternative E would locate facilities in nonhabitat areas, would site new linear features in existing corridors or collocate them with other features, and would engage in reclamation and weed control. As feasible, some communication and power lines would be buried; lines no longer in use that cross important GRSG habitat would be removed. Alternative E would provide more restrictions on lands and realty than would Alternative A.

Impacts from Lands Uses and Realty Management

Authorizations

Under Alternative E specific mitigation measures would be set in place to avoid, minimize, or mitigate impacts on leks and nesting, brood-rearing, and wintering habitats. Impacts would be minimized by modifying proposed actions or developing permit conditions to include measures that lessen the adverse effects on GRSG and their habitat. This would be accomplished through site-specific consultation-based design features (see **Appendix D**), such as reducing the disturbance footprint, limiting seasonal use, and collocating structures. These increased measures would restrict infrastructure development in specific areas and would impact management and maintenance of existing and future development.

Under Alternative E, in Nevada only, ROW authorizations in GRSG habitat would require RDFs consistent with applicable law to minimize impacts on GRSG and their habitat. Application of RDFs consistent with applicable law, such as consolidating ROWs in existing utility corridors and burying power lines, could affect ROW development by limiting the availability of lands suitable for consolidated development. Requirements to bury transmission lines could add development costs, which could prohibit completion or restrict the scope of the project.

Utility Corridors

For lands in California, impacts on utility corridors would be the same as under Alternative A. For lands in Nevada, Alternative E would encourage the use of existing corridors for new ROW development. Identifying the desired locations for future development provides a level of certainty as to the location of future infrastructure, including collocated ROWs. Over time, however, corridors could become overcrowded with ROW development and could become unfeasible for additional development. This would result in costly infrastructure retrofitting to increase capacity or redirecting new development to areas in or outside of GRSG habitat. This could impact the utility market by potentially reducing the service availability to customers.

Land Tenure

Impacts on land tenure would be the same as under Alternative A.

Impacts from Leasable, Locatable, and Salable Minerals Management

New or expanded mineral development, which places a demand on the lands and realty program through applications for ROW authorizations, would be allowed under Alternative E, with stipulations to mitigate impacts on GRSG populations. While the stipulations may extend the processing times for mineral development permits, impacts on lands and realty under Alternative E from mineral development would be less than under Alternative D, due to more land open for mineral development.

Impacts from Comprehensive Travel and Transportation Management

Impacts under Alternative E would be the same as under Alternative A.

Impacts from Renewable Energy Management

The strategy for managing renewable energy under Alternative E would be to avoid conflict with GRSG by locating facilities and activities in nonhabitat wherever possible. All new proposed utility-scale commercial wind energy facilities in SGMA would trigger SETT consultation.

Potential future development of renewable energy would be reduced or eliminated in core, priority, and general habitat. This would force development to occur outside those habitats or on private lands.

Determining nonhabitat would allow the BLM and the Forest Service to be more transparent about placing fewer restrictions on lands for future development. Renewable energy companies would know what lands were available and open to development.

4.13.9 Alternative F

Impacts from GRSG Management

Under Alternative F, new ROWs, including those for wind and solar, would be excluded in all Core/Priority/General habitat (16,526,600 acres); therefore, no areas in GRSG habitat would be open to new ROW development. Impacts on authorizations would be the same as Alternative C.

Impacts from Land Uses and Realty Management

Authorizations

Under Alternative F, new ROW development would be prohibited in PHMA and GHMA, unless that new development could be collocated with existing ROW infrastructure. Restricting new development to collocation would minimize opportunities for new development and likely increase the complexity and costs of proposed ROWs in GRSG habitat. Because existing infrastructure is limited to select locations in the planning area, other areas without existing ROWs would be excluded from future ROW development.

Utility Corridors

Alternative F identifies corridors with existing ROW infrastructure as the desired location for future ROW development. Accordingly, under Alternative F, new ROW would only be allowed in the 1,322,800 acres (8 percent of the planning area) of corridors with existing ROW authorizations. Identifying the desired locations for future development provides a level of certainty as to the location of future infrastructure, including collocated ROWs. Over time, however, the limited amount of lands in the planning areas associated with corridors containing existing ROW development could preclude additional development as those corridors receive additional development. The result could be costly retrofitting of existing infrastructure to increase capacity or new development being redirected to areas outside of GRSG habitat. This could impact the utility market by potentially reducing the service availability to customers.

Land Tenure

Impacts from land tenure and landownership adjustments would be the same as Alternative B.

Impacts from Leasable, Locatable and Salable Minerals Management

Impacts under Alternative F from mineral development would be the same as Alternative B, with the exception that mineral closures would apply to all Core habitat, including surface and split-estate areas.

Impacts from Comprehensive Travel and Transportation Management
Impacts under Alternative F would be the same as Alternative C.

Impacts from Renewable Energy Management
Impacts under Alternative F would be the same as Alternative C.

4.13.10 The Proposed Plan

The Proposed Plan would require a 3 percent disturbance cap on human surface-disturbing activities in PHMA (see **Appendix F**), and it would incorporate RDFs consistent with applicable law in PHMA, GHMA, and OHMA. It would also require all human disturbances to result in a net conservation gain for GRSG and their habitat. Lek buffers would be required (see **Appendix B**).

Collectively, these GRSG conservation management actions would increase mitigation requirements for land use authorizations. This would result in more complex project designs, potentially excluding infrastructure placement in the most cost-effective locations and potentially resulting in overall greater development costs. A corresponding effect could be a reduction in the number of authorization applications for activities in PHMA and longer, more complicated review periods for those that are proposed in PHMA. Implementing the GRSG habitat conservation management actions listed above would also place NSO stipulations on fluid mineral development in PHMA. This would further reduce the demand for new ROW development in those areas.

Impacts from GRSG Management
PHMA and GHMA outside designated corridors would be managed as ROW avoidance areas for all major ROWs, except those for solar and wind (see the renewable energy actions that follow). PHMA for minor ROWs would be managed as avoidance areas (8,888,300 acres), and GHMA would be managed as open (6,010,700 acres); PHMA and GHMA for major ROWs would be managed as avoidance areas (14,899,000 acres).

New ROW projects in PHMA and GHMA would be managed for net conservation gain, and proponents would be required to follow specific RDFs consistent with applicable law. As a result, ROW activities (e.g., roads, permits, leases and power lines) may be impacted and would result in fewer opportunities for the public to acquire authorizations in those areas.

Impacts from Land Uses and Realty Management

Authorizations
Under the Proposed Plan, PHMA and GHMA would be designated as ROW avoidance areas for major ROWs; GHMA would be managed as open to minor ROWs. The BLM and the Forest Service would allow minor ROWs in PHMA if development were to incorporate specific conditions, mitigation measures, and stipulations provided in the GRSG screening criteria and **Appendix D** (RDFs). This would result in a net conservation gain for GRSG and their habitat.

These additional restrictions would impact processing time for the BLM and the Forest Service and would increase costs for the applicants. In some cases this could restrict applicants for smaller ROWs from receiving a ROW due to financial feasibility. The BLM and the Forest Service would allow ROWs in GHMA, following the standard process and procedures for issuing the authorizations. The Proposed Plan would have greater impacts on the lands and realty program than would Alternatives A and E but fewer impacts than would Alternatives B, C, D, and F.

Under the Proposed Plan, developers of ROWs in PHMA, GHMA, and OHMA would be required to apply RDFs consistent with applicable law to minimize impacts on GRSG and their habitat. Applying RDFs (consistent with applicable law), such as retrofitting them with anti-perching devices, could increase development costs and construction timelines.

The proposed TransWest Express Transmission Project is not subject to the proposed plan decision to designate PHMA and GHMA as an avoidance area. The project is also exempt from the proposed GRSG screening criteria, RDFs consistent with applicable law, buffers, tall structure requirements, and disturbance cap requirements identified in **Chapter 2,** Proposed Action and Alternatives.

The Obama Administration identified this transmission project as a priority project, as part of the President's commitment to job creation and modernizing America's Infrastructure. This transmission project was one of seven projects identified for expedited permit review and federal agency coordination by the interagency Rapid Response Team for Transmission (RRTT). The RRTT was established to foster coordination, expedite simultaneous permitting processes, and resolve permitting challenges, while ensuring appropriate environmental reviews.

The BLM is processing the application for the TransWest Express Transmission Project, a high-voltage transmission line. , In a separate NEPA document, the TransWest Express project includes some alternatives that would take the transmission line through GRSG habitat in eastern Nevada. The BLM is analyzing conservation measures for GRSG as part of the NEPA review process for the TransWest Express Transmission Project. It is analyzed in detail in the cumulative impacts section.

While not identified as a national priority project, the Southwest Intertie Transmission Line Project is also proposed in the planning area. A portion of the line was recently completed from Las Vegas to Ely, Nevada; the remaining portion is proposed to extend farther northward into Elko County. Depending on when the northern portion of the project actually gets built, the NEPA analysis for this project would most likely need to be refreshed to ensure consistency with GRSG conservation measures. However, the project would

contribute to the 3 percent disturbance cap, thereby potentially reducing the extent of land available for future ROW development.

The project would also directly and indirectly affect the BLM and the Forest Service lands and realty programs by providing future collocation opportunities for new transmission infrastructure. Collocation could increase costs and result in longer review periods, but it would enable the BLM to accommodate a portion of the demand for new or expanded ROW development.

Utility Corridors

Under the Proposed Plan, existing utility corridors would be open in GRSG habitat; however, only the utility corridors identified on the proposed plan corridor map would remain designated (see **Figure 2-67**). Based on the BLM's evaluation of existing designated corridors, the Proposed Plan would undesignate some previously designated corridors. Of the 1,322,800 acres of existing utility corridors (Alternative A), 390,500 acres would remain designated under the Proposed Plan. Corridors in habitat would be designated to a maximum width of 3,500 feet.

GHMA would be open to minor ROWs; however, the Proposed Plan would impose specific restrictions on processing and issuing permits for those activities. Designating new utility corridors would be excluded in PHMA and GHMA. This would reduce the available lands open to entry for linear ROWs and could cause new linear ROWs to be concentrated in existing corridors.

Over time, corridors could become overcrowded and unfeasible for additional ROW development. This would result in costly retrofitting of infrastructure to increase capacity or redirecting new development to areas outside of GRSG habitat. These added costs would negatively impact the utility market by potentially reducing the availability of affordable service to customers.

Land Tenure

Management actions that prioritize GRSG habitat for acquisition and limit disposal of these lands would help the BLM and the Forest Service prioritize future land tenure and landownership adjustments. These are intended to maintain or improve the efficiency of the BLM's and the Forest Service's management. However, these same actions could reduce the BLM's and the Forest Service's flexibility for consolidating BLM-administered and National Forest System lands for effective management of other resources.

Under the Proposed Plan, approximately 505,500 acres would be no longer suitable for disposal via sale compared to Alternative A. Disposal and acquisitions of BLM-administered and National Forest System lands would allow for more contiguous federal ownership patterns in the GRSG habitat, or where a land tenure adjustment would result in a net gain in the extent or quality of GRSG habitat.

Compared to Alternative A, the Proposed Plan would limit land disposals or exchanges in GRSG habitat. However, compared to Alternatives B, C, D, and F, the Proposed Plan would allow the BLM and the Forest Service the opportunity to dispose of lands and to acquire private lands. This includes lands with intact mineral estate, and acquisition would be by purchase, exchange, or donation. This would result in a net conservation for GRSG.

Impacts from Leasable, Locatable, and Salable Minerals Management

Mineral development indirectly impacts the lands and realty program by requiring new infrastructure development, such as roadways and communication facilities.

Although land use authorizations are not necessary for surface occupancy of leased federal lands, ROWs are often required for infrastructure (e.g., pipelines and centralized facilities). In areas closed to leasing, the need for ROWs to access leases and material sites would be eliminated. For example, in SFA, where lands would be withdrawn from locatable mineral entry; fluid minerals would be managed as NSO without waivers, exceptions, and modifications; and the demand for new LUAs would decrease or be eliminated.

In areas open to mineral entry, where surface occupancy restrictions would decrease development, overall demand for ROWs would also decrease. In those cases, the demand would continue but could increase the length and cost of construction of ROWs, due to the requirement to find alternative routes or sites for infrastructure to support development.

Impacts from Comprehensive Travel and Transportation Management

Under the Proposed Plan, no acreage would be open to motorized travel, and the BLM would manage 16,526,600 acres as limited to existing or designated routes. No new roads would be allowed in PHMA, which could restrict motorized access to ROW infrastructure and communication sites for construction and maintenance. No upgrades of existing routes that would expand the disturbance footprint would be allowed, except for resource protection or public safety.

Impacts from Renewable Energy Management

Under the Proposed Plan, PHMA would be managed as ROW exclusion for utility-scale commercial wind and solar energy facilities (i.e., those that generate 20 megawatts or more). The BLM and the Forest service would manage 10,296,100 acres as wind ROW exclusion areas, which would not be open for wind energy ROW applications. GHMA would be managed as ROW avoidance for utility-scale commercial wind energy facilities (i.e., those that generate 20 megawatts or more; 6,516,700 acres) and exclusion for solar energy ROWs. New wind energy ROWs would be allowed in GHMA if they could be demonstrated to provide a net conservation gain for GRSG habitat. The BLM and the Forest Service would manage 16,812,800 acres as solar ROW exclusion areas.

Potential future development of renewable energy would be reduced or eliminated in PHMA and GHMA, forcing development outside PHMA and GHMA or onto private lands.

These limitations on new renewable energy ROWs and SUAs, would limit the BLM's and the Forest Service's ability to accommodate demand for ROW and SUA development, which in turn could restrict the availability of energy or service reliability for communication systems.

Impacts from Adaptive Management

In PHMA where a hard trigger has been reached, the corresponding adaptive management responses are identified in **Table 2-9**; **Table 4-12** below describes the effects on ROWs and LUAs in the affected BSU.

In GHMA where a hard trigger has been reached, the corresponding adaptive management responses are identified in **Table 2-10**; **Table 4-13** below describes the effects on ROW/LUAs in the affected BSU.

Table 4-12
PHMA Adaptive Management Effects

Program Area Activity	Corresponding Analysis
ROWs in corridors	In BSUs where a ROW in the designated corridor is found to be the cause of declining GRSG trend, new ROW developers would incur the added costs of retrofitting or relocating ROW infrastructure to minimize effects on GRSG.
Major ROWs outside corridors	Same as Alternatives B, C, and F
Minor ROWs outside corridors	Same as Alternatives B, C, and F

Table 4-13
GHMA Adaptive Management Effects

Program Area Activity	Corresponding Analysis
ROWs in corridors	In BSUs where a ROW in the designated corridor is found to be the cause of declining GRSG trend, new ROW developers would incur the added costs of retrofitting or relocating ROW infrastructure to minimize effects on GRSG.
Major ROWs outside corridors	Same as Alternatives B, C, and F
Minor ROWs outside corridors	Same as Alternatives B and D

4.14 RENEWABLE ENERGY RESOURCES

BLM-administered and National Forest System lands are used for a variety of purposes. Major focus areas for the renewable energy program are wind and solar ROW grants and SUAs and to be responsive to applications for renewable

energy sites and associated ROWs, as encouraged by current policy. Although geothermal is a resource considered under the renewable energy program, it is discussed under the leasable minerals section. The renewable energy program potentially would be affected by management actions in the resource programs of each office.

Identification of areas as having high potential for renewable energy does not mean these lands would be developed. The feasibility of development would be determined by project proponents, and all applications for land use authorizations would be subject to site-specific NEPA analysis.

Currently, and in the reasonable foreseeable future, there is no and will be no significant commercial biomass energy economy, other than for incidental use as a firewood fuel, in California and Nevada.

This section discusses impacts on renewable energy from proposed management actions of other resources and resource uses. Existing conditions concerning lands and realty are described in **Section 3.12**, Renewable Energy Resources.

4.14.1 Methods and Assumptions

- Number and acres of existing ROW exclusion/avoidance areas in PHMA and GHMA.
- Number and acres of existing solar energy zones with PHMA and GHMA.
- Number of authorized Type II ROW grants/SUAs in PHMA and GHMA and in PHMA and GHMA buffer zones (as determined by wildlife specialist)
- Number of authorized Type III ROW grants/SUAs in PHMA and GHMA and in PHMA and GHMA buffer zones (as determined by wildlife specialist).
- Number of permits/authorizations and proposed permits/authorizations in PHMA and PHMA and GHMA and in PHMA and GHMA buffer zones (as determined by wildlife specialist).
- Application of COAs on existing, pending, and future wind and solar projects to improve conservation efforts of the GRSG and their habitat.

Assumptions

The analysis includes the following assumptions:

- Renewable energy resources include solar, wind, (geothermal is discussed under leasable minerals) and biomass facilities. Biomass

projects are authorized under the timber regulations, unless a new facility is being authorized for biomass production.

- Good or better wind potential is classified as wind speeds of 23 feet per second at 164 feet high or at wind power density of above 400 watts/meter (NREL 2012).
- Existing ROWs may be modified on their renewal, assignment, or amendment if the requested actions meet the objectives of the amended LUP.
- ROW/SUA holders may continue their authorized use as long as they are in compliance with the terms and conditions of their grant.
- Technological advancements, such as enhanced/engineered renewable energy systems, could lead to changes in levels of development potential throughout the planning area.
- Valid existing renewable energy ROWs would be managed under the stipulations in effect when the ROWs were issued; new stipulations proposed under this LUPA would apply only to new ROWs.
- On renewal, assignment, or amendment of existing ROWs, permits, and leases, additional stipulations or modifications could be included in the land use authorization if the request action meets the objective of the amended or revised LUP.
- Existing ROWs, designated utility corridors, and communication sites would be managed to protect valid existing rights.
- Demand for small distribution facilities to extend and upgrade services, such as communication sites and utilities, is anticipated to increase as rural development occurs on dispersed private parcels and parcels identified for disposal in the planning area.
- Private parcels in the planning area and parcels identified for disposal would continue to require new or upgraded services such as power distribution facilities, including communication sites, roads, and any appurtenant utilities.
- The number of ROW/SUA applications for new communication and computer technology, such as fiber optic cable would continue to increase.
- Maintaining and upgrading utilities communication sites, and other ROWs is preferred before the construction of new facilities in the decision area, but only if the upgrading can be accommodated in the existing ROW.
- Collocation of new infrastructure in existing ROWs is preferred over creating a new ROW. The BLM and the Forest Service

recognize that collocation does not necessarily prevent new temporary or permanent surface disturbance.

- Federal energy policy (42 USC §13201 et seq.), would continue to support domestic energy production, including renewable energy such as wind and solar.
- BLM-administered and National Forest System lands would continue to be available for regional and interstate transmission lines, particularly those needed to transport renewable energy.
- Management of all previously withdrawn land from entry, appropriation, or disposal under the public land laws on BLM-administered and National Forest System lands would continue. The BLM and the Forest Service would review withdrawals as needed and when necessary, make recommendations for extensions, modifications, revocations, or terminations. All existing withdrawals initiated by other agencies, such as the Bureau of Reclamation or the Department of Energy, would be continued unless the initiating agency or BLM or Forest Service requests that the withdrawal be revoked.
- The demand for both energy and nonenergy types of authorizations are anticipated to remain steady or gradually increase over time due to economic growth and state and local government usage.
- Distributed solar energy development may occur during the life of the LUP but would be localized and the number of associated authorizations is anticipated to be minimal.
- Any lands that become unencumbered by withdrawals or classifications will be managed according to the decisions made in the LUP. If the LUP has not identified management prescriptions for these lands, they will be managed in a manner consistent with adjacent or comparable BLM-administered and National Forest System lands in the decision area. If the unencumbered lands fall within two or more management scenarios where future-planning criteria may not be clear, a plan amendment may be required.
- New information may lead to changes in delineated GRSG habitat. New habitats, or areas that are no longer habitat, may be identified. These adjustments would typically result in small changes to areas requiring the stipulations or management actions stated in the LUP. Modifications to GRSG habitat would be updated in the existing date inventory through plan maintenance.
- There is projected to be no impact from exclusion of solar energy development on National Forest System land in the planning area as there is limited potential for solar energy development.

4.14.2 Nature and Type of Effects

Resources and resource uses affect the lands and realty program by prescribing ROW exclusion and avoidance areas and stipulations in order to protect resources. A ROW exclusion area is one that is not available for new ROW location under any conditions. In a ROW avoidance area, new ROW development would ideally be avoided; however, the area may be available for ROW location subject to special stipulations, such as resource surveys and reports, construction and reclamation engineering, long-term monitoring, special design features, special siting requirements, timing limitations, and rerouting. Such requirements could restrict project location, delay availability of energy supply (by delaying or restricting pipelines, transmission lines or renewable energy project), or they could delay or restrict communications service availability.

Forest Service Forest Plan prescriptions would be similar to BLM exclusion and avoidance areas as in these areas certain uses are restricted or prohibited. Additionally, the Forest Service grants SUAs on Forest Service-administered lands. The Forest Service grants SUAs, while the BLM grants ROW on their respective agency lands.

For renewable energy resources, impacts on anticipated projects would only occur as a result of a change in management of BLM-administered and National Forest System lands in the planning area in California and Nevada.

The primary impact issues associated with renewable energy development are directly related to the large surface area needed for wind and solar facilities, and infrastructure. Areas that are suitable for renewable energy development are limited to those areas where these resources occur. Thus, conflicts with other resources would have the potential to reduce areas deemed available for development.

Other impacts on renewable energy development generally occur in areas where transportation and utility corridors as well as a solar and wind energy zones exist.

Impacts are also related to the mitigation measures required for specific project siting and special stipulations required for resource protection.

Collocating utilities and other appurtenances in designated corridors would reduce land use conflicts by grouping similar facilities and activities in specific areas and away from conflicting developments and activities. It would also clarify the preferred locations for utilities on BLM-administered and National Forest System lands, would make construction and maintenance of the facilities easier, and would simplify the application processing for new facilities. However, designation of corridors could limit options for ROW and facility design and selection of more-preferable locations.

Renewable energy projects, such as wind farms and concentrated solar power development could be impacted by land use authorizations for power plants, disposals of land resulting in commercial or residential developments, and other lands and realty actions resulting in siting constraints for these large facilities. While the acreage of moderate to high potential for wind energy may occur along mountain ridge tops, these areas are not types of lands typically proposed for disposal.

Land tenure and landownership adjustments are intended to maintain or improve the efficiency of BLM and Forest Service management, including management of GRSG habitat. Land disposal on BLM-administered land and land exchange, purchase, and donation on Forest Service-administered land can result in a more contiguous decision area, thus increasing efficient management of BLM-administered lands. However, while consolidation may be beneficial for certain resources and uses, it may have a negative effect on GRSG habitat.

Renewable energy projects and electrical transmission projects to connect both wind and solar energy projects to the grid can only occur on lands that are not ROW/SUA exclusion areas. Alternatives with greater ROW/SUA exclusion acreages would have long-term direct impacts on the ability for renewable resources to be developed.

As discussed in **Section 4.15**, Lands and Realty, ROW applications may be filed in ROW avoidance areas. As a result of special surveys and reports, alternative routes may need to be identified to protect sensitive resources, such as the GRSG habitat. Designating ROW exclusion and avoidance areas and applying special stipulations would result in increased application processing time and costs due to the potential need to relocate facilities or due to greater design, mitigation, and siting requirements.

Alternatives with larger ROW avoidance areas would have short-term direct impacts (e.g., special surveys, reports, and construction and reclamation RDFs, consistent with applicable law) and long-term direct impacts (e.g., potential operation and maintenance requirements) on the economic feasibility of the development of renewable energy resources.

Implementing management for all of the resources, except lands and realty and special designation, would have negligible or no impact on renewable energy.

For renewable resources, impacts on anticipated projects would only occur as a result of the change in management of lands in California and Nevada.

4.14.3 Impacts Common to All Alternatives

Impacts from Comprehensive Travel and Transportation Management

Travel management actions can involve closing areas or specific routes to motorized or mechanized travel, thereby creating areas that are impractical for

some types of land uses, such as transmission lines or communication sites. Under all alternatives, the BLM and the Forest Service would complete a CTTM plan, designating certain routes as open, closed or limited to motorized travel. While the BLM and the Forest Service would not close access to valid existing rights, travel management decisions that make access to existing or desirable future ROW locations more difficult would discourage colocation in existing ROWs and new ROW development.

Impacts from Special Designations Management

The designation of ACECs would create ROW exclusion and avoidance areas that could limit the siting of renewable energy development projects and the transmission lines required to connect them to the grid. ACECs located in the southern region of the planning area and areas of special designated, such as wilderness, also would affect the location of renewable energy solar development projects. New roads would not be constructed in designated wilderness, WSAs and ACECs, reducing impacts on resources protected by these designations. There is a moderate to high wind potential and high solar potential to occur in some of the ACECs, designated wilderness and, WSAs.

Wind and solar power developments would have to be compatible with the management prescriptions for other resources and would be evaluated on a project-specific basis.

4.14.4 Alternative A

The No Action Alternative represents continuation of present management for all the sub-regional LUPs considered in this programmatic LUPA.

Impacts from GRSG Management

Under Alternative A, 1,884,300 acres of lands would be affected by wind ROW/SUA exclusion areas, and 13,957,800 acres of lands would be affected by solar ROW exclusion or avoidance areas. All other lands with renewable energy potential would continue to be open for ROW and SUA applications on a case-by-case basis.

Exclusions of any additional areas from wind energy development would be determined at the project level as part of the site-specific analyses or through local LUP planning efforts, with opportunities for full public involvement. As required by the Wind Energy Development Program, proposed policies and BMPs and site-specific analyses, including the development of an appropriate monitoring program, would be conducted for any proposed project on BLM-administered lands. The scope and approach for site-specific analyses would be determined on a project-by-project basis in conjunction with input from other federal, state, and local agencies, and interested stakeholders. Through this process, the BLM would develop project-specific stipulations for incorporation into the Plan of Development. Site-specific analyses are beyond the scope of the PEIS.

Renewable Energy applications would be accepted by the BLM and the Forest Service under existing policy. However, under Alternative A, GRSG could likely become a federally listed endangered species and the Section 7 Consultation process would be likely to result in substantial project constraints.

Impacts from Land Uses and Realty Management

Under Alternative A, existing ROWs in the decision area would continue to provide opportunities for colocation of new infrastructure. No acres would continue to be managed as ROW avoidance areas, while 1,884,300 acres would be designated exclusion. All other lands in the decision area would continue to be open for ROW development. The continuation of the renewable energy program would have direct impacts on the lands and realty program by allowing new facilities to be constructed and service renewable energy projects.

BLM-administered and National Forest System lands would continue to be available for multiple-use and single-use communication sites and road access ROW on a case-by-case basis pursuant to Title V of FLPMA and 43 CFR, Part 2800 regulations. All ROW applications would be reviewed using the criteria of following existing corridors wherever practical and avoiding the proliferation of separate ROWs.

4.14.5 Alternative B

Alternative B represents the NTT alternative and would make PHMA exclusion areas for all wind and solar ROWs. The BLM and the Forest Service would manage GHMA as ROW avoidance areas for wind development. Solar development in GHMA would be managed as avoidance for the Forest Service while the BLM would manage as exclusion areas.

Impacts from GRSG Management

Under Alternative B, 10,120,700 acres of BLM-administered and National Forest System lands with wind potential would be managed as ROW/SUA exclusion areas and would not be open for renewable energy ROW and SUA applications while 6,405,900 acres would be managed as wind ROW avoidance areas. For Solar ROW development 14,562,400 acres would be excluded for solar energy ROWs while 1,964,200 acres would be managed as solar ROW avoidance areas.

Potential future development of renewable energy would be eliminated in PHMA through exclusion areas. This would force development to occur outside PHMA and/or on private lands. 6,470,600 acres would be restricted through ROW avoidance designations.

By determining exclusion areas, the BLM and the Forest Service would be more transparent about lands that would have fewer restrictions for future development. Renewable energy companies would know what lands are available and open to development.

Additionally, in avoidance areas, mitigation requirements for renewable energy could direct renewable energy development from federal to non-federal lands. Renewable energy development on adjacent private lands would impact the lands and realty program if transmission lines are required to cross BLM-administered and National Forest System lands.

Impacts from Land Uses and Realty Management

Under Alternative B, ROWs such as roads, fiber optic, natural gas lines, power substations, power distribution and transmission lines to the anticipated projects in the sub-region, would be similarly affected by the change in designation. Facilities would have to be collocated only if the entire footprint of the proposed project (including construction and staging), can be completed in the existing disturbance associated with the authorized ROWs or SUAs. These limitations on new ROWs and aboveground linear features, such as transmission lines, fiber optic, natural gas lines, and power substations, would limit the BLM's and the Forest Service's ability to accommodate demand for renewable energy ROW development, which in turn could restrict the availability of energy or service availability and reliability for communication systems.

4.14.6 Alternative C

Alternative C represents the Western Watershed Project Alternative. This alternative would designate PHMA as ACECs. New BLM ROWs or Forest Service SUAs would be prohibited in these areas.

Impacts from GRSG Management

Under Alternative C, 16,526,600 acres of PHMA would be excluded from wind and solar development ROW applications.

In total, 16,526,600 acres of lands would be ROW exclusion areas and would be affected under Alternative C. All of these acres would be completely unavailable for wind development through ROW/SUA exclusion designations since wind energy development is managed through the lands and realty program.

While the acreage of moderate to high potential for wind energy may occur along mountain ridge tops, potential future development of renewable energy would be reduced or eliminated in PHMA. This would force development to occur outside PHMA and/or on private lands.

Management of PHMA as a ROW/SUA exclusion would eliminate the BLM's ability to accommodate any new wind energy development demand in those areas. Potential future development of renewable energy would be reduced or eliminated in PHMA. This would force development to occur outside PHMA and/or on private lands.

Determining lands of nonhabitat would allow the BLM to be more transparent regarding lands that would have fewer restrictions for future development.

Renewable energy companies would be able to identify what lands are available and open to development.

Impacts from Land Uses and Realty Management

Under Alternative C, ROWs such as roads, transmission lines and to the anticipated projects in the sub-region would be similarly affected by the change in designation. Facilities would have to be sited in nonhabitat or bundled with existing corridors. These limitations on new ROWs and aboveground linear features, such as transmission lines, would limit the BLM's ability to accommodate demand for renewable energy ROW development, which in turn could restrict the availability of energy or service availability and reliability for communication systems.

4.14.7 Alternative D

Alternative D would manage priority and GHMA to reduce fragmentation and enhance connectivity between habitats. PHMA and GHMA would be designated as exclusion areas. No new renewable energy projects would be allowed in PHMA and GHMA.

Impacts from GRSG Management

Under Alternative D, PHMA and GHMA lands would be designated exclusion areas for utility-scale wind and solar development. Approximately 16,526,600 acres of BLM-administered and National Forest System lands would be managed as wind ROW/SUA exclusion areas and would not be open for renewable energy ROW applications.

Impacts under Alternative D would be the same as Alternative C.

Impacts from Land Uses and Realty Management

Under Alternative D, all areas in PHMA and GHMA would be designated as LUA avoidance. The BLM and the Forest Service would allow ROW development in avoidance areas to occur if the development incorporates appropriate RDFs (consistent with applicable law) in design and construction (e.g., noise, tall structure, or seasonal restrictions) and development results a net conservation gain of GRSG habitat. Facilities would have to be sited and developed in nonhabitat, bundled with existing corridors, or mitigated so that no PHMA or GHMA habitat is lost. These limitations on new ROWs and aboveground linear features, such as transmission lines, would limit the BLM's and the Forest Service's ability to accommodate demand for renewable energy ROW development, which in turn could restrict the availability of energy or service availability and reliability for communication systems.

Under Alternative D, authorizations in GRSG habitat would be required to apply RDFs consistent with applicable law to minimize impacts on GRSG and their habitat. Application of RDFs (consistent with applicable law), such as retrofitting with anti-perching devices, would result in increased development costs and construction timelines.

4.14.8 Alternative E

This alternative would reduce the effect on GRSG habitat (core, priority, and general) by applying the avoid, minimize, and mitigate strategies, with the addition of the Conservation Credit System managed by the State of Nevada.

Alternative E proposes to achieve no net unmitigated loss of GRSG habitat due to human disturbances, including land tenure adjustments and land uses, in the SGMA. This would be to stop the decline of GRSG populations and applies to Nevada lands only; California lands would fall under Alternative A. All proposed utility-scale commercial wind energy facilities in the SGMA would require coordination with the SETT.

Under Alternative E and in the State of Nevada only, authorizations in GRSG habitat would be required to apply RDFs consistent with applicable law. This would be to minimize impacts on GRSG and their habitat. Application of RDFs consistent with applicable law, such as consolidating ROWs in existing utility corridors and burying power lines, would result in long-term cumulative impacts on the availability of lands suitable for consolidated development and that would support renewable energy development in and outside GRSG habitat.

Impacts from GRSG Management

The strategy for managing renewable energy under Alternative E would trigger SETT consultation. It would focus on avoiding conflict with GRSG by locating facilities and activities in nonhabitat wherever possible. This could force development to occur outside GRSG habitat or on private lands.

Determining nonhabitat would allow the BLM to be more transparent about which lands would have fewer restrictions to future development. Renewable energy companies would know what lands were available and open to development.

Impacts from Land Uses and Realty Management

Under Alternative E, impacts would be similar to Alternative A, except decisions would avoid occupied and suitable habitat wherever possible. The BLM and the Forest Service would allow ROW development in these areas if SETT consultation were completed and new features were in existing corridors or, at a minimum, collocated with existing linear features. These limitations on new ROWs and aboveground linear features, such as transmission lines, would limit the BLM's and the Forest Service's ability to accommodate demand for renewable energy ROW development. This in turn could restrict the availability of energy or service and the reliability for communication systems.

Under Alternative E, specific mitigation measures would be set in place to minimize impacts on leks and nesting, brood-rearing, and wintering habitats. Infrastructure would not be located within 0.6 mile of specific habitat, and travel would be limited to specific times that least impact habitats. These increased

measures would restrict renewable energy development in specific areas and would impact management and maintenance of existing and future development.

4.14.9 Alternative F

This alternative would make occupied GRSG habitat (PHMA and GHMA) exclusion areas for new BLM ROWs or Forest Service SUAs. Wind energy development would be sited at least five miles from the nearest active lek.

Impacts from GRSG Management

In PHMA and GHMA impacts would be same as Alternative C; however additional restrictions could be imposed outside of habitat as a result of the 5-mile buffer around active leks.

Impacts from Land Uses and Realty Management

Under Alternative F, impacts would from Land Use and Realty management would be the same as Alternative C.

4.14.10 The Proposed Plan

The Proposed Plan would require a 3 percent disturbance cap on surface-disturbing activities in PHMA (see **Appendix F**), and it would incorporate RDFs consistent with applicable law in PHMA, GHMA, and OHMA. It would also require all human disturbances to result in a net conservation gain for GRSG and their habitat. Lek buffers would also be required (see **Appendix B**).

Collectively, these GRSG conservation management actions would increase mitigation requirements for land use authorizations. This would result in more complex project designs, potentially excluding infrastructure placement in the most cost-effective locations and potentially resulting in overall greater development costs. A corresponding effect could be a reduction in the number of authorization applications received for activities in PHMA and longer, more complicated review periods for those that are proposed in PHMA.

The Proposed Plan would manage PHMA and would reduce fragmentation and enhance connectivity between habitats. PHMA would be managed as ROW exclusion for utility-scale commercial wind and solar energy facilities (i.e., those that generate 20 megawatts or more). GHMA would be managed as exclusion for solar energy and avoidance for wind energy. Only utility-scale commercial wind energy projects would be allowed in GHMA, with specific requirements and restrictions, including RDFs consistent with applicable law and GRSG screening criteria.

Impacts from GRSG Management

Under the Proposed Plan, PHMA would be managed as ROW exclusion for utility-scale commercial wind and solar (i.e., those that generate 20 megawatts or more). The BLM and the Forest Service would manage 10,296,100 acres as wind ROW exclusion areas, which would not be open for renewable energy ROW applications. GHMA would be managed as ROW avoidance for utility-

scale commercial wind energy facilities (i.e., those that generate 20 megawatts or more; 6,516,700 acres). New ROWs for wind development in GHMA would be allowable if development could not be avoided due to existing authorized uses, adjacent development, or split-estate issues, and it could be demonstrated that stipulations are incorporated into the authorization to achieve net conservation gain for GRSG and their habitat. The BLM and the Forest Service would manage 16,812,800 acres as solar ROW exclusion areas.

Applications would be required to go through specific screening criteria identified in Actions SSS 1. This prioritizes the location of new projects and activities outside of PHMA and GHMA, requires the project/activity to maintain GRSG habitat connectivity, and ensures that land uses meet GRSG habitat objectives identified in **Table 2-2**. The Proposed Plan would represent fewer acres open to wind energy development than under Alternative A.

Potential future development of renewable energy would be reduced or eliminated in PHMA and GHMA. This would force development to occur outside PHMA and GHMA or onto private lands.

These limitations on new renewable energy ROWs would limit the BLM's ability to accommodate demand for ROW development, which in turn could restrict the availability of energy or service reliability for communication systems.

By determining exclusion areas, the BLM and the Forest Service would be more transparent on lands that would have fewer restrictions to future development. Renewable energy companies would know what lands are available and open to development.

Impacts from Land Uses and Realty Management

Under the Proposed Plan, GHMA and PHMA would be managed as ROW and SUA avoidance areas for major and minor ROWs, with the exception of minor ROWs in GHMA being managed as open. The BLM and the Forest Service would allow ROW development in avoidance areas if the development were to meet the GRSG screening criteria (Action SSS 1) and incorporate appropriate RDFs consistent with applicable law in design and construction (e.g., restrictions on noise, tall structures, and seasonal use). Facilities would have to be sited and developed in nonhabitat, bundled with existing corridors, or mitigated so that no PHMA or GHMA habitat is lost.

These limitations on new ROWs and aboveground linear features, such as transmission lines, would limit the BLM's and the Forest Service's ability to accommodate demand for renewable energy ROW development. This in turn could restrict the availability of energy or service and the reliability of communication systems.

Under the Proposed Plan, authorizations in PHMA, GHMA, and OHMA would be required to apply RDFs consistent with applicable law to minimize impacts

on GRSG and their habitat. Applying RDFs (consistent with applicable law), such as retrofitting with anti-perching devices, could increase development costs and construction timelines.

Impacts from Adaptive Management

In PHMA where a hard trigger has been reached, the corresponding adaptive management responses are identified in **Table 2-9**; where no adaptive management trigger response has been identified (i.e., PHMA characterized as "no change" or "same as the Proposed Plan"), it is because the allocation that is recommended in the Proposed Plan is the most restrictive for that resource use.

Table 4-14 below describes the effects on ROWs in the affected BSU.

Table 4-14
PHMA Adaptive Management Effects

Program Area Activity	Corresponding Analysis
Wind energy ROWs	Same as under the Proposed Plan
Solar energy ROWs	Same as under the Proposed Plan

In GHMA where a hard trigger has been reached, the corresponding adaptive management responses are identified in **Table 2-10**. Where no adaptive management trigger response has been identified (i.e., PHMA characterized as "no change" or "same as the Proposed Plan"), it is because the allocation that is recommended in the Proposed Plan is the most restrictive for that resource use.

Table 4-15 below describes the effects on LUAs in the affected BSU.

Table 4-15
GHMA Adaptive Management Effects

Program Area Activity	Corresponding Analysis
Wind energy ROWs	Same as under Alternatives C and F
Solar energy ROWs	Same as under the Proposed Plan

4.15 MINERAL RESOURCES

4.15.1 Fluid Minerals

Methods and Assumptions

Analysis of impacts on minerals from this LUPA focuses on the impacts of conservation measures to protect GRSG. These impacts may be direct or indirect. For example, a direct impact on fluid minerals would result from closure of an area to fluid mineral leasing. An indirect impact would result from management of an area as ROW/SUA exclusion, which would change the economic feasibility of developing a site. Additional actions or conditions that

might cause direct or indirect impacts on fluid minerals are described under Indicators, below.

Indicators

Indicators of impacts on GRSG are as follows:

- The amount of land (option: unleased land) identified as closed to fluid mineral exploration and development
- The amount of land open to leasing subject to NSO stipulations
- The amount of land open to leasing subject to CSU stipulations
- The amount of land open to leasing subject to TL stipulations
- Application of COAs on fluid mineral exploration and development activities on existing and future leased lands for the protection of GRSG
- The amount of land managed as ROW/SUA avoidance areas
- The amount of land managed as ROW/SUA exclusion areas

Assumptions

The analysis includes the following assumptions:

- Federal energy policy (42 USC §13201 et seq.), would continue to support domestic energy production, geothermal and oil and gas.
- All future designated ACECs will be closed to mineral leasing.
- Existing fluid mineral leases would not be affected by the closures proposed under this LUPA.
- Fluid mineral operations on existing federal leases, regardless of surface ownership, would be subject to COAs by the BLM Authorized Officer. The BLM can deny surface occupancy on portions of leases with COAs to avoid or minimize resource conflicts if this action does not eliminate reasonable opportunities to develop the lease.
- Valid existing leases would be managed under the stipulations in effect when the leases were issued; new stipulations proposed under this LUPA would apply only on new leases. See the glossary for definitions of stipulations versus COAs.
- New information may lead to changes in delineated GRSG habitat. New habitats, 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 plan. Modifications to GRSG habitat would be updated in the existing data inventory through plan maintenance.

- If an area is leased, it could be developed; however, not all leases would be developed within the life of this LUPA.
- As the demand for energy increases, so will the demand for extracting energy resources in areas with potential.
- Stipulations also apply to fluid mineral leasing on lands overlying federal mineral estate, which includes federal mineral estate underlying BLM-administered lands and non-BLM-administered lands. There are 49,868,700 acres of federal mineral estate in the planning area.
- As discussed in **Section 3.13**, Mineral Resources, market circumstances will likely result in continued industry emphasis on increasing oil supplies and searching for additional natural gas supplies in the planning area. Much of the oil and gas supply growth in the planning area is expected to come from production in existing reservoirs, and new nonconventional resources plays.
- As discussed in **Section 3.13**, Mineral Resources, There are new prospective oil and gas plays as well as expansions to existing areas in the planning area. The level of oil and gas exploration activity in the planning area is likely to increase during the life of this planning effort. If any of the plays are determined to be economic, it is anticipated that development in the planning area would also increase.
- As discussed in **Section 3.13**, Mineral Resources, interest in geothermal resource development in Nevada is expected to remain sporadic and depend on market conditions and government incentive programs. However, geothermal exploration and development will continue in areas where resources are identified.

Nature and Type of Effects

The following analysis describes the nature and type of impacts that could affect fluid minerals in the planning area. Details on how the occurrence of each impact would vary by alternative are described under the various subheadings. Closing areas in GRSG habitat to fluid mineral leasing would directly impact the fluid minerals program by prohibiting the development of those resources on federal mineral estate. Fluid mineral operations would be limited in their choice of project locations and may be forced to develop in areas that are challenging to access or have less economic resources because more ideal areas could be closed to leasing. This could raise the cost of fluid mineral development in the planning area and would result in operators moving to nearby private or state minerals with no such restrictions.

Management actions that prohibit or restrict surface occupancy or disturbance (such as NSO, TLs, and CSU stipulations) overlying federal fluid mineral resources would also directly impact the development of those resources by

limiting the siting, design, and operations of fluid mineral development projects. This, in turn, could force operators to use more costly development methods than they otherwise might have used. Equipment shortages would result from application of TLs because a bottleneck may be created during the limited time period in which activity would be allowed. In areas where NSO stipulations are applied, federal fluid minerals could be leased, but the leaseholder/operator would have to use offsite directional drilling to access the mineral resource. Areas where directional drilling can be effectively used is limited by geology and costs, meaning some minerals may be inaccessible in areas where an NSO stipulation covers a large area or where no leasing is allowed on adjacent lands.

Applying COAs, which include RDFs consistent with applicable law (per **Appendix D**) and conservation measures outlined in **Chapter 2** (**Table 2-15**, Description of Alternative Actions), to existing leases would directly impact fluid mineral operations. These RDFs consistent with applicable law and conservation measures would include standards such as noise restrictions, height limitations on structures, design requirements, water development standards, remote monitoring requirements, and reclamation standards. Application of these requirements through COAs would impact fluid mineral operations by increasing costs if it resulted in the application of additional requirements or use of more expensive technology (such as remote monitoring systems) than would otherwise have been used by operators. To avoid these costs, operators may move to other less restrictive states or private minerals. Impacts from these COAs would be mitigated where exceptions limit their application. This would occur where a COA was not applicable (e.g., a resource is not present on a given site) or where site-specific consideration merited slight variation.

Placing limits on geophysical exploration could reduce the availability of data on fluid mineral resources and could increase costs of fluid mineral development if the limits required use of more expensive technology. Timing limitations on geophysical exploration would delay development activities and could cause equipment shortages because all exploration would be occurring during the same time period.

Requiring master development plans and unitization could cause direct impacts on fluid minerals through increased costs of fluid mineral extraction by delaying the permit approval process until such additional site-specific planning efforts are completed. However, unitization typically has been initiated at the operator's discretion.

Requiring reclamation bonds in the amount necessary to cover full reclamation on completion of the project could deter fluid mineral exploration and development by increasing up-front costs when these costs could have previously occurred after economic resources had already been recovered. This would be a direct impact on fluid minerals.

Identification of areas in which to acquire additional surface or mineral estate containing GRSG habitat would have no impacts on fluid minerals because it would not result in application of management actions to additional acres of surface or fluid mineral estate. If areas for acquisition were identified, acquisition would occur only in areas containing existing federal mineral leases, which are already subject to BLM management actions applicable to both the surface and the mineral estate through the fluid minerals program.

Management actions creating ROW/SUA exclusion or avoidance areas could indirectly reduce fluid mineral extraction by limiting the available means for transporting fluid minerals: oil and gas to processing facilities and markets; and transmitting electricity from on-site geothermal plants to markets. For example, new oil and gas pipelines or a new electrical transmission line could not be built in an ROW/SUA exclusion area. Additionally, access to leases would be limited in ROW/SUA exclusion or avoidance areas.

Impacts would be mitigated where exceptions were allowed for collocation of new ROWs in existing ROWs to satisfy valid existing rights. Implementing management for the following resources would have negligible or no impact on fluid minerals and is therefore not discussed in detail: CTTM, recreation, livestock grazing, wild horse and burros, solid minerals, fire and fuels management, habitat restoration, and vegetation management.

Impacts Common to All Alternatives

There are no impacts that would be common to all alternatives. All proposed alternatives would have some level of negative impacts on fluid minerals because placing restrictive management actions on lands would curtail leasing, exploration and development.

Alternative A

Impacts from Land Use and Realty Management

Fluid mineral development can be indirectly impacted by the lands and realty program from permitting requirements for new infrastructure development, such as ROW access for roadways, pipelines, power plants, and other related facilities. In occupied habitat under Alternative A, 14,642,300 acres of fluid mineral leasing (subject to stipulations) would continue to be open to new leasing. New mineral development in open areas would continue to be impacted by the lands and realty program.

Impacts from Leasable Minerals Management

Geothermal Resources

As discussed in **Section 3.13**, Mineral Resources, approximately 42,608,800 acres (97 percent) of lands open to geothermal leasing in the decision area is unleased.

Based on a geothermal potential map and report for Nevada prepared by the Nevada Bureau of Mines and Geology, **Table 4-16** below gives acreages of lands with moderate and high geothermal potential in GRSG habitat management areas (SFA, PHMA, GHMA) in the decision area, The low geothermal potential area is not considered because everything but the moderate and high potential areas in the whole planning area has low potential. That makes it difficult to compare alternatives, and it is most likely that moderate and high geothermal potential areas will be leased, explored, and developed, especially the high geothermal potential areas. There are approximately 41,322,000 acres of land that are considered to have moderate and high geothermal potential in the planning area.

Table 4-16
Geothermal Potential Acreage in the Decision Area

Geothermal Potential	Acres in PHMA	Acres in GHMA	Acres in OHMA	Acres in SFA	Total Acres
High	371,300	334,200	463,400	13,700	1,182,600
Moderate	4,890,000	3,111,800	3,067,500	1,062,300	12,131,600
Total	5,261,300	3,446,000	3,530,900	1,076,000	13,314,200

Source: BLM and Forest Service GIS 2015

Under Alternative A, leasing, exploration, and development would continue with the least disruption compared to the other alternatives. Geophysical exploration would continue to be allowed in the decision area.

Existing undeveloped geothermal leases in PHMA (for this alternative) could be impacted by COAs as described under *Nature and Type of Effects*. Currently there are 33,600 acres of geothermal leases in PHMA and 39,100 acres of authorized geothermal leases in GHMA.

Under Alternative A, it is projected that 94 new exploratory and development wells would be drilled during the life of the LUP. Of these new wells, up to 56 are expected to be producing geothermal wells supporting an additional 12 geothermal power plants with a production capacity of 336 MW (see **Appendix P**, Fluid Minerals Reasonably Foreseeable Development Scenario).

Oil and Gas Resources

As discussed in **Section 3.13**, Mineral Resources, approximately 39,961,700 acres (91 percent) of lands open to oil and gas leasing in the decision area is unleased.

Table 4-17 below breaks out acreages of lands with oil and gas potential in GRSG habitat in the decision area, based on an interactive map of oil and gas potential for Nevada created by the University of Nevada at Reno (http://gisweb.unr.edu/flexviewers/map_162_and_of11_2/). In the decision area, there is approximately 13,464,100 acres of land that is considered to have low,

Table 4-17
Oil and Gas Potential Acreage in the Decision Area

Potential	Acres in PHMA	Acres in GHMA	Acres in OHMA	Acres in SFA	Total Acres
High	228,800	227,500	328,800	0	785,100
Moderate	1,008,300	1,356,800	785,500	0	3,150,600
Low	2,555,600	2,008,200	2,167,200	2,797,400	9,528,400

Source: BLM and Forest Service GIS 2015

moderate, and high oil and gas potential. Under Alternative A, leasing, exploration, and development would continue with minimal disruption.

Existing undeveloped oil and gas leases in PHMA (for this alternative) could be impacted by COAs as described under *Nature and Type of Effects*.

Oil and gas exploration would continue to be allowed in the decision area.

Under Alternative A, it is projected that 100 new exploratory and development wells would be drilled on during the life of the LUP. Of these new wells, up to 41 are expected to be producing oil and gas (see **Appendix P**, Reasonable Foreseeable Development Scenarios).

Alternative B

Geothermal Resources

Under Alternative B, 8,236,400 acres in PHMA would be closed to new geothermal leasing. Of the 8,236,400 acres, there are 5,261,300 acres with moderate and high geothermal potential that would be closed to new geothermal leasing. Currently, there is 33,600 acres of authorized geothermal leases in PHMA that would be subject to NSO stipulations with exceptions. GHMA would continue to be open to leasing subject to standard stipulations with the same impacts as described in Alternative A.

Compared to Alternative A, Alternative B would close 5,261,300 acres with moderate and high geothermal potential, which equates to 12.7 percent of the 41,322,000 acres of moderate and high geothermal potential in the planning area. Therefore, geothermal leasing, exploration, and development could be reduced by 12.7 percent under this alternative.

In the case where operators have access to lands adjacent to lands closed to leasing, operators could use geothermal resources underneath lands closed to leasing without paying royalties due to the Federal Government. Therefore, closing lands to leasing, instead of managing with a NSO stipulation, presents the opportunity for the federal government to not be paid royalties for the utilization of geothermal resources.

The BLM would also require design features on existing leases. No quantitative percentage limit, surface occupancy buffers, or timing limitation would apply to surface disturbance; rather, surface disturbance would prevent or minimize disturbance to GRSG and their habitat. Unitization would occur on a case-by-case basis.

In addition to RDF and limitations on disturbance (consistent with applicable law), noise limitations and structure height restrictions would apply under Alternative B. Cost impacts of these operating and siting constraints would be the same type as those described under Nature and Type of Effects.

Under Alternative B, geophysical exploration would be allowed in PHMA to obtain exploratory information for areas outside and adjacent to PHMA areas. Geophysical projects in PHMA would only allow helicopter or portable drilling methods and in accordance with seasonal timing restrictions and/or other restrictions that may apply. These restrictions would likely reduce the amount of geophysical exploration in the decision area, which could reduce the amount of fluid mineral resources that are identified and developed.

Overall, as a result of increased restrictions and limitations as compared with Alternative A, Alternative B would result in a substantial increase in the magnitude and duration of effects on fluid minerals development over time.

Oil and Gas

Under Alternative B, 8,236,400 acres in PHMA would be closed to new oil and gas leasing. Of the 8,236,400 acres, there are 6,591,100 acres with low, moderate, and high oil and gas potential in PHMA that would be closed. There are 3,592,500 acres, out of the 6,953,500 acres in GHMA open to new oil and gas leasing and development, which has low, moderate, and high oil and gas potential. It is uncertain which future oil and gas exploration and development projects would be located in these lands; however, it is estimated that oil and gas exploration and development could be reduced by 20 to 33 percent under this alternative.

Closing lands to leasing, instead of managing with an NSO stipulation, could enable operators to drain the resources underneath lands closed to leasing without paying royalties due to the Federal Government, as required under leasing.

The BLM would also require design features on existing leases. No quantitative percentage limit, surface occupancy buffers, or timing limitation would apply to surface disturbance; rather, surface disturbance would prevent or minimize disturbance to GRSG and their habitat. Unitization would occur on a case-by-case basis.

In addition to RDF and limitations on disturbance (consistent with applicable law), noise limitations and structure height restrictions would apply under

Alternative B. Cost impacts of these operating and siting constraints would be the same type as those described under Nature and Type of Effects.

Under Alternative B, geophysical exploration would be allowed in PHMA to obtain exploratory information for areas outside and adjacent to PHMA areas. Geophysical projects in PHMA would only allow helicopter or portable drilling methods and in accordance with seasonal timing restrictions and/or other restrictions that may apply. These restrictions would likely reduce the amount of geophysical exploration in the decision area, which could reduce the amount of fluid mineral resources that are identified and developed.

Overall, as a result of increased restrictions and limitations as compared with Alternative A, Alternative B would result in a substantial increase in the magnitude and duration of effects on fluid minerals development over time. Compared to Alternative A, 10,120,700 acres with oil and gas potential would be closed under Alternative B. Therefore, impacts would increase significantly under Alternative B.

Impacts from Land Uses and Realty Management
Under Alternative B, an additional 9,573,300 acres would be managed as ROW/SUA exclusion areas in PHMA, and an additional 6,953,300 acres would be managed as ROW/SUA avoidance area in GHMA. This would have the potential to affect fluid mineral exploration and development projects with associated ROWs.

Alternative C

Impacts from Leasable Minerals Management

Geothermal Resources
Under Alternative C, all 16,526,600 acres in GRSG habitat would be closed to new geothermal leasing. Of the 16,526,600 acres, there are 8,707,300 acres of lands with moderate and high geothermal potential that would be closed to new geothermal leasing (See Table 3-51). Currently there are 33,600 acres of authorized geothermal leases in PHMA and 39,100 acres of authorized geothermal leases in GHMA. Existing undeveloped geothermal leases in PHMA (for this alternative) would be impacted by COAs, such as requiring unitization and reclamation bonding as described under *Nature and Type of Effects*.

Compared to Alternative A, Alternative C would close 8,707,300 acres with moderate and high geothermal potential, which equates to 21.1 percent of the 41,322,000 acres of moderate and high geothermal potential in the planning area. Therefore, geothermal leasing, exploration, and development could be reduced by 21.1 percent under this alternative.

In the case where operators have access to lands adjacent to lands closed to leasing, operators could use geothermal resources underneath lands closed to

leasing without paying royalties due to the Federal Government. Therefore, closing lands to leasing, instead of managing with a NSO stipulation, presents the opportunity for the federal government to not be paid royalties for the utilization of geothermal resources.

Impacts on geophysical exploration would be the same as under Alternative B. Geophysical exploration would be allowed in PHMA to obtain exploratory information for areas outside and adjacent to PHMA areas. Geophysical projects in PHMA would only allow helicopter or portable drilling methods and in accordance with seasonal timing restrictions and/or other restrictions that may apply. These restrictions would likely reduce the amount of geophysical exploration in the decision area, which could reduce the amount of fluid mineral resources that are identified and developed.

Overall, as a result of increased restrictions and limitations as compared with Alternative A, Alternative C would result in a substantial increase in the magnitude and duration of effects on fluid minerals development over time.

Oil and Gas

Under Alternative C, all 16,526,600 acres in GRSG habitat would be closed to new oil and gas leasing, exploration, and development affecting almost 13.5 million acres of lands with low, moderate, and high oil and gas potential (See **Table 3-48**. The maximum lateral extent of wells with current drilling technologies is typically between 3,000 – 4,000 feet, but can be as much as 10,000 feet lateral extent. However, the feasibility of directional drilling is determined by several factors such as, the depth, length, and size of the drill pipe, geology and lithology, rig size and availability, and the costs associated with drilling a lateral well. If the expected ground conditions are bedrock, or other hard to drill conditions, horizontal or directional drilling may be cost prohibitive. It is estimated that oil and gas exploration and development could be reduced by 28 to 67 percent under this alternative.

Closing lands to leasing, instead of applying an NSO stipulation, could enable operators to drain the resources underneath lands closed to leasing without paying royalties to the Federal Government, as required under leasing. The BLM would not issue new fluid mineral leases, which would prevent the BLM from complying with federal energy policy (42 USC §13201 et seq.) to support domestic energy production.

Existing undeveloped oil and gas leases in PHMA (for this alternative) would be impacted by COAs, such as requiring MDPs/unitization and reclamation bonding as described under *Nature and Type of Effects*.

Impacts on geophysical exploration would be the same as under Alternative B. Geophysical exploration would be allowed in PHMA to obtain exploratory information for areas outside and adjacent to PHMA areas. Geophysical projects in PHMA would only allow helicopter or portable drilling methods and in

accordance with seasonal timing restrictions and/or other restrictions that may apply. These restrictions would likely reduce the amount of geophysical exploration in the decision area, which could reduce the amount of fluid mineral resources that are identified and developed.

Overall, as a result of increased restrictions and limitations as compared with Alternative A, Alternative C would result in a substantial increase in the magnitude and duration of effects on fluid minerals development over time.

Impacts from Land Uses and Realty Management
Under Alternative C, no lands in the decision area would be available for new ROWs. Because federally managed lands are closed to leasing under this alternative, there would be no impacts on BLM-administered and National Forest System lands. However, Alternative C could decrease development of fluid mineral projects on private lands by decreasing the accessibility and availability to develop infrastructure (e.g., pipelines, transmission lines).

Alternative D

Impacts from Leasable Minerals Management

Geothermal Resources
Under Alternative D, 8,151,600 acres in PHMA would be managed as NSO without any waivers, exceptions, or modifications. In addition, 6,490,700 acres in GHMA would be managed as NSO, but would allow exceptions. Currently there are 33,600 acres of authorized geothermal leases in PHMA and 39,100 acres of authorized geothermal leases in GHMA. Once existing undeveloped geothermal leases in PHMA for Alternative D expire or terminate, those lands would be managed as NSO, with no exceptions, modifications, or waivers and have additional impacts on geothermal leasing, exploration, and development.

Under Alternative D, geophysical exploration would be allowed in PHMA and GHMA that does not result in crushing of sagebrush vegetation or create new or additional surface disturbance. Helicopter-portable drilling methods, articulated rubber-tired vehicles that "leave no trace," and vibroseis geophysical operations conducted on existing roads and bladed shoulders would be allowed. Geophysical operations would be subject to TL and CSU stipulations established for GRSG in PHMA and GHMA. No surface shot methods would be allowed in PHMA. These restrictions would likely reduce the amount of geophysical exploration in the decision area, which could reduce the amount of fluid mineral resources that are identified and developed.

It is difficult to predict the leasing activity in areas with NSO stipulations. In the case of PHMA, this alternative proposes NSO stipulations without any waivers, exceptions, or modifications. Unless there are adjacent lands that are not subject to these restrictions, it would be impossible to explore and develop with current technology. In the case of GHMA with NSO with exceptions, it is

still unlikely to be leased because industry would have to lease the land first without knowing if an exception would be granted. This would create a level of uncertainty. Unless there are adjacent lands that are not subject to these restrictions, then it would be unlikely to be leased.

Overall, as a result of increased restrictions and limitations as compared with Alternative A, Alternative D would result in a substantial increase in the magnitude and duration of effects on fluid minerals development over time. Compared to Alternative A, Alternative D would impose NSO stipulations without waivers, exceptions, and/or modifications on 5,524,000 acres of moderate and high geothermal potential in PHMA, which is 13.4 percent of the 41,322,000 acres of moderate and high geothermal potential in the planning area. Additionally, Alternative D would impose an NSO stipulation with exceptions on 3,183,200 acres of moderate and high geothermal potential in GHMA, which is 7.7 percent of the 41,322,000 acres of moderate and high geothermal potential in the planning area. It is likely that no geothermal leasing, exploration, and development would occur in PHMA, and little to none would occur in GHMA, Therefore, geothermal leasing, exploration, and development would be reduced by at least the moderate and high geothermal potential in PHMA and at most the additional moderate and high geothermal potential in GHMA. Therefore, geothermal leasing, exploration, and development could be reduced by at least 13.4 percent and possibly as much as 21.1 percent

A 13.4 to 21.1 percent reduction in geothermal leasing, exploration, and development would result in twelve to 20 fewer exploratory and production wells being drilled, between two to three fewer geothermal power plants being constructed, and a reduction of 45 to 71 MW of potential production (See **Appendix P**, Fluid Minerals Reasonably Foreseeable Development Scenario).

Oil and Gas

Under Alternative D, 8,151,600 acres in PHMA would be managed as NSO without any waivers, exceptions, or modifications. In addition, 6,490,700 acres in GHMA would be managed as NSO, but would allow exceptions. Timing stipulations would be applied to new fluid mineral leases in PHMA that would limit exploration and development operations during lekking, nesting, and early brood-rearing seasons.

The maximum lateral extent of oil wells with current drilling technologies is typically between 3,000 – 4,000 feet, but can be as much as 10,000 feet lateral extent. However, the price of the project is determined by several factors, such as the length and size of the installed product, the expected ground conditions, and the ongoing operation. If the expected ground conditions are bedrock, or other hard to drill conditions, horizontal directional drilling may be cost prohibitive, therefore as much as 50 percent of oil and gas resources in the NSO interior in PHMA may not be accessible. It is estimated that 60 percent of lands with low, moderate, and high potential could not be developed.

Once existing undeveloped oil and gas leases in PHMA for Alternative D expire or terminate, those lands would be managed as NSO, with no exceptions, modifications, or waivers and have additional impacts on oil and gas leasing, exploration, and development.

Under Alternative D, geophysical exploration would be allowed in PHMA and GHMA that does not result in crushing of sagebrush vegetation or create new or additional surface disturbance. Helicopter-portable drilling methods, articulated rubber-tired vehicles that "leave no trace", and vibroseis geophysical operations conducted on existing roads and bladed shoulders would be allowed. Geophysical operations would be subject to TL and CSU stipulations established for GRSG in PHMA and GHMA. No surface shot methods would be allowed in PHMA.

Impacts would be the same as those described under *Nature and Type of Effects*. Therefore oil and gas exploration and development could be reduced by 25 to 60 percent under this alternative.

Under Alternative D, geophysical exploration would be permitted in priority GRSG habitats with restrictions. These restrictions would likely reduce the amount of geophysical exploration in the decision area, which could reduce the amount of fluid mineral resources that are identified and developed.

Impacts from Land Uses and Realty Management

Under Alternative D, impacts would be the same as Alternative A in all areas except GRSG general and PHMA, which would be designated as ROW/SUA avoidance. The BLM would allow ROW development in avoidance areas to occur if the development incorporates appropriate RDFs consistent with applicable law in design and construction (e.g., noise, tall structure, or seasonal restrictions) and development results a net conservation gain of GRSG habitat. Facilities would have to be sited and developed in nonhabitat, bundled with existing corridors or mitigated so that no habitat is loss. These limitations on new ROWs and aboveground linear features, such as transmission lines, would limit the BLM's ability to accommodate demand for fluid mineral ROW development, which in turn could restrict the availability of fluid minerals.

Impacts from Adaptive Management

Under this Alternative, adjustments up to plus or minus 10 percent of the mapped habitat in the Nevada and Northeastern California Sub-region planning area could occur. These adjustments would result in the cumulative effects described from management under the Proposed Plan applying to up to 2,232,600 acres more or less of the planning area. See section **4.4.10** for additional analysis.

Alternative E

This alternative proposes to reduce the impact on GRSG habitat (core, priority, and general) by applying the avoid, minimize, and mitigate strategies, with the addition of the Conservation Credit System managed by the State of Nevada.

Impacts from Leasable Minerals Management

Under Alternative E, 14,642,300 acres would be open to geothermal leasing, exploration, and development, but would require avoidance, minimization, and mitigation of impacts on GRSG habitat. The BLM would achieve no net unmitigated loss of GRSG habitat from geothermal development disturbances. This is because of the use of stipulations with exception, waiver, and modification language. The 1,984,300 acres in PHMA and GHMA that are already closed to leasing would remain closed.

Existing undeveloped geothermal leases in habitat under Alternative E would be impacted by COAs, as described under *Nature and Type of Effects*.

Under Alternative E, all proposed geophysical exploration in SGMA would trigger SETT Consultation under the avoid, minimize, and mitigate process to ensure no unmitigated loss of GRSG habitat due to geothermal disturbance.

It is difficult to predict leasing activity in areas with requirements of avoidance, minimization, and mitigation of impacts on GRSG habitat. If industry is comfortable with such requirements, then geothermal leasing, exploration, and development would be reduced as little as zero percent. In this case, the impacts on geothermal leasing, exploration, and development would be less than those described under Alternatives B, C, and D and possibly not much more than Alternative A. However, if industry is not comfortable with such requirements, then geothermal leasing, exploration, and development could be reduced by 5,261,300 acres of moderate and high geothermal potential in PHMA and 3,446,000 acres of moderate and high geothermal potential in GHMA, for a total of 8,707,300. This is 21.1 percent of the 41,322,000 acres of moderate and high geothermal potential in the planning area. The impacts on geothermal leasing, exploration, and development would be more than those described under Alternatives A and B and the same as under Alternatives C and D.

Overall, a zero to 21.1 percent reduction in geothermal leasing, exploration, and development would result up to 20 fewer exploratory and production wells being drilled, up to three fewer geothermal power plants being constructed, and a reduction of up to 71 MW of potential production (see **Appendix P**, Fluid Minerals Reasonably Foreseeable Development Scenario).

<u>Oil and Gas</u>

Under Alternative E, 14,642,300 acres would be open to oil and gas leasing, exploration, and development but would require avoidance, minimization, and mitigation of impacts on GRSG habitat. The BLM and the Forest Service would

achieve no net unmitigated loss of GRSG habitat, due to oil and gas development through the use of stipulations with exception, waiver, and modification language. Existing closures would remain in place on 1,436,900 acres in PHMA and 547,400 acres in GHMA.

For Alternative E, existing undeveloped oil and gas leases in habitat would be impacted by COAs, as described under *Nature and Type of Effects*.

Under Alternative E, all proposed geophysical exploration in SGMA would trigger SETT Consultation for application of the avoid, minimize, and mitigate process to ensure no unmitigated loss of GRSG habitat due to oil and gas disturbance.

The impacts on oil and gas leasing, exploration, and development would be less than those described under Alternatives B, C, and D but more than under Alternative A. This would increase development costs and would decrease interest in exploring oil and gas resources in Nevada. Therefore, oil and gas drilling and exploration may be reduced more than 15 percent under this alternative.

Impacts from Land Uses and Realty Management
Under Alternative E, the impacts on fluid minerals would be similar to those described under Alternative A.

Alternative F

Geothermal Resources
Under Alternative F, 8,236,400 acres in PHMA and 6,405,900 acres in GHMA would be closed to new geothermal leasing, exploration, and development. Only existing leases could be explored. The impacts on geothermal leasing, exploration, and development would be same as those described under Alternatives C.

When there is opportunity for the BLM to influence conservation measures, where surface and/or mineral ownership is not entirely federally owned (split-estates), a Plan Amendment may be developed that opens GRSG habitat for new leasing. The Amendment must demonstrate long-term population increases in the PHMA through mitigation (prior to issuing leases) including lease stipulations, and off-site mitigation, and short-term losses that put the GRSG population at risk from stochastic events leading to extirpation.

Under Alternative F, geophysical exploration in PHMA and GHMA would be allowed similarly to Alternatives B, C, and D. Geophysical exploration that does not result in crushing of sagebrush vegetation or create new or additional surface disturbance would be allowed. Only heli-portable drilling methods would be allowed that are in accordance with timing restrictions. Geophysical exploration shall be subject to seasonal restrictions that preclude activities in

breeding, nesting, brood-rearing, and winter habitats. Impacts would be the same type as those described under Nature and Type of Effects.

In addition to applying the restrictive management under Alternative F to more acres, management under Alternative F would call for COAs implementing seasonal restrictions on vehicle traffic and human presence associated with exploratory drilling. This alternative also would limit new surface disturbance on existing leases to 3 percent per section, with some exceptions. Impacts from these operating and siting restrictions would be the same type as those described under Nature and Type of Effects.

Overall, as a result of increased restrictions and limitations as compared with Alternative A, Alternative F would result in a substantial increase in the magnitude and duration of effects on fluid minerals development over time. Compared to Alternative A, Alternative F would close 5,261,300 acres of moderate and high geothermal potential in PHMA and 3,446,000 acres of moderate and high geothermal potential in GHMA for a total of 8,707,300 acres, which equates to 21.1 percent of the 41,322,000 acres of moderate and high geothermal potential in the planning area. A 21.1 percent reduction in geothermal leasing, exploration, and development would result in 20 fewer exploratory and production wells being drilled, up to three fewer geothermal power plants being constructed, and a reduction of as much as 71 MW of potential production.

Oil and Gas

Under Alternative F, 8,236,400 acres in PHMA and 6,405,900 acres in GHMA would be closed to new oil and gas leasing, exploration, and development. Only existing leases could be explored. This would remove more than 10 million acres of land with oil and gas potential from leasing, exploration, and development. It is estimated that oil and gas exploration and development could be reduced by 28 to 67 percent under this alternative.

When there is opportunity for the BLM to influence conservation measures, where surface and/or mineral ownership is not entirely federally owned (split-estates), a Plan Amendment may be developed that opens GRSG habitat for new leasing. The Amendment must demonstrate long-term population increases in the PHMA through mitigation (prior to issuing leases) including lease stipulations, and off-site mitigation, and short-term losses that put the GRSG population at risk from stochastic events leading to extirpation.

Under Alternative F, geophysical exploration in PHMA and GHMA would be allowed similarly to Alternatives B, C, and D. Geophysical exploration that does not result in crushing of sagebrush vegetation or create new or additional surface disturbance would be allowed. Only heli-portable drilling methods would be allowed that are in accordance with timing restrictions. Geophysical exploration shall be subject to seasonal restrictions that preclude activities in breeding, nesting, brood-rearing, and winter habitats.

Under Alternative F, 9,573,300 acres in PHMA (100 percent) and 6,953,400 GHMA (100 percent) would be closed to oil and gas leasing, which would increase impacts on fluid minerals compared with Alternative A. Of these lands, 222,500 acres (PHMA) and 80,300 acres (GHMA) have high potential. Impacts would be the same type as those described under Nature and Type of Effects.

In addition to applying the restrictive management under Alternative F to more acres, management under Alternative F would call for COAs implementing seasonal restrictions on vehicle traffic and human presence associated with exploratory drilling. This alternative also would limit new surface disturbance on existing leases to 3 percent per section, with some exceptions. Impacts from these operating and siting restrictions would be the same type as those described under Nature and Type of Effects.

Overall, as a result of increased restrictions and limitations as compared with Alternative A, Alternative F would result in an increase in the magnitude and duration of effects on fluid minerals development over time.

Impacts from Land Uses and Realty Management
Under Alternative F, impacts on fluid minerals would be the same as Alternative C.

Proposed Plan
This alternative would require a 3 percent disturbance cap on human surface-disturbing activities in PHMA (see **Appendix F**) and would incorporate RDFs consistent with applicable law in PHMA, GHMA, and OHMA. It would also require all human disturbances to result in a net conservation gain for GRSG and their habitat, and lek buffers would be required (see **Appendix B**).

Collectively, these GRSG conservation management actions would increase mitigation requirements for land use authorizations. This would result in more complex project designs, potentially excluding infrastructure placement in the most cost-effective locations, and potentially resulting in overall greater development costs.

A corresponding effect could be a reduction in the number of authorization applications received for activities in PHMA and longer, more complicated review periods for those that are proposed in PHMA. Implementing the GRSG habitat conservation management actions listed above would also place NSO stipulations on fluid mineral development in PHMA, which would further reduce the demand for new ROW development in those areas.

Impacts from Leasable Minerals Management

<u>Geothermal Resources</u>
Under the Proposed Plan, 7,498,700 acres of land in PHMA would be subject to NSO restrictions, with only one exception in Nevada. An additional 2,797,400

acres of PHMA is considered SFA and would be managed as NSO without any waivers, exceptions, or modifications. Another 6,516,800 acres of GHMA would be open to leasing, exploration, and development, but would be subject to moderate constraints, such as TL and CSU stipulations, and it would require avoidance, minimization, and mitigation of impacts on GRSG habitat. Associated with the above acreage figures, there are 1,984,300 acres that are closed to leasing in WSAs and wilderness areas.

Currently there are 33,600 acres of authorized geothermal leases in PHMA and 39,100 acres of authorized geothermal leases in GHMA. Existing leases would be managed in accordance with their lease stipulations. Once existing undeveloped geothermal leases in PHMA under the Proposed Plan expire or terminate, those lands would be managed as NSO, with no exceptions, modifications, or waivers and would have additional impacts on geothermal leasing, exploration, and development.

Under the Proposed Plan, geophysical exploration would be permitted in priority GRSG habitats with restrictions. In PHMA and GHMA, geophysical exploration that does not crush sagebrush vegetation or does not create new or additional surface disturbance would be permitted. These restrictions would likely reduce the level of geophysical exploration in the decision area, which could reduce the number of fluid mineral resources that are identified and developed.

It is difficult to predict leasing activity in areas with requirements of avoidance, minimization, and mitigation of impacts on GRSG habitat, as is the case with GHMA under the Proposed Plan. If industry chooses to lease under such stipulations, then there would be no reduction in geothermal leasing, exploration, and development in GHMA. However, if industry chooses not to lease under such requirements, then geothermal leasing, exploration, and development could be reduced by 3,324,600 acres of moderate and high geothermal potential in GHMA. This is eight percent of the total area of moderate and high geothermal potential.

Overall, geothermal leasing, exploration, and development could be reduced by 15.7 percent and possibly as much as 23.7 percent. A 15.7 to 21.1 percent reduction in geothermal leasing, exploration, and development would result in 15 to 22 fewer exploratory and production wells being drilled, between two to three fewer geothermal power plants being constructed, and a reduction of 53 to 80 MW of potential production.

Oil and Gas

Under the Proposed Plan, 9,255,400 acres of lands with low, moderate, and high oil and gas potential in PHMA would be subject to NSO, with one exception in Nevada and two exceptions in California. Included in the acreage is 2,797,400 acres of PHMA which is considered SFA and would be managed as NSO with no exceptions. Another 6,037,800 acres of GHMA would be open to leasing,

exploration, and development; however, it would be subject to moderate constraints, such as TL and CSU stipulations and would require avoidance, minimization, and mitigation of impacts on GRSG habitat. There are also 1,984,300 acres that are closed to leasing in WSAs and wilderness areas in PHMA and GHMA.

The maximum lateral extent of oil wells with current drilling technologies is typically between 3,000 and 4,000 feet, but it can be as much as 10,000 feet. However, the price of the project is determined by several factors, such as the length and diameter of the installed well casing, the expected ground conditions, and the ongoing operation. If the expected ground conditions are bedrock or there are other hard to drill conditions, horizontal directional drilling may be cost prohibitive. Therefore, oil and gas leasing, exploration, and development could be reduced by approximately 18 to 25 percent under the Proposed Plan.

Impacts from Adaptive Management for Fluid Minerals (Geothermal, Oil, and Gas)
In PHMA where a hard trigger has been reached, the corresponding adaptive management responses are identified in **Table 2-9**; **Table 4-18** describes the effects on LUAs in the affected BSU.

Table 4-18
PHMA Adaptive Management Effects

Program Area Activity	Corresponding Analysis
Fluid minerals	Same as Alternative D

In GHMA where a hard trigger has been reached, the corresponding adaptive management responses are identified in **Table 2-10**. **Table 4-19** describes the effects on LUAs in the affected BSU.

Table 4-19
GHMA Adaptive Management Effects

Program Area Activity	Corresponding Analysis
Fluid minerals	Same as Alternative D; NSO stipulation with one exception would apply

4.15.2 Locatable Minerals

In the planning area, all lands are generally open to mineral location under the 1872 Mining Law. There are specific locatable mineral withdrawals for particular ROWs, designated wilderness areas, areas of critical environmental concern and other administrative needs. There are no locatable mineral withdrawals specific to protecting GRSG habitat. All locatable mineral activities are managed under the regulations at 43 CFR, Part 3800 or 36 CFR, Part 228, through approval of a Notice of Intent or a Plan of Operations. Mitigation of effects on GRSG and habitat are identified through the NEPA process approving plans of operation. Goals and objectives for locatable minerals are to provide opportunities to

develop the resource while preventing undue or unnecessary degradation of BLM-administered and National Forest System lands.

Methods and Assumptions

Analysis of impacts on locatable minerals from this EIS focuses on the impacts of conservation measures to protect GRSG. These impacts may be direct or indirect. For example, a direct impact on locatable minerals would result from closure of an area to mineral exploration. An indirect impact would result from removal of a road, which would change the economic feasibility of developing a site. Additional actions or conditions that might cause direct or indirect impacts on mineral material sales are described under indicators, below.

Indicators

Indicators for impacts on locatable minerals and the measurements used to describe the impacts (where available or appropriate) are described below:

- Actions that reduce availability and opportunity for development of a resource (e.g., mineral withdrawal).
- Amount of federal minerals available versus closed to development. Indirect impacts include loss of production of mineral resource for the public use and for the generation of sale revenues and tax revenues.
- Actions placing restrictions or requirements that reduce efficiency and increase operational costs that could make development infeasible.
- Amount of federal lands with restrictions (e.g., RDFs consistent with applicable law, PDFs, and TLs) Indirect impacts include reduced production of mineral resources for the public use and for the generation of tax revenues; possible adverse impact of higher cost of accessing portion of lease via more circuitous route for access road, electric utility lines, seasonal limitations to road use, or additional restrictions/requirements on development activities.
- Actions that affect the ability to access minerals.
- Amount of acres or miles that would affect the ability to access mining claims (e.g., ROW exclusions and disturbance caps).
- Adverse impact of restrictions affecting the ability to access minerals that would otherwise be available, including limits to road construction, permanent road closures, avoidance, and exclusion areas.

Assumptions

Assumptions for this analysis include the following:

- New locatable mineral development in the planning area is most likely to occur in proximity to existing mines and previously mined areas. Due to the large number of previously mined areas in the planning area and the lack of reliable data on those areas, the impact analysis focuses on existing mines as an indicator of areas of likely future development.
- Any alternative that limits locatable mineral development (i.e., reduces the area available for development) subject to valid existing rights and applicable law will have some adverse impact on locatable minerals by reducing availability of these resources.
- The 43 CFR, Part 3809, and 36 CFR, Part 228, Subpart A, regulations manage surface-disturbing activities on mining claims.
- Mineral operations are sensitive to costs, especially when prices are depressed.
- Validity of mining claims is based on profitability.
- Ability to construct roads and pipelines on private lands to access federal minerals is subject to landowner approval, which is not guaranteed.
- Mineral resources are not evenly distributed across the landscape.
- Operators need predictable continuity of operations before acquiring or developing.
- Development techniques are highly technical and not uniformly applicable.
- A minimum of 5 years is needed for restoration of self-sustaining native grass/forb cover on reclamation.
- A minimum of 10 years is needed for successful establishment or colonization by sagebrush on reclamation.
- Habitat restoration requirements would impact mineral operations. If the operator is required to restore habitat, then the operator will have to pay monitoring costs and maintain a reclamation bond for the specified restoration time.
- Implementing management actions for the following resources or resource uses would have negligible or no impact on locatable minerals and are, therefore, not discussed in detail: recreation management, range management, wind energy development, industrial solar, wild horse management, fluid minerals and solid minerals, nonenergy leasable minerals, salable minerals, fuels management, fire operations, ESR..

Nature and Type of Effects

Management actions for resources and resource uses could affect potential locatable mineral development when they result in (1) reduced availability of locatable mineral resources, (2) reduced access to new or existing mines due to restrictions on use of the overlying surface lands, and (3) reduced efficiency and increased operational costs that make potential locatable mineral development economically infeasible.

Withdrawal of areas from locatable mineral entry would prohibit the filing of new mining claims in those areas and reduce availability of locatable mineral resources. However, alternative decisions on locatables are subject to valid existing rights and applicable law.

Mining claims in areas recommended for withdrawal would require validity examinations subject to 43 CFR, Part3809.100.New notices would not be reviewed or plans approved until a validity examination report was prepared.

Application of RDFs consistent with applicable law could change the way mining operations are conducted; however, availability of and access to locatable minerals would remain the same, and efficiency of operations would not change.

Impacts Common to All Alternatives

There are no impacts common to all alternatives.

Alternative A

Impacts from Locatable Mineral Management

This alternative does not designate PHMA or GHMA in the planning area. This alternative will have no effect on locatable mineral management.

Alternative A would be the least restrictive to locatable minerals because a larger percentage (97 percent or 16,005,000 acres) of the decision area (PHMA and GHMA) would be open to locatable mineral entry and no additional restrictions would be applied to mining operations. Approximately 3 percent (521,600 acres) of the decision area would remain withdrawn from locatable mineral entry. Impacts in withdrawn areas and areas recommended for withdrawal would be the same as those described under *Nature and Type of Effects*.

Alternative B

Impacts from Locatable Mineral Management

Management actions for mineral programs other than locatable minerals would not impact locatable minerals. Therefore, only the impacts from locatable mineral management actions are discussed in the paragraphs below.

Like Alternative A, 521,600 acres would remain withdrawn from locatable mineral entry under Alternative B. Under Alternative B, an additional 9,342,600 acres would be recommended for withdrawal from locatable mineral entry, and 6,662,400 acres would be open. There are 12 existing mines in areas that would be recommended for withdrawal under Alternative B (all PHMA). Mining claims in areas recommended for withdrawal would require validity examinations subject to 43 CFR 3809.100 when new plans of operations or notices are submitted to the BLM. New mining claims would no longer be allowed. Because new locatable mineral development is most likely to occur in proximity to existing mines, anticipated impacts on locatable minerals under the proposed plan would be concentrated in these areas. Impacts of the recommended withdrawal (and eventual withdrawal) would be the same type as those described under *Nature and Type of Effects*.

Impacts from these actions would be the same type as those described under Alternative A; however, total withdrawals (including lands currently withdrawn) under this alternative would increase to 60 percent compared with 3 percent for Alternative A, thereby further limiting opportunities for locatable mineral development in the decision area.

Under this alternative, RDFs, consistent with applicable law, would be recommended in PHMA. The types of impacts from these RDFs would be the same as those described under *Nature and Type of Effects*.

Alternative C

Impacts from Locatable Mineral Management

Management actions for mineral programs other than locatable minerals would not impact locatable minerals. Therefore, only the impacts from locatable mineral management actions are discussed in the paragraphs below.

Like Alternative A, 521,600 acres would remain withdrawn from locatable mineral entry under Alternative C. Under Alternative C, an additional 16,005,000 acres would be recommended for withdrawal from locatable mineral entry, and 0 acres would be open. There are 12 existing mines in areas that would be recommended for withdrawal under Alternative C (all PHMA). Mining claims in areas recommended for withdrawal would require validity examinations subject to 43 CFR 3809.100 when new plans of operations or notices are submitted to the BLM. New mining claims would no longer be allowed. Because new locatable mineral development is most likely to occur in proximity to existing mines, anticipated impacts on locatable minerals under the proposed plan would be concentrated in these areas. Impacts of the recommended withdrawal (and eventual withdrawal) would be the same type as those described under *Nature and Type of Effects*.

Impacts from these actions would be the same type as those described under Alternative A; however, total withdrawals (including lands currently withdrawn)

under this alternative would increase to 100 percent compared with 3 percent for Alternative A, thereby eliminating further opportunities for locatable mineral development.

Alternative D

This alternative designates PHMA and GHMA in the planning area. The BLM and the Forest Service authorize locatable mineral development under 43 CFR § 3809 and 36 CFR § 228, Subpart A, respectively. This alternative would apply mitigation and GRSG best management practices that minimize the loss of PHMA through off-site mitigation in the planning area.

Impacts from Locatable Mineral Management

Under Alternative D, additional restrictions and design features for locatable minerals may apply in PHMA, GHMA, and OHMA. To the extent practicable, surface disturbance could be limited, and enhancements of PHMA through on-site and/or off-site mitigation could be requested

Management actions for mineral programs other than locatable minerals would not impact locatable minerals. Therefore, only the impacts from locatable mineral management actions are discussed in the paragraphs below.

Like Alternative A, 521,600 acres would remain withdrawn from locatable mineral entry under Alternative D. Under Alternative D, 16,005,000 acres (97 percent) of the decision area would be open.

Alternative D includes the application of RDFs, consistent with applicable law, which are additional conservation measures for the protection of GRSG. The RDFs would be applied to all GRSG habitat, consistent with applicable law.

Impacts from the application of RDFs consistent with applicable law will likely result in higher costs and longer time frames for development of locatable minerals. RDFs include placing operations and facilities as close together as possible, minimizing site disturbance through site analysis and planning, and phased development with concurrent reclamation. Further details on RDFs are found in Appendix D.

Alternative E

Alternative E proposes to reduce the impact on GRSG habitat (core, priority, and general) by applying the avoid, minimize, and mitigate strategies, with the addition of the Conservation Credit System managed by the State of Nevada.

Impacts from Locatable Mineral Management

Under Alternative E, additional restrictions and design features for locatable minerals would apply in SGMA. To the extent practicable, surface disturbance would be limited, and enhancements of GRSG habitat through on-site or off-site mitigation would be required through the Conservation Credit System.

Management actions for mineral programs other than locatable minerals would not impact locatable minerals. Therefore, only the impacts from locatable mineral management actions are discussed in the paragraphs below.

Like Alternative A, 521,600 acres (3 percent) would remain withdrawn from locatable mineral entry. Under Alternative E, 97 percent of acres would be open, 15,234,500 acres in Nevada and 770,500 acres in California.

Alternative E would apply RDFs, which are additional conservation measures for the protection of GRSG (consistent with applicable law). The RDFs would be applied to all GRSG habitat.

Impacts from RDFs (consistent with applicable law) would likely result in higher costs and longer time frames for developing locatable minerals. RDFs include placing operations and facilities as close together as possible, minimizing site disturbance through site analysis and planning, and phased development, with concurrent reclamation. Further details on RDFs are found in **Appendix D**.

Alternative F

Impacts from Locatable Mineral Management

Like Alternative A, 3 percent (521,600 acres) of the decision area would remain withdrawn from locatable mineral entry under Alternative F. Under Alternative F, an additional 57 percent (9,342,600 acres) would be recommended for withdrawal from locatable mineral entry, and 40 percent (6,662,400 acres) would be open. There are 12 existing mines in areas that would be recommended for withdrawal under Alternative F (all PHMA). Mining claims in areas recommended for withdrawal would require validity examinations subject to 43 CFR 3809.100 when new plans of operations or notices are submitted to the BLM. New mining claims would no longer be allowed. Because new locatable mineral development is most likely to occur in proximity to existing mines, anticipated impacts on locatable minerals under the proposed plan would be concentrated in these areas. Impacts of the recommended withdrawal (and eventual withdrawal) would be the same type as those described under *Nature and Type of Effects*.

Impacts from these actions would be the same type as those described under Alternative A; however, total withdrawals (including lands currently withdrawn) under this alternative would increase to 60 percent compared with 3 percent for Alternative A, thereby further limiting opportunities for locatable mineral development in the decision area.

The Proposed Plan

The Proposed Plan incorporates a decision-making policy of avoid, minimize, and apply compensatory mitigation. This would limit habitat disturbance, would manage operations timing, would apply mitigation and GRSG conservation efforts. The Proposed Plan would require aggressive reclamation as projects are

completed and it would target reclamation where the ecological site potential exists in GRSG habitat.

Impacts from Locatable Mineral Management
Under the Proposed Plan, additional restrictions and design features for locatable minerals would apply in GRSG habitat. To the extent practicable, surface disturbance would be limited, and enhancements of GRSG habitat through on-site and off-site mitigation would be required. In Nevada, mitigation could be accomplished by the State of Nevada Conservation Credit System.

As with Alternative A, 3 percent (521,600 acres) of the decision area would remain withdrawn from locatable mineral entry under the Proposed Plan. An additional 17 percent (2,731,600 acres) of the decision area would be recommended for withdrawal from locatable mineral entry, and 80 percent (13,273,400 acres) would be open.

There are no active mines in the 2,731,600 acres that would be recommended for withdrawal in the SFA. Mining claims in areas recommended for withdrawal would require validity examinations subject to 43 CFR 3809.100 when new plans of operations or notices are submitted to the BLM. New mining claims would no longer be allowed. Because new locatable mineral development is most likely to occur in proximity to existing mines, anticipated impacts on locatable minerals under the proposed plan would be concentrated in these areas. Impacts of the withdrawal would be the same as those described under *Nature and Type of Effects*.

There are no proposed adaptive management hard trigger responses for locatable minerals if a trigger were reached.

The Proposed Plan would apply RDFs consistent with applicable law to all GRSG habitat as additional conservation measures. Impacts from the RDFs would likely result in higher costs and longer time frames for developing locatable minerals. RDFs include placing operations and facilities as close together as possible, minimizing site disturbance through site analysis and planning, and phasing development with concurrent reclamation. Further details on RDFs are found in Appendix D.

4.15.3 Salable Minerals

Methods and Assumptions
Analysis of impacts on mineral material sales from this EIS focuses on the impacts of conservation measures to protect GRSG. These impacts may be direct or indirect. For example, a direct impact on mineral materials would result from closure of an area to mineral material sales disposal. An indirect impact would result from removal of a road, which would change the economic feasibility of developing a site. Additional actions or conditions that might cause

direct or indirect impacts on mineral material sales are described under indicators, below.

Indicators

Indicators for impacts on salable minerals and the measurements used to describe the impacts (where available or appropriate) are described below:

- Actions that reduce the availability and opportunity for development of resources
- Amount of federal minerals available versus closed to development Indirect impacts include loss of production of the mineral for public use and for revenues and tax revenues
- Actions placing restrictions or requirements that reduce efficiency and increased operational costs that could make development infeasible
- Acreage unavailable for surface disturbance
- Indirect impacts include reduced production of mineral resources for the public use and for the generation of revenues and tax revenues; possible adverse impact of higher cost of accessing portion of lease via more circuitous route for access road, electric utility lines, seasonal limitations to road use or additional restrictions and requirements on development
- Actions that affect the ability to access minerals
- Acreage unavailable for surface disturbance
- Indirect impacts include adverse impacts of restrictions affecting the ability to access minerals that would otherwise be available; includes limits to road construction, permanent road closures, avoidance, and exclusion areas

Assumptions

Assumptions for this analysis include the following:

- Clarification: The terms "salable minerals" and "mineral materials" are used interchangeably.
- Any alternative that limits salable mineral development (i.e., reduces the area available for development) will have some adverse impact on the mineral materials.
- The 43 CFR, Part 3600 and 36 CFR § 228, Subpart C, regulations manage disposal of mineral materials.
- Mineral operations are sensitive to costs, especially when prices are depressed.

- Ability to construct roads and utilities on private lands to access federal minerals subject to landowner approval are not guaranteed.
- Mineral resources are not evenly distributed across the landscape.
- Operators need predictable continuity of operations before acquiring or developing land.
- Development techniques are highly technical and not uniformly applicable.
- Seasonal closures on travel may make full development infeasible.
- A minimum of 5 years is needed for restoring self-sustaining native grass and forb cover on reclamation.
- A minimum of 10 years is needed for successful establishment or colonization by sagebrush on reclamation.
- Implementing management actions for the following resources or resource uses would have negligible or no impact on salable minerals and are therefore not discussed in detail: recreation, range management, wind energy development, industrial solar, wild horse management, fuels management, fire operations, ESR, and habitat restoration.

Nature and Type of Effects

Management actions for resources and resource uses could affect potential salable mineral development when they result in (1) reduced availability of salable mineral resources, (2) reduced access to new or existing material sites due to restrictions on use of the overlying surface lands, and (3) reduced efficiency and increased operational costs that make potential salable mineral development economically infeasible.

Closing an area to salable mineral disposal would reduce the availability of salable minerals for disposal to local governments and members of the public. Impacts would be mitigated where free use permits and expansion of existing pits would be allowed.

Managing an area as ROW/SUA exclusion or avoidance would reduce construction of roads and other infrastructure in that area and would therefore reduce demand for salable minerals in the area. As a result, disposal of salable minerals on federal mineral estate could be reduced. Areas managed as ROW exclusion or avoidance could also limit access to salable mineral deposits.

Requiring restoration of salable mineral pits no longer in use to meet GRSG habitat conservation objectives could make disposal and extraction of salable minerals more difficult if it increased reclamation requirements above and beyond those already included in salable mineral permits.

Impacts Common to All Alternatives

Due to the definitions of the alternatives being analyzed, there are no goals common to all alternatives.

Alternative A

This alternative does not designate PHMA or GHMA in the planning area. This alternative will have no effect on salable mineral management.

Impacts from Land Uses and Realty Management

Management actions for programs related to infrastructure development other than lands and realty would not impact mineral materials. Therefore, only the impacts from lands and realty management actions are discussed in the paragraphs below.

Under Alternative A, construction of new roads would likely decrease on the 11 percent (1,884,300 acres) of the decision area that would continue to be managed as ROW/SUA avoidance or exclusion under this alternative. In these areas, salable mineral development would be impacted as described under *Nature and Type of Effects*. Impacts would be mitigated where new ROWs could be collocated in existing ROWs to satisfy valid existing rights.

Impacts from Salable Minerals Management

Approximately 11 percent (1,884,300 acres) of the decision area would remain closed to salable mineral disposal. Impacts of this closure would be the same type as those described under *Nature and Type of Effects*.

Alternative B

Impacts from Land Uses and Realty Management

Management actions for programs related to infrastructure development other than lands and realty would not impact mineral materials. Therefore, only the impacts from lands and realty management actions are discussed in the paragraphs below.

Under Alternative B, construction of new roads would likely decrease on the 100 percent of the decision area that would be managed as ROW/SUA avoidance or exclusion under this alternative. In these areas, salable mineral development would be impacted as described under *Nature and Type of Effects*. Impacts would be mitigated where new ROWs could be collocated in existing ROWs to satisfy valid existing rights.

Impacts from Salable Minerals Management

Under Alternative B, 61 percent (10,120,700 acres) of the decision area would be closed to salable mineral disposal. Impacts of this closure would be the same type as those described under *Nature and Type of Effects*. Because 61 percent of the decision area (including acreage already closed) would be closed under

Alternative B, impacts would increase compared with 11 percent closed for Alternative A.

Alternative C

Impacts from Land Uses and Realty Management
Management actions for programs related to infrastructure development other than lands and realty would not impact mineral materials. Therefore, only the impacts from lands and realty management actions are discussed in the paragraphs below.

Under Alternative C, construction of new roads would likely decrease on the 100 percent of the decision area that would be managed as ROW/SUA avoidance or exclusion under this alternative. In these areas, salable mineral development would be impacted as described under *Nature and Type of Effects*. Impacts would be mitigated where new ROWs could be collocated in existing ROWs to satisfy valid existing rights.

Impacts from Salable Minerals Management
Under Alternative C, 100 percent of the decision area would be closed to salable mineral disposal. Impacts of this closure would be the same type as those described under *Nature and Type of Effects*. Because 100 percent of the decision area (including acreage already closed) would be closed under Alternative C, impacts would increase compared with 11 percent closed for Alternative A.

Alternative D
This alternative designates PHMA and GHMA in the planning area. This alternative allows for no new commercial mineral material sales in priority and GHMA. In PHMA, this alternative would require restoration of salable mineral pits no longer in use to meet GRSG conservation objectives. Additional mitigation may be required to offset any net loss of habitat as a result of authorizing expansion of existing materials pits. Habitat loss in PHMA would be offset through mitigation to ensure a net conservation gain of GRSG habitat. Designation of new community pits would be located outside of priority areas.

Impacts from Land Uses and Realty Management
Management actions for programs related to infrastructure development other than lands and realty would not impact mineral materials.

Under Alternative D, construction of new roads would likely decrease on the 100 percent of the decision area that would be managed as ROW/SUA avoidance or exclusion under this alternative. In these areas, salable mineral development would be impacted as described under *Nature and Type of Effects*. Impacts would be mitigated where new ROWs could be collocated in existing ROWs to satisfy valid existing rights.

Impacts from Salable Minerals Management
Under Alternative D, federal mineral estate in PHMA would be closed to mineral material disposal. The types of impacts from these closures would decrease access for local governments and members of the public to mineral material sites.

Like Alternate C, Alternative D would have 100 percent of the decision area closed to salable mineral disposal. Impacts of this closure would be the same type as those described under *Nature and Type of Effects*. Because 100 percent would be closed (including acreage already closed) under Alternative D, impacts would increase compared with the 11 percent closed in Alternative A.

Alternative D includes the application of RDFs consistent with applicable law which are additional conservation measures for the protection of GRSG. The RDFs (consistent with applicable law) would be applied to all GRSG habitat.

Impacts from the application of RDFs (consistent with applicable law) will likely result in higher costs and longer time frames for development of salable minerals. RDFS (consistent with applicable law) include placing operations and facilities as close together as possible, minimizing site disturbance through site analysis and planning, and phased development with concurrent reclamation. Further details on RDFs (consistent with applicable law) are found in **Appendix D**.

Alternative E
This alternative proposes to reduce the impact on all GRSG habitat by applying the avoid, minimize, and mitigate strategies, with the addition of the Conservation Credit System managed by the State of Nevada. Existing projects would operate under existing rules and regulations.

Impacts from Land Uses and Realty Management
Management actions for programs related to infrastructure development other than lands and realty would not impact mineral materials.

Under Alternative E, construction of new roads would likely decrease on the 100 percent of the decision area that would be managed as ROW and SUA avoidance or exclusion. In these areas, salable mineral development would be impacted, as described under *Nature and Type of Effects*. Impacts would be mitigated where new ROWs could be collocated with existing ROWs to satisfy valid existing rights.

Impacts from Salable Minerals Management
Under Alternative E, all federal mineral estate not closed to mineral material disposal under Alternative A would remain open. Additional restrictions would apply in the federal mineral estate in GRSG habitat, including maximum disturbance of no more than 5 percent of occupied habitat in each population area. Noise, structure height, and timing limitations would also apply. Impacts

from these restrictions on mineral material development would be the same as those described under Alternative D. Mitigation may also be required, which would increase costs of mineral material development.

Federal mineral estate in the decision area outside core, priority, and general habitat would be subject to the same management as that under Alternative A.

Like Alternative A, approximately 11percent (1,884,300 acres) of the decision area would remain closed to salable mineral disposal under Alternative E. Impacts of this closure would be the same as those described under *Nature and Type of Effects*.

Alternative E would apply RDFs consistent with applicable law, to all habitats as additional conservation measures to protect GRSG. Impacts from RDFs consistent with applicable law would likely result in higher costs and longer time frames for developing salable minerals. RDFS consistent with applicable law include placing operations and facilities as close together as possible, minimizing site disturbance through site analysis and planning, and phasing development with concurrent reclamation. Further details on RDFs consistent with applicable law are found in **Appendix D**.

Alternative F

Impacts from Land Uses and Realty Management
Management actions for programs related to infrastructure development other than lands and realty would not impact mineral materials. Therefore, only the impacts from lands and realty management actions are discussed in the paragraphs below.

Under Alternative F, construction of new roads would likely decrease on the 100 percent of the decision area that would be managed as ROW/SUA avoidance or exclusion under this alternative. In these areas, salable mineral development would be impacted as described under *Nature and Type of Effects*. Impacts would be mitigated where new ROWs could be collocated in existing ROWs to satisfy valid existing rights.

Impacts from Salable Minerals Management
Under Alternative F, 61 percent (10,120,700 acres) of the decision area would be closed to salable mineral disposal. Impacts of this closure would be the same type as those described under *Nature and Type of Effects*. Because 61 percent (including acreage already closed) would be closed under Alternative F, impacts would increase compared with 11 percent (1,884,300 acres) closed for Alternative A.

Proposed Plan
The Proposed Plan would require a 3 percent cap on surface-disturbing activities in PHMA (see **Appendix F**) and would incorporate RDFs consistent

with applicable law in PHMA, GHMA, and OHMA. It would also require all disturbances to result in a net conservation gain for GRSG and their habitat. Lek buffers would also be required (see **Appendix B**).

Collectively, these GRSG conservation management actions would increase mitigation requirements for land use authorizations. This would result in more complex project designs, potentially excluding infrastructure placement in the most cost-effective locations and potentially resulting in overall greater development costs. Corresponding effects could be a reduction in the number of authorization applications received for activities in PHMA and longer, more complicated review periods for those that are proposed in PHMA.

Management actions for programs related to infrastructure development other than lands and realty would not impact mineral materials; therefore, only the impacts from lands and realty management actions are discussed in the paragraphs below.

Under the Proposed Plan, construction of new roads would likely decrease on the 100 percent of the decision area that would be managed as ROW and SUA avoidance or exclusion (renewable resources). In these areas, salable mineral development would be impacted, as described under *Nature and Type of Effects*. Impacts would be mitigated where new ROWs could be collocated with existing ROWs to satisfy valid existing rights.

Impacts from Salable Minerals Management

Under the Proposed Plan, 64 percent (10,739,100 acres) of the decision area would be closed to salable mineral disposal. Impacts of this closure would be the same type as those described under *Nature and Type of Effects*. Because 64 percent of the decision area (including acreage already closed) would be closed under the Proposed Plan, impacts would increase, compared to the 11 percent closed under Alternative A.

The Proposed Plan would apply RDFs consistent with applicable law to all GRSG as additional conservation measures for GRSG. Impacts from RDFs (consistent with applicable law) would likely result in higher costs and longer time frames for developing salable minerals. RDFS consistent with applicable law would place operations and facilities as close together as possible, minimizing site disturbance through site analysis and planning, and phased development with concurrent reclamation. Further details on RDFs are found in **Appendix D**.

Impacts from Adaptive Management

In PHMA where a hard trigger has been reached, the corresponding adaptive management responses are identified in **Table 2-9**. Where no adaptive management trigger response has been identified (i.e., no change or same as the Proposed Plan), it is because the allocation under the Proposed Plan is the most restrictive for that resource use. **Table 4-20** describes the effects on salable minerals management in the affected BSU.

Table 4-20
PHMA Adaptive Management Effects

Program Area Activity	Corresponding Analysis
Salable minerals	Same as Proposed Plan

In GHMA where a hard trigger has been reached, the corresponding adaptive management responses are identified in **Table 2-10**. **Table 4-21** describes the effects on salable minerals management in the affected BSU.

Table 4-21
GHMA Adaptive Management Effects

Program Area Activity	Corresponding Analysis
Salable minerals	Same as Alternatives B, C, and F

4.15.4 Solid (Nonenergy) Leasable Minerals

Methods and Assumptions

Analysis of impacts on nonenergy leasable mineral development from this EIS focuses on the impacts of conservation measures to protect GRSG. These impacts may be direct or indirect. For example, a direct impact on nonenergy leasable mineral development would result from closure of an area to nonenergy leasable mineral development. An indirect impact would result from removal of a road, which would change the economic feasibility of developing a site. Additional actions or conditions that might cause direct or indirect impacts on nonenergy leasable mineral development are described under indicators, below.

Indicators

Indicators for impacts on nonenergy leasable mineral development and the measurements used to describe the impacts (where available or appropriate) are described below:

- Actions that reduce the availability and opportunity for development of resources
- Amount of federal minerals available versus closed to development Indirect impacts include loss of production of the mineral for public use and for revenues and tax revenues
- Actions placing restrictions or requirements that reduce efficiency and increased operational costs that could make development infeasible
- Acreage unavailable for surface disturbance
- Indirect impacts include reduced production of mineral resources for the public use and for the generation of revenues and tax revenues; possible adverse impact of higher cost of accessing

portion of lease via more circuitous route for access road, electric utility lines, seasonal limitations to road use or additional restrictions and requirements on development

- Actions that affect the ability to access minerals
- Acreage unavailable for surface disturbance
- Indirect impacts include adverse impacts of restrictions affecting the ability to access minerals that would otherwise be available; includes limits to road construction, permanent road closures, avoidance, and exclusion areas

Assumptions

Assumptions for this analysis include the following:

- Any alternative that limits nonenergy leasable mineral development (i.e., reduces the area available for development) will have some adverse impact on the nonenergy leasable mineral development.
- The 43 CFR, Part 3500 regulations manage leasing of nonenergy solid minerals.
- Mineral operations are sensitive to costs, especially when prices are depressed.
- Ability to construct roads and utilities on private lands to access federal minerals subject to landowner approval are not guaranteed.
- Mineral resources are not evenly distributed across the landscape.
- Operators need predictable continuity of operations before acquiring or developing land.
- Development techniques are highly technical and not uniformly applicable.
- Seasonal closures on travel may make full development infeasible.
- A minimum of 5 years is needed for restoring self-sustaining native grass and forb cover on reclamation.
- A minimum of 10 years is needed for successful establishment or colonization by sagebrush on reclamation.
- Implementing management actions for the following resources or resource uses would have negligible or no impact on nonenergy leasable mineral development and are, therefore, not discussed in detail: recreation management, range management, wind energy development, industrial solar, wild horse management, fluid minerals and solid minerals, salable minerals, fuels management, fire operations, ESR, and habitat restoration.

Nature and Type of Effects

Management actions for resources and resource uses could affect potential nonenergy leasable minerals development when they result in (1) reduced availability of nonenergy leasable minerals resources, (2) reduced access to new or existing nonenergy leasable minerals sites due to restrictions on use of the overlying surface lands, and (3) reduced efficiency and increased operational costs that make potential nonenergy leasable minerals development economically infeasible.

Areas managed as ROW exclusion or avoidance could also limit access to nonenergy leasable minerals deposits.

Impacts Common to All Alternatives

Due to the definitions of the alternatives being analyzed, there are no goals common to all alternatives.

Alternative A

This alternative does not designate PHMA or GHMA in the planning area. This alternative will have no effect on nonenergy leasable minerals management.

Management actions for mineral programs other than nonenergy leasable minerals would not impact nonenergy leasable mineral development. Therefore, only the impacts from nonenergy leasable minerals management actions are discussed in the paragraphs below.

Impacts from Nonenergy Leasable Minerals Management

Approximately 11 percent (1,884,300 acres) of the decision area would remain closed to nonenergy leasable mineral leasing. Impacts of this closure would be the same type as those described under *Nature and Type of Effects*.

Alternative B

Management actions for mineral programs other than nonenergy leasable minerals would not impact nonenergy leasable mineral development. Therefore, only the impacts from nonenergy leasable minerals management actions are discussed in the paragraphs below.

Impacts from Nonenergy Leasable Minerals Management

Under Alternative B, 61 percent (10,120,700 acres) of the decision area would be closed to nonenergy leasable mineral leasing. There are 11 pending prospecting permits in areas that would be recommended for closure under Alternative B. Impacts of this closure would be the same type as those described under *Nature and Type of Effects*. Because 61 percent of the decision area (including acreage already closed) would be closed under Alternative B, impacts would increase compared with 11 percent closed for Alternative A.

Alternative C

Management actions for mineral programs other than nonenergy leasable minerals would not impact nonenergy leasable mineral development. Therefore, only the impacts from nonenergy leasable minerals management actions are discussed in the paragraphs below.

Impacts from Nonenergy Leasable Minerals Management

Under Alternative C, 100 percent of the decision area would be closed to nonenergy leasable mineral leasing. There are 11 pending prospecting permits in areas that would be recommended for closure under Alternative C. Impacts of this closure would be the same type as those described under *Nature and Type of Effects*. Because 100 percent of the decision area (including acreage already closed) would be closed under Alternative C, impacts would increase compared with 11 percent closed for Alternative A.

Alternative D

This alternative designates PHMA and GHMA in the planning area. This alternative allows for no new nonenergy leasable mineral leasing in priority and GHMA.

Management actions for mineral programs other than nonenergy leasable minerals would not impact nonenergy leasable mineral development. Therefore, only the impacts from nonenergy leasable minerals management actions are discussed in the paragraphs below.

Impacts from Nonenergy Leasable Minerals Management

Under Alternative D, federal mineral estate in PHMA would be closed to nonenergy leasable mineral leasing.

Like Alternate C, Alternative D would have 100 percent of the decision area closed to nonenergy leasable mineral leasing. Impacts of this closure would be the same type as those described under *Nature and Type of Effects*. Because 100 percent would be closed (including acreage already closed) under Alternative D, impacts would increase compared with the 11 percent closed in Alternative A.

Alternative D includes the application of RDFs consistent with applicable law which are additional conservation measures for the protection of GRSG. The RDFs would be applied to all habitat consistent with applicable law.

Impacts from the application of RDFs (consistent with applicable law) would likely result in higher costs and longer time frames for development of nonenergy leasable minerals. RDFS include placing operations and facilities as close together as possible, minimizing site disturbance through site analysis and planning, and phased development with concurrent reclamation. Further details on RDFs are found in Appendix D.

Alternative E

This alternative proposes to reduce the impact on all GRSG habitat by applying the avoid, minimize, and mitigate strategies, with the addition of the Conservation Credit System managed by the State of Nevada. Existing projects would operate under existing rules and regulations.

Management actions for mineral programs other than nonenergy leasable minerals would not impact nonenergy leasable mineral development; therefore, only the impacts from nonenergy leasable minerals management actions are discussed in the paragraphs below.

Impacts from Nonenergy Leasable Minerals Management

Under Alternative E, all federal mineral estate not closed to nonenergy leasable mineral leasing under Alternative A would remain open. Additional restrictions would apply in the federal mineral estate in GRSG habitat. This includes a maximum disturbance of no more than 5 percent of occupied habitat in each population area. Noise, structure height, and timing limitations would also apply. Impacts from these restrictions on nonenergy leasable mineral leasing would be the same as those described under Alternative D. Mitigation may also be required, which would increase costs of nonenergy leasable mineral development.

Federal mineral estate in the decision area outside core, priority, and general habitat would be subject to the same management as under Alternative A.

As with Alternative A, approximately 11percent (1,884,300 acres) of the decision area would remain closed to nonenergy leasable mineral leasing under Alternative E. Impacts of this closure would be the same as those described under *Nature and Type of Effects*.

Alternative E includes RDFs for all habitats, which are additional conservation measures for the protection of GRSG consistent with applicable law. Impacts from RDFs would likely result in higher costs and longer time frames for development of nonenergy leasable minerals. RDFS would place operations and facilities as close together as possible, minimizing site disturbance through site analysis and planning and phasing development with concurrent reclamation. Further details on RDFs are found in **Appendix D**.

Alternative F

Management actions for mineral programs other than nonenergy leasable minerals would not impact nonenergy leasable mineral development. Therefore, only the impacts from nonenergy leasable minerals management actions are discussed in the paragraphs below.

Impacts from Nonenergy Leasable Minerals Management

Under Alternative F, 61 percent (10,120,700 acres) of the decision area would be closed to nonenergy leasable mineral leasing. There are 11 pending

prospecting permits in areas that would be recommended for closure under Alternative F. Impacts of this closure would be the same type as those described under *Nature and Type of Effects*. Because 61 percent (including acreage already closed) would be closed under Alternative F, impacts would increase compared with 11 percent (1,884,300 acres) closed for Alternative A.

Proposed Plan

This alternative would require a 3 percent disturbance cap on human surface-disturbing activities in PHMA (see **Appendix F**), and it incorporates RDFs consistent with applicable law in PHMA, GHMA, and OHMA. It would also require all human disturbances to result in a net conservation gain for GRSG and their habitat. Lek buffers would also be required (see **Appendix B**).

Collectively, these GRSG conservation management actions would increase mitigation requirements for land use authorizations. This would result in more complex project designs, potentially excluding infrastructure placement in the most cost effective locations and potentially resulting in overall greater development costs. A corresponding effect could be a reduction in the number of authorization applications received for activities in PHMA and longer, more complicated review periods for those that are proposed in PHMA.

Management actions for mineral programs other than nonenergy leasable minerals would not impact nonenergy leasable mineral development. Therefore, only the impacts from nonenergy leasable minerals management actions are discussed in the paragraphs below.

Impacts from Nonenergy Leasable Minerals Management

Under the Proposed Plan, 64 percent (10,739,100 acres) of the decision area would be closed to nonenergy leasable mineral development. There are 11 pending prospecting permits in areas that would be recommended for closure under the Proposed Plan. Expanding existing leases would be considered in PHMA. Impacts of this closure would be the same type as those described under *Nature and Type of Effects*. Because 64 percent of the decision area (including acreage already closed) would be closed under the Proposed Plan, impacts would increase, compared with 11 percent closed under Alternative A.

The Proposed Plan includes applying RDFs on all GRSG habitat, which would mean additional conservation measures for the protection of GRSG consistent with applicable law. Impacts from the RDFs would likely result in higher costs and longer time frames for developing nonenergy leasable minerals. RDFS would place operations and facilities as close together as possible, would minimize site disturbance through site analysis and planning, and would phase development with concurrent reclamation. Further details on RDFs are found in **Appendix D**.

Impacts from Adaptive Management

In PHMA where a hard trigger has been reached, the corresponding adaptive management responses are identified in **Table 2-9**. Where no adaptive management trigger response has been identified (i.e., no change or same as the Proposed Plan), it is because the allocation that is recommended in the Proposed Plan is the most restrictive for that resource use. **Table 4-22** describes the effects on nonenergy leasable minerals management in the affected BSU.

Table 4-22
PHMA Adaptive Management Effects

Program Area Activity	Corresponding Analysis
Nonenergy leasable minerals	Same as Proposed Plan

In GHMA where a hard trigger has been reached, the corresponding adaptive management responses are identified in **Table 2-10**; **Table 4-23** describes the effects on nonenergy leasable minerals management in the affected BSU.

Table 4-23
GHMA Adaptive Management Effects

Program Area Activity	Corresponding Analysis
Nonenergy leasable minerals	Same as Alternatives B, C, and F

4.16 LANDS WITH WILDERNESS CHARACTERISTICS

4.16.1 Methods and Assumptions

Indicators

Indicators of impacts on lands with wilderness characteristics are protection or degradation of the inventoried characteristics to a level at which the value of the wilderness characteristic would no longer be present within the specific area. The inventoried wilderness characteristics are as follows:

- Size of roadless acres—Impacts would result from building roads that would reduce the roadless size.
- Naturalness (apparent naturalness, not ecological naturalness)—Impacts would result from developments or vegetation manipulations that make the area appear less natural.
- Opportunities for solitude or primitive recreation—Impacts would result from increases in visitation or loss of recreation opportunities.

Assumptions

The analysis includes the following assumptions:

- No available statewide GIS data track whether or not inventoried lands with wilderness characteristics have been assessed in an RMP revision and decisions have been made about whether to protect their wilderness characteristics. As such, all lands with wilderness characteristics are treated as if their wilderness characteristics are not protected, and impacts on them are discussed.
- Management to protect GRSG under Alternatives B through F and the Proposed Plan could provide additional protections of wilderness characteristics and, at a minimum, would provide complementary management.

4.16.2 Nature and Type of Effects

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. These actions and activities could damage the qualities listed in BLM Manual 6310 (naturalness, outstanding opportunities for solitude, and opportunities for primitive and unconfined types of recreation) that make up the criteria for wilderness characteristics (BLM 2012k). Generally, actions that create surface disturbance degrade the naturalness of 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 include the following:

- Presence or absence of roads and trails and use of motorized vehicles along those roads and trails
- Range facilities or other structures
- The nature and extent of landscape modifications
- 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 under the following conditions:

- 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 non-motorized, non-mechanized means
- Where there are no developed or only minimally 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 of naturalness and opportunities for solitude would confine recreation to some extent.

Any increase in travel on existing roads and trails could reduce opportunities for solitude by increasing sights and sounds of other people. Any increase in motorized and mechanized access would also reduce opportunities for primitive recreation. The existence of trails open to motorized and mechanized travel could reduce the natural appearance in the vicinity of the trails. Effects would be localized and would not be experienced in the unit as a whole. Prohibiting motorized and mechanized use on lands with wilderness characteristics would enhance those characteristics by restricting activities that could impact natural appearance and opportunities for solitude and primitive and unconfined recreation. Increased motorized and mechanized use of routes by established livestock grazing permittees would impact opportunities for solitude and naturalness of appearance. Creating new routes would impact naturalness and size, if created by mechanical means.

While vegetation treatments are implemented, both naturalness and solitude experienced by recreational users could be impacted in the short term. The presence of treatment crews would decrease the sense of solitude and the presence of machinery and/or tools necessary for treatments would lessen the sense of naturalness. After the treatment is over, solitude would be restored with the departure of treatment crews. Over the long term, naturalness would likely be enhanced by restoring natural vegetation structures and patterns although stumps may remain for many decades where juniper treatments occurred.

Managing for wildland fire could impact wilderness characteristics. In areas where suppression is a priority, vegetation modification could prevent the spread of fires, potentially reducing the naturalness of appearance. Wildfire management actions and prescribed burns could have short-term impacts on wilderness characteristics by disturbing naturalness and the sense of solitude, but over the long term could improve ecological function. Constructed fuelbreaks would reduce naturalness whereas designated fuelbreaks that use natural features only, such as rimrock and wet areas, would have no effect on naturalness. The degree of reduction in naturalness from constructed fuelbreaks would depend on fuelbreak size, type, and the degree to which vegetation is altered so that the fuelbreak can function.

Allowing any type of energy or mineral development, such as fluid, coal, nonenergy leasable, locatable, and salable minerals, as well as renewable energy, would 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. This would be the case if the road were to bisect the unit so that it would no longer be considered a roadless area of adequate size. In addition, allowing developers regular access to the lease area or mine site would reduce opportunities for solitude.

Impacts on wilderness characteristics are possible from changes in livestock grazing, and wild horses and burro management, particularly from new developments (e.g., water developments and range facilities) in lands with wilderness characteristics. This could lessen the naturalness of appearance or could limit unconfined recreation. Existing range facilities used for livestock grazing, and wild horses and burro management, such as stock trails, and spring developments would result in no changes to current wilderness characteristics. Maintaining range improvements could result in short-term impacts on solitude and naturalness. Where PHMA and GHMA were closed to livestock grazing, lands with wilderness characteristics that overlapped with PHMA and GHMA would experience a reduction of these impacts. Gathering operations to manage wild horse and burro populations would temporarily reduce opportunities for solitude.

ROW exclusion areas provide indirect protection of wilderness characteristics by preserving naturalness and opportunities for solitude and primitive recreation by prohibiting disturbance from transmission lines, roads, and other utility developments. ROW avoidance areas also provide protection of wilderness characteristics by encouraging ROW development outside of the avoidance area when feasible.

Implementing management for the following resources would have negligible impact or no impact on wilderness characteristics for all alternatives; therefore, they are not discussed in detail:

- Special status species—Greater Sage-Grouse
- Wildfire management
- Air quality and climate change
- Special status plants

4.16.3 Impacts Common to All Alternatives

All of the action alternatives (B through F) and the Proposed Plan would result in greater restrictions on resource uses and surface-disturbing activities than would management under Alternative A. These restrictions could provide incidental protection of wilderness characteristics, and wilderness characteristics in those areas could be maintained. Wilderness characteristics

would likely experience either increased protection or no impacts from GRSG management and restrictions. Impacts would vary in degree across alternatives.

4.16.4 Alternative A

This alternative has the fewest restrictions to cross-country OHV travel. Most BLM lands in the planning area, with the exception of designated wilderness, wilderness study areas, and the lands managed by California remain open to cross-country OHV use. Lands with wilderness characteristics that overlap areas that are open to OHV cross-country travel would experience fewer of the incidental protections resulting from prohibiting or restricting motorized and mechanized use and more of the impacts from such use as discussed in *Nature and Type of Effects*.

Under Alternative A, the majority of lands remain open to fluid minerals leasing except for those that are within designated wilderness or wilderness study areas. Areas open to fluid minerals leasing and development do not provide protection to wilderness characteristics because development and infrastructure related to those actions, would continue to be allowed, as discussed in *Nature and Type of Effects*. Alternative A, has the fewest acres closed to oil and gas leasing on BLM-administered lands and consequently would offer less protection of wilderness characteristics than would the other alternatives.

Under Alternative A, the majority of lands outside of designated wilderness and wilderness study areas remain open for salable mineral and non-energy leasable development. Lands outside of designated wilderness are open for locatable mineral development. Where lands with wilderness characteristics intersect with the areas open for mineral development, there is no certainty for protection of these wilderness resources.

Additionally, Alternatives A would have fewer acres of ROW exclusion areas in PHMA and GHMA than the other alternatives. Where lands with wilderness characteristics overlap ROW exclusion areas, this would likely result in fewer indirect protections of lands with wilderness characteristics than the other alternatives. The effects of having more acres open for ROWs are described in *Nature and Types of Effects*.

4.16.5 Alternative B

Alternative B would limit travel to existing roads and trails on lands within PHMA, thereby increasing the acreage being protected from cross-country travel. Lands with wilderness characteristics that overlap these areas would experience more of the incidental protections resulting from prohibiting or restricting motorized and mechanized use and fewer of the impacts from such use as discussed in *Nature and Type of Effects*.

Under Alternative B, PHMA would be closed to fluid mineral leasing, thereby increasing the acreage being protected from oil and gas leasing and development

from that in Alternative A. Lands in GHMA would remain open to oil and gas leasing. Types of effects are discussed in *Nature and Type of Effects*.

Under Alternative B, all PHMA would be closed to salable minerals, closed to the development of non-energy leasable minerals, and recommended for withdrawal from locatable minerals. These closures would protect the naturalness of the lands with wilderness characteristics. However, lands in GHMA would remain open for salable mineral and non-energy leasable mineral development, as well open for locatable mineral development. Where lands with wilderness characteristics intersect with the areas open for mineral development, there is no certainty for protection of these wilderness resources.

PHMA would be ROW exclusion areas under Alternative B, and GHMA would be ROW avoidance areas. Where lands with wilderness characteristics overlap ROW exclusion and avoidance areas, this would result in more protection of lands with wilderness characteristics than under Alternative A, as described in *Nature and Type of Effects*.

4.16.6 Alternative C

Alternative C would limit travel to existing roads and trails on all acres of PHMA and GHMA. Lands with wilderness characteristics that overlap these areas would experience more of the incidental protections resulting from prohibiting or restricting motorized and mechanized use and fewer of the impacts from such use as discussed in *Nature and Type of Effects*.

Under Alternative C, all PHMA and GHMA would be closed to fluid mineral leasing, providing far more protection to lands with wilderness characteristics that under Alternative A. Types of effects are discussed in *Nature and Type of Effects*.

Under Alternative C, all PHMA and GHMA would be closed to salable minerals, closed to the development of non-energy leasable minerals, and recommended for withdrawal from locatable minerals. These closures would protect the naturalness of the lands with wilderness characteristics.

Under Alternative C, no areas in PHMA or GHMA would be open to livestock grazing. This would result in the most indirect protection of lands with wilderness characteristics of all the other alternatives because lands with wilderness characteristics would not be subject to the types of impacts from livestock grazing that could reduce naturalness. The effects of closing acres to livestock grazing on lands with wilderness characteristics are described in *Nature and Type of Effects*.

The same amount of PHMA would be ROW exclusion areas under Alternative C as under Alternative B. In addition, all of GHMA would be ROW exclusion areas as well. Management under Alternative C would have the greatest potential to maintain wilderness characteristics on lands with wilderness

characteristics. Allowable uses such as livestock grazing and ROWs for corridors and towers would be prohibited in PHMA and GHMA. ROW 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, as described in *Nature and Type of Effects*. Precluding these types of activities would help protect wilderness characteristics.

In addition, all PHMA would be designated as a new ACEC. Because the same protections and restrictions would be in place under this Alternative, even if the ACECs were not designated the ACECs would not, by themselves, provide for any additional management for the protection of wilderness characteristics.

4.16.7 Alternative D

Under Alternative D, PHMA and GHMA would be limited to existing roads and trails until such time as travel management plans are completed. Once completed, they would be limited to designated roads and trails. The number of PHMA and GHMA acres limited to existing roads and trails would be the same as under Alternative C; impacts would be the same as Alternative C.

PHMA and GHMA would be open to fluid mineral leasing, but subject to a no surface occupancy (NSO) stipulation. The NSO stipulation would protect lands with wilderness characteristics that intersect with PHMA and GHMA because surface disturbing activities would not be allowed on the surface of the lands.

Under Alternative D, all PHMA and GHMA would be closed to salable minerals and closed to the development of non-energy leasable minerals. These closures would protect the naturalness of the lands with wilderness characteristics. However, lands in PHMA and GHMA would remain open for locatable mineral development. Where lands with wilderness characteristics intersect with the areas open for mineral development, there is no certainty for protection of these wilderness resources.

All PHMA and GHMA would be managed as a ROW avoidance area. Consequently, more protection of wilderness characteristics would occur under Alternative D than under Alternative A.

Juniper treatments under Alternatives D and E could temporarily impact wilderness characteristics; however, this could enhance wilderness characteristics in the long term, as discussed in *Nature and Type of Effects*.

4.16.8 Alternative E

Alternative E would limit travel to existing roads and trails. Lands with wilderness characteristics that overlap these areas would experience incidental protections resulting from restricting motorized and mechanized use as discussed in *Nature and Type of Effects*.

Under Alternative E, Core and Priority habitat would remain open to fluid mineral leasing subject to controlled surface use and timing limitations and subject to the State of Nevada's Conservation Credit System. Impacts to lands with wilderness characteristics would be most similar to Alternative A because leasing and development could still occur within Core and Priority areas., However, this could potentially provide some protection to lands with wilderness characteristics because some applicants would try to develop outside of these lands due to the mitigation requirements. Types of effects are discussed in *Nature and Type of Effects*.

Under Alternative E, all Core and Priority habitat would be open to salable minerals, open to the development of non-energy leasable minerals, and open for development of locatable minerals. Where lands with wilderness characteristics intersect with the areas open for mineral development, there is no certainty for protection of these wilderness resources.

All lands in Alternative E would be managed as a ROW avoidance area and subject to the State of Nevada's Conservation Credit System. With appropriate mitigation, ROW would be allowed within habitat. This would potentially provide some protection to lands with wilderness characteristics because some applicants would try to develop outside of these lands due to the mitigation requirements.

Additionally, juniper treatments under this alternative could temporarily impact lands with wilderness characteristics, as described under Alternative D.

4.16.9 Alternative F

Under Alternative F, PHMA and GHMA would be limited to existing roads and trails until such time as travel management plans are completed. Once completed, they would be limited to designated roads and trails. The number of PHMA and GHMA acres limited to existing roads and trails would be the same as under Alternative C; impacts would be the same as Alternative C.

The number of PHMA and GHMA acres closed to fluid mineral leasing would be the same as under Alternative C, and impacts would be the same as Alternative C.

Under Alternative F, all PHMA would be closed to salable minerals, closed to the development of non-energy leasable minerals, and recommended for withdrawal from locatable minerals. GHMA would also be recommended for withdrawal from locatable minerals. These closures would protect the naturalness of the lands with wilderness characteristics. However, lands in GHMA would remain open for salable mineral and non-energy leasable mineral development. Where lands with wilderness characteristics intersect with the areas open for mineral development, there is no certainty for protection of these wilderness resources. Types of effects are discussed in *Nature and Type of Effects*.

The same number of acres of PHMA and GHMA would be ROW exclusion areas under Alternative F as under Alternative C, so impacts on lands with wilderness characteristics would be the same.

Under Alternative F, new ACECs would be designated to conserve GRSG and other sagebrush-dependent species. The new ACECs would encompass a smaller amount of acres of PHMA than in Alternative C. The protections and restrictions on uses within these new ACECs would be the same as the protections and restrictions if the ACECs were not in place, therefore the ACEC designation would not provide any additional protection to lands with wilderness characteristics under this alternative.

4.16.10 Proposed Plan

Under the Proposed Plan, PHMA and GHMA would be limited to existing roads and trails until such time as travel management plans are completed. Once completed, they would be limited to designated roads and trails. The number of PHMA and GHMA acres limited to existing roads and trails would be the same as under Alternative C; impacts would be the same as Alternative C. In PHMA, oil and gas leasing would be managed as open with an NSO stipulation – along with two extremely limited exceptions. In the SFA portions of the PHMA, there would be no exceptions. This would protect lands with wilderness characteristics that intersect with PHMA from oil and gas development. Geothermal leasing and development would also be managed with an NSO stipulation, but an additional exception could allow for surface disturbance, thereby not providing the same amount of protection to lands with wilderness characteristics as that for fluid mineral leasing. GHMA would be open to fluid mineral leasing under the Proposed Plan with controlled surface use and timing limitations. Impacts to lands with wilderness characteristics would be most similar to Alternative A because leasing and development could still occur within GHMA. Types of effects are discussed in *Nature and Type of Effects*. However, there could be some added protection to lands with wilderness characteristics because the mitigation requirements under the Proposed Plan may influence applicants to develop outside of GHMA.

Under the Proposed Plan, all PHMA would be closed to salable minerals and closed to the development of non-energy leasable minerals. The SFAs within the PHMA would be recommended for withdrawal from locatable minerals. These closures would protect the naturalness of the lands with wilderness characteristics. However, lands in GHMA would remain open for salable mineral and non-energy leasable mineral development, as well open for locatable mineral development outside of the SFAs. Where lands with wilderness characteristics intersect with the areas open for mineral development, there is no certainty for protection of these wilderness resources.

Under the Proposed Plan, PHMA and GHMA would be managed as ROW avoidance areas for major ROWs. This would result in more incidental

protection of wilderness characteristics than under Alternative A. For minor ROWs, PHMA would be managed as avoidance areas, and GHMA would remain open to ROWs development. Due to screening criteria, conditions for development, and required mitigation, applicants may find it easier to cite their development outside of the GRSG habitat, thereby leading to some additional protection of lands with wilderness characteristics.

4.17 AREAS OF CRITICAL ENVIRONMENTAL CONCERN

4.17.1 Methods and Assumptions

Indicators

Indicators of impacts on ACECs are as follows:

- Potential degradation on the relevance and importance values of existing ACECs such as plant communities, wildlife, soil resources and other natural processes may be prohibitive to management direction to improve GRSG habitat.
- Potential threat of irreparable harm to some ACEC relevance and importance values such as historical and cultural structures and sites may limit proposed management decisions to improve GRSG habitat.
- Indicators of beneficial impacts on ACECs are proposed GRSG management decisions will defer to management decisions for existing ACECs that provide more restrictive protective measures.

Assumptions

The analysis includes the following assumptions:

- Management decisions to improve GRSG habitat may result in degradation to vegetation relevance and importance values of some existing ACECs.
- Management decisions to improve GRSG habitat by reducing or eliminating surface disturbances and human interaction would be beneficial to ACECs with Cultural or Historic relevance and importance values.
- Designation of an ACEC does not prevent other appropriate resource uses so long as they are not detrimental to relevance and importance values.
- Management decisions to improve GRSG habitat may result in unforeseen opportunities for noxious and invasive plant species to encroach on vegetation relevance and importance values.
- Management actions proposed for new ACECs would be the same for management actions in PHMA, independent of an ACEC

designation. Management actions for PHMA would retain the relevance and importance values for GRSG and their habitat.

- Any designation for the protection of GRSG habitat would be managed as Zoological Special Interest Areas on National Forest System lands.

4.17.2 Nature and Type of Effects

ACECs cover a variety of different resources, each with different relevance and importance values. With these relevance and importance values there are specific management decisions which protect and preserve those values. In some cases the effects may be direct and in others the effects may be indirectly caused by primary or secondary impacts from GRSG habitat management activity. It is expected that proposed GRSG management decisions will defer to existing ACEC management decisions that are more restrictive in the protection of ACEC resources.

ACECs with relevance and importance values that are specific to vegetation resources may be directly impacted by management decisions to improve or re-establish GRSG habitat. This may occur through localized changes wrought by large-scale surface disturbance to soils and existing vegetation. Surface disturbances can result in unforeseen opportunities for noxious and invasive plant species to encroach on protected vegetation resources.

ACECs with relevance and importance values that are specific to historical and cultural resources may be both directly and indirectly impacted by GRSG habitat restoration management decisions. This may occur through physical impacts on cultural sites and historic structures.

ACECs with relevance and importance values that are specific to other wildlife resources may be indirectly impacted by management decisions to improve or re-establish GRSG habitat. This may occur through changes in vegetation food sources or protective cover brought about by altering the vegetation landscape from scattered woodland to open sagebrush steppe.

ACECs with relevance and importance values that are specific to scenic or geologic resources may be impacted directly by GRSG habitat restoration management decisions. However, these impacts would probably be more short term rather than long term in duration. Vegetation manipulation would result in a highly visible in the short term, but would become less intrusive as time passes.

Overall, the potential effect of impacts from proposed management decisions can only be discussed in very general terms. Since relevance and importance values cover a variety of resources, management decisions for GRSG habitat restoration must be addressed and analyzed in site-specific NEPA documents in order to accurately portray the potential impacts on ACEC relevance and

importance values. But in some cases, proposed GRSG management can and will provide additional protective measures to ACECs if that proposed management is more restrictive than the current ACEC management.

Designation of new ACECs in Alternatives C and F would have no impact on the following resources because new ACECs would be managed the same as PHMA for the other resources; Vegetation and Soils, Riparian Areas and Wetlands, Special Status Species, Wild Horses and Burros, Wildland Fire and Fuels, Recreation, Travel and Transportation, Lands and Realty, Renewable Energy, Mineral Resources, Water Resources, and Climate Change.

4.17.3 Impacts Common to All Alternatives

There are no impacts on ACECs that are common to all alternatives.

4.17.4 Alternative A

Impacts from GRSG Management

Under Alternative A, existing ACEC management decisions will continue to provide protective measures to relevance and importance values on 237,000 acres in 29 existing ACECs.

4.17.5 Alternative B

Impacts from GRSG Management

Under Alternative B, no proposed ACECs will be designated; however, more restrictive management will affect 114,700 acres in 22 existing ACECs which contain PHMA and GHMA GRSG habitat, as compared to Alternative A. The ACECs would most likely be subject to more restrictive management regarding minerals and more restrictive ROW management. This may be of more benefit to the Relevance and Importance values of these ACECs. Where the proposed GRSG management prescription or the existing ACEC management is more restrictive, the more restrictive management prescription will take precedence. In addition, the recommendation for withdrawal of locatable minerals would extend to ACECs with PHMA acreage which are currently open to locatable materials.

4.17.6 Alternative C

Impacts from GRSG Management

Under Alternative C, approximately 9,573,300 acres of PHMA habitat in 18 proposed ACECs will have more restrictive management to protect GRSG Relevance and Importance values than Alternative A. Management prescriptions on 114,700 acres of PHMA and GHMA habitat in 22 existing ACECs will become more restrictive regarding Minerals and ROW because of GRSG management proposals. Where the management prescription of the existing ACEC is more restrictive, the more restrictive management prescription will take precedence. In addition, the recommendation for Withdrawal of locatable

minerals would extend to with the existing ACECs in PHMA acreage which are currently open to locatable materials. This action would extend more restrictive measures to protect relevance and importance values.

4.17.7 Alternative D

Impacts from GRSG Management

Under Alternative D, no new ACECs are proposed, making this alternative similar to Alternative A. Alternative D would provide for more restrictive management prescriptions in in existing ACECs in PHMA and GHMA than Alternative A. Where the proposed GRSG management prescription or the existing ACEC management prescription is more restrictive, the more restrictive management prescription will take precedence.

4.17.8 Alternative E

Impacts from GRSG Management

Under Alternative E, impacts would be similar to those under Alternative D. As under Alternative A, no proposed ACECs would be designated. Existing ACECs would have additional protections where they intersect with core and priority habitat. However, where the proposed GRSG management prescription or the existing ACEC management prescription is more restrictive, the more restrictive management prescription would take precedence.

4.17.9 Alternative F

Impacts from GRSG Management

Under Alternative F, impacts would be similar to Alternative C because new ACECs are being proposed, thus providing more protection to resource values than Alternative A. However, where Alternative C would designate 18 ACECs encompassing approximately 9,573,300 acres of PHMA habitat; Alternative F would designate nine ACECs encompassing 848,400 acres of GRSG habitat. More restrictive management to protect GRSG Relevance and Importance values would be established in these ACECs. Management on 114,700 acres of PHMA and GHMA habitat in 22 existing ACECs will have additional resource protection. Where the management prescription of the proposed ACEC or the existing ACEC is more restrictive, the more restrictive management prescription will take precedence. In addition, the recommendation for withdrawal of locatable minerals would extend to ACECs in PHMA acreage which are currently open to locatable materials.

4.17.10 The Proposed Plan

Impacts from GRSG Management

Under the Proposed Plan, impacts would be similar to those under Alternative D in regard to management prescriptions for PHMA over 114,700 acres of GRSG habitat in 22 existing ACECs. The only exception would be SFA in

PHMA, which would be recommended for withdrawal of locatable minerals. This management action would affect three ACECs and would provide additional protection to the relevance and importance values.

Management of GHMA would be similar to that under Alternative F, with the exception of minor ROWs, which would be open instead of avoided. No proposed ACECs would be designated. As with Alternative A, management prescriptions of the existing ACECs would continue to provide protective measures to their relevance and importance values. However, where the proposed GRSG management prescription or the existing ACEC is more restrictive, the more restrictive management prescription would take precedence.

4.18 WATER RESOURCES

4.18.1 Methods and Assumptions

Indicators

Indicators of impacts on water resources are as follows:

- More areas closed to activities that result in surface disturbance, cause erosion and sedimentation, lower groundwater tables, and contaminate groundwater aquifers.
- More areas treated for fuels and invasive species, reducing wildfire potential and subsequent erosion and sedimentation.

Assumptions

The analysis includes the following assumptions:

- Climate change forecasts identify changes to timing of streamflows due to a change in the timing and severity of precipitation events and increased temperatures, which could lead to less water availability throughout the planning area (Melillo et al. 2014; Chambers and Pellant 2008).
- Areas closed to ROWs, travel management, mining, or with NSO stipulations will result in less potential for water erosion and sedimentation to streams and springs.
- Projects that help restore watersheds, desirable vegetation communities, or wildlife habitats (including surface disturbance associated with these efforts) would benefit water resources over the long term.

4.18.2 Nature and Type of Effects

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.

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 into streams due to improperly managed livestock grazing, introduction of waste matter such as fecal coliforms into streams from domestic livestock, and "low water" crossing points of roads, routes, and ways used by motorized vehicles.

Surface-disturbing activities can remove or disturb essential soil-stabilizing agents, such as vegetation, soil crusts, litter, and woody debris. These soil features function as living mulch by retaining soil moisture and discouraging annual weed growth (Belnap et al. 2001). Loss of one or more of these agents increases potential erosion and sediment transport to surface water bodies, leading to surface water quality degradation. Surface-disturbing activities under certain circumstances can also lead to soil compaction, which decreases infiltration rates and elevates potential for overland flow. Overland flow can increase erosion and sediment delivery potential to area surface water bodies, leading to surface water quality degradation.

In areas with NSO stipulations, managed as ROW/SUA exclusion, or closed to mining activities, water quality would be protected since ground disturbance would be prohibited and soil erosion limited to natural processes. In areas managed as ROW/SUA avoidance, water quality would receive some protection since ground disturbance would often be limited. ROW/SUA avoidance areas would generally result in lower impacts on water quality, compared with areas not managed as ROW/SUA avoidance.

Surface-disturbing activities in stream channels, floodplains, and riparian habitats are more likely to alter natural morphologic stability and floodplain function. Morphologic destabilization and loss of floodplain function accelerate stream channel and bank erosion, increase sediment supply, dewater near stream alluvium, cause the loss of riparian and fish habitat, and deteriorate water quality (Rosgen 1996). Altering or removing riparian habitats can reduce the hydraulic roughness of the bank and increase flow velocities near the bank (National Research Council 2002). Increased flow velocities near the bank can accelerate erosion, decreasing water quality.

When surface-disturbing impacts are allowed to alter natural drainage patterns, the runoff critical to recharging and sustaining locally important aquifers, springs/seeps/fens, wetlands, and associated riparian habitats is redirected elsewhere. As a result, these sensitive areas can be dewatered, compromising vegetation health and vigor, while degrading proper function and condition of the watershed.

Subsurface disturbances can alter natural aquifer properties (e.g., enhance hydraulic conductivity of existing fractures, breach confining units, and change hydraulic pressure gradients), which can increase potential for contamination of surface and groundwater resources. Furthermore, altering natural aquifer

properties can dewater locally important freshwater sources (e.g., groundwater, springs, seeps, fens, and streams).

Under dry conditions, surface-disturbing activities release dust into the air. During winter, wind-blown dust can settle on top of snow and affect the rate of snowmelt. Dust-covered snow versus clean snow can have albedo (reflectivity) values as low as 0.35, doubling the amount of absorbed solar radiation. Research and simulations based on observations in the Senator Beck Basin Study Area near Silverton, Colorado, indicate that excess dust on snow (versus pre-1800 conditions) increased the rate of snowmelt and advanced the timing of melting by about three to four weeks (Painter et al. 2007). Furthermore, results of studies conducted by Painter and others (2007) indicate that annual runoff is reduced by 5 percent under current dust conditions. Primary contributing factors for decreased runoff follow.

Greater absorption of energy during snowmelt causes more of the snow to sublimate directly into the atmosphere.

Earlier melting exposes the ground surface to sunlight and warmth, which both allow more water to evaporate directly from the soil and extend the growing season for plants that then can transpire additional water. It is this combined increase in evapotranspiration that appears to have the most impact on stream flow.

Surface water runoff depends on both natural factors and land management. Natural factors include climate, geology and soils, slope, channel conditions, and vegetation type and density. Land use or management actions that alter these natural factors play a role in altering surface water runoff. Such actions include grading or compacting soils for new roads or well pads and calling for management prescriptions that alter the type or density of vegetation.

Reducing water flow can have adverse impacts on the ecology of a watershed, its recreational potential, the availability of drinking water and water for other uses, and groundwater quality and quantity. Water quality impacts from reduced water supplies include increased water temperatures, pH levels, and alkaline levels. Reductions in water supply would result from consumptive uses of surface water or tributary groundwater sources that do not return water to the basin. Examples are evaporative loss from new surface water features, evapotranspiration from irrigation of vegetation, injection into deep wells, or use in drilling fluids that are later disposed of outside of the basin.

Water right holdings and use also have the ability to impact water quantity on BLM-administered and National Forest System lands. Both the States of Nevada and California are 'prior appropriation' states, meaning that the first water right holder to put a water to beneficial use, i.e., with the earliest priority date, has the first right to the water. Any water right holders on waters either located on BLM-administered and National Forest System land or upstream of BLM-

administered and National Forest System land, could potentially use all available water, making less water available for wildlife use and riparian habitat maintenance unless a prior federal right has been exercised, or an appropriated right has been issued to the BLM by the State.

Water use on BLM-administered and National Forest System lands primarily depends on the water rights associated with the source. Privately held water rights on BLM-administered and National Forest System land can result in full appropriation of surface waters and modification of riparian habitats. An appropriation of groundwater rights has the potential to reduce surface water flows. Although land management agencies may not have the ability to fully control all water uses on BLM-administered and National Forest System land, the agencies should be actively involved in the States water rights processes, working with water right holders to ensure the use will not impact GRSG and acquiring water rights to protect habitat and ensure water sources for GRSG in accordance with state water law.

Riparian areas are very productive and valuable parts of the ecosystem. They often act as transition zones between the aquatic and upland areas increasing benefits such as fish and wildlife habitat, erosion control, forage, late season streamflow, and water quality. Wetlands and meadows provide benefits by acting as reservoirs in the watershed regulating late season streamflow and increasing groundwater recharge. Since these areas generally have saturated soils, they are more vulnerable to soil compaction and rutting, making revegetation a difficult task. The riparian area is the section of land and water forming a transition from aquatic to terrestrial ecosystems along streams and lakes. It supports high soil moisture and a diverse assemblage of vegetation and performs important ecological functions. It acts as a filtering system, stabilizes banks, and regulates stream water quality. The vegetation provides a buffer for the stream by slowing down water and settling out sediment and nutrients. Strong root masses decrease surface erosion by stabilizing the streambanks and are able to absorb floodwater without degrading during high stream flows. The vegetation cover associated with riparian areas provide a thermal break from radiant sunlight reaching the water surface increasing water temperatures and reducing oxygen levels.

Lands that are open for fluid minerals leasing have the potential for future health and safety risks related to oil, gas, and geothermal exploration, development, operation, and decommissioning. The number of acres open for leasing is proportional to the potential for long-term direct health and safety impacts. Use, storage, and transportation of fluids, such as produced water, hydraulic fracturing fluids, and condensate, have the possibility of spills that could migrate to surface or groundwater, causing human health impacts. Additionally, some of the techniques used in oil and gas activities, such as directional drilling and hydraulic fracturing, would result in contamination of overlying aquifers and drinking water supplies (Osborn et al. 2011; Duke University 2012).

Potential impacts from locatable mineral, mineral material, and nonenergy leasable mineral activities and development include the release of pollutants capable of contaminating surface water during stormwater runoff or contaminating aquifers during groundwater recharge. Mineral activities and developments could also alter drainage patterns, which would affect stream hydrographs and water supplies. Discharge of mine water can alter water chemistry and impair natural stream morphologic conditions.

Grazing by livestock and wild horses and burros can increase sediment and other nutrients (primarily nitrogen and phosphorus) to streams through bank trampling and excrement. As stream banks break down, parts of the bank slough off and into the stream channel. This increase in sediment load can affect fish habitat and alter channel stability. Excrement, when added directly to a stream or in the riparian area, can increase the amounts of nutrients in streams. Urine has been found to have prolonged effects on nitrogen fixation in soil (Menneer et al. 2003). High amounts of nutrients can lead to increased aquatic plant and algal growth, which can decrease the dissolved oxygen content and affect fish.

The BLM manages to ensure water quality complies with the Standards and Guidelines for Livestock Grazing Administration (43 CFR, Part4180.2 (b)). The Forest Service manages livestock grazing to ensure compliance with appropriate water quality standards under the direction contained in 36 CFR, Part 222, Forest Service Manual 2200, and Forest Service Handbook 2209. For wild horses and burros, the BLM and the Forest Service manage in existing herd management areas for healthy populations and to achieve a thriving natural ecological balance with respect to wildlife, livestock and other multiple uses.

Vegetation management activities generally benefit water resources by restoring rangelands to native communities and reducing the potential for wildfire and sedimentation and erosion. Pinyon and/or juniper woodlands have increased thorough out the planning area since the early 1900s due to increased livestock grazing and fire suppression. Early investigators thought that reduction in pinyon and/or juniper communities would result in higher water yields. Although conversion of pinyon and/or juniper woodlands to more herbaceous and shrub communities does not result in an increase to water yields (Ffolliott and Stropki 2008), it can reduce wildfire risk.

Invasive vegetation species can impact water resources by altering wildfire regimes and increasing sedimentation and erosion risk, thereby impacting water quality.

These species are able to take advantage of soil disturbances and establish themselves and out-compete native species for resources. With few natural predators, invasive species are able to take advantage of favorable ecological conditions and spread at excessive rates. Most invasive weeds do not have strong root structures that are needed to hold soil in place. In many instances, accelerated erosion is seen in areas dominated by invasive species. Cheatgrass is

one of the most common and prolific invasive weeds found in the planning area. Although cheatgrass is able to provide adequate cover to protect soils from erosion after invasion, this protection decreases during drought conditions and instances of die-off and results in an increased risk of wildfire (Pellant 1996).

Effects of fire on water resources are determined largely by the severity of the fire, suppression tactics used for fire management and post-fire precipitation regimes (Neary et al. 2005). Higher-severity fires, typically associated with wildfire, often result in near complete consumption of vegetation and litter cover and can cause changes to soil chemistry resulting in hydrophobic soil conditions. As a result, stream flow responses in severely burned watersheds are typically higher, in some cases orders of magnitude, than in unburned or lower severity burned watersheds. Additionally, increased flooding and debris flow risks can occur up to 5 years after a severe wildfire. Prescribed fire can be beneficial to water resources by reducing the risk of high severity wildfires in treated watersheds. Additionally, the purpose of a prescribed fire is rarely to consume all vegetation or cause high severity conditions. Streamflow responses after prescribed fires are often lower in magnitude compared with wildfires and typically do not result in the drastic stream flow alterations (flooding and debris flows) as after wildfires (Neary et al. 2005).

Fire suppression activities, such as building firelines, drafting of water sources, applying fire retardants and foams, and driving cross-country can have direct impacts on water resources. Building firelines and driving cross-country creates new roads and trails that can channelize flows and increase sedimentation and erosion to streams and springs. Chemical fire retardants most commonly used in current suppression activities are ammonium-based. Ecologically, these fire retardants produce effects similar to application of fertilizers (Little and Calfee 2003).This can result in changes to water quality and can result in increased algal biomass in water bodies. Additionally, some retardants can contain low quantities of chemicals that can be toxic to aquatic biota. The BLM and the Forest Service have identified buffers along water systems to reduce the potential for retardant entering water bodies (Forest Service 2011d; DOI and USDA 2013). Drafting of water sources can reduce overall water available in streams and springs where drafting occurs. This can impact water rights and reduce water available to for habitat maintenance.

Changes in vegetation communities due to wildfire can also affect water resources. Most wildfires in the planning area result in an increase to invasive vegetation communities, particularly cheatgrass. Cheatgrass communities often have shorter wildfire return intervals, altering the 32-70 return interval for sagebrush communities to a 5-year wildfire return interval (Pellant 1996).

Roads and trails can impact water quality. Stream crossings, formed when roads and trails traverse streams, remove vegetation and create vectors for surface runoff and sediment movement directly into streams. When the vegetation is

removed, the banks become more susceptible to erosion and can slough off into the channel. During times of high stream flows the bare banks are easily eroded, leading to channel downcutting and degradation. The roads and trails act as new channels, crisscrossing the landscape and concentrating water. When these tracks cross a stream, it is an open outlet for the water and sediment to enter. In some instances a road or trail can intercept the stream and divert the water onto it.

Recreational activities, both motorized and non-motorized, often result in ground disturbance. These impacts are typically dispersed and small in size but can cause localized impacts on water resources by increasing erosion and sedimentation to streams and springs.

Activities beneficial to water resources are primarily defined as improving conditions by enhancing or restoring degraded water quality or by reducing ongoing groundwater depletion. Changing grazing patterns in riparian areas further benefits the water quality and geomorphic function of streams. Management actions regarding closure or avoidance of specific areas, or restrictions of disturbance, protect environmental conditions and, thus, are beneficial. Mitigation measures also reduce the impacts on water resources from ongoing or future activities.

Implementing management for the following resources would have negligible or no impact on water resources and are therefore not discussed in detail: mineral split-estate and ACECs.

4.18.3 Impacts Common to All Alternatives

This section will describe the impacts common to all alternatives, if applicable. The description of the impacts is the same throughout the alternatives; however, the degree of the impact would vary in each alternative.

Impacts from All Minerals Management

All mineral resources development projects have the potential for impacting water resources in a variety of ways, and project impacts would vary greatly based on resource-specific and project-specific conditions. At the general level, a supply of water is usually needed to meet process requirements and to meet the demand created by workers, support facilities, and economic growth or development that may result from the project.

Mineral resource projects also generally generate waste, including wastewater and waste solids that may come into contact with water. In most cases, compliance with existing laws, regulations, and policies is sufficient to ensure that water resources would be protected. However, it remains very costly to clean up environmental damage once it occurs, so planning, prevention, and monitoring are the most important aspects of compliance.

Mineral development disturbs soils and can result in increased erosion and contamination of waterways via runoff. Mineral development increases the presence of petroleum-using vehicles and equipment on the land and increases the likelihood of chemical spills that can sink into the earth and contaminate groundwater.

All mining activities are subject both state and federal laws and regulations targeted at reducing impacts on water resources. However, the more land excluded from development, the less likely it is that water resources impacts would occur, although projects may differ greatly in the potential to impact water resources.

Impacts from Leasable Minerals Management

Fluid minerals (oil, gas, and geothermal resources) in the area center on geothermal and oil development and exploration. Most of the impacts from geothermal mining relate to reduction of surface flows where there are surface expressions of thermal springs. These springs generally discharge under a low hydraulic head and are therefore easily impacted by reductions in reservoir pressures. Drilling or placement of wells is activities that can reduce reservoir pressures. New geothermal facilities could reduce reservoir temperatures due to reinjection of fluids. Impacts from oil development include potential groundwater contamination due to drilling techniques and poor well constructions. Additionally, there is a potential for surface water contamination and water quality impacts from flowback and produced water spills.

Impacts from Salable Minerals Management

Salable minerals, such as sand and gravel, tend to have fewer impacts on water resources. Most sand and gravel operations are shallow quarry operations located in the basin fill and can generally be located away from water resources. Typically, salable minerals do not contain significant amounts of soluble constituents that may leach from the waste material even if it comes into contact with water. Most quarry operations present minor threats to surface or groundwater quality.

Impacts from Locatable Minerals Management

For some mineral projects dewatering is required that may generate large volumes of wastewater or fluids that must be contained until they can be safely discharged. Additionally, inactive open pit mines which are below the water table and allowed to fill in once operation are ceased ultimately act as a groundwater sink inasmuch as they can allow for perpetual loss of large volumes of water due to evaporation. Currently, there is no method employed by the Nevada State Engineer to account for these evaporative losses in groundwater basin water budgets.

Impacts from Land Uses and Realty Management

Lands and realty decisions affect where ground disturbing activities can and cannot occur. The use of ROW/SUA exclusion and ROW/SUA avoidance

designations limit the amount of man-made runoff of soils and chemicals into waterways in those areas and are generally considered to be protective of water quality. ROW/SUA exclusion and avoidance reduce the likelihood of chemical spills onto the ground, which can then sink into the earth and contaminate groundwater. ROWs associated with groundwater development projects would result in lowering of local groundwater tables and would result in decreases to both ground and surface water resources. Additionally, construction of some ROWs may require short-term use of water for dust abatement and other construction activities resulting in short-term, localized impacts on water resources.

Impacts from Renewable Energy Management

Renewable energy development projects would have varying potential for impacting water resources based on resource-specific and project-specific conditions. Generally, solar projects require the blading of large areas of land and can potentially require large quantities amount of water during operation depending on the technology. Wind energy and photovoltaic projects would require minimal use of water resources. In all cases, some supply of water is usually needed to meet the demand to operate these projects. Development of renewable energy projects would require road access to the sites. All projects would involve construction, soil disturbance, and the potential for enhanced erosion to impact surface water quality.

Impacts from Livestock Grazing Management

Livestock grazing would continue to have impacts on water resources, especially on surface water quality. Potential impacts of grazing are sediment loading from soil eroded by wind and water. Grazing may cause the following:

- Vegetation loss
- Soil compaction
- Reduced runoff retention
- Riparian function loss
- Biological soil crust loss
- Direct soil disturbance
- Runoff concentrated into animal trails, with consequent enhanced erosion

Grazing animals can alter vegetation and natural succession patterns, spread undesirable species, and create conditions more susceptible to erosion and large-scale wildfires.

The surface disturbance around watering sources results in the compaction of soils, resulting in localized runoff, erosion, and delivery of sediments to ephemeral stream channels. Grazing animals create waste that can introduce

nutrients and pathogens to surface waters directly or indirectly through runoff. Excessive nutrient loading can lead to algal growth, depleted dissolved oxygen needed to support aquatic fauna, reduced water clarity and consequent increased water temperature, any of which are would reduce riparian function. The effects of grazing occur at very low animal densities and vary over a wide spectrum, temporally and spatially, and with slope, soil, climate, and vegetation.

At the same time, water supply structures throughout the landscape that have been established for the benefit of livestock also often provide drinking water sources for GRSG. Installing properly maintained exclosures around the riparian area and allowing some water to remain in the natural surface water system help reduce impacts on water quality and preserve the natural condition of the surface water system.

Impacts from Wild Horse and Burro Management

Wild horses and burros use results in similar impacts as livestock grazing management. WHB cause adverse impacts on water quality when the animals congregate near surface water, overgraze sensitive areas, spread plant pests, increase pathogen loading to water bodies via surface water contact with manure, and compact or otherwise damage soil. Unlike livestock, which can be moved to other areas when impacts are observed and in most cases are only on the land for part of the year, movements of WHB are not controlled because maintaining the free-roaming nature of WHB is an objective of all of the alternatives (though Alternative B makes it a secondary objective) and use occurs year-round. WHB tend to stay in the same watering areas all year, and this does not allow damaged areas to rest and recover.

The most effective measures for reducing impacts on water resources are by controlling populations and preventing WHB from using damaged or sensitive areas during low water periods.

Impacts from Vegetation and Soils Management

Vegetation management activities can result in short-term impacts on water quality due to increased erosion and sedimentation to water bodies. Long-term impacts are typically beneficial by reducing nonnative communities and the risk to wildfire.

Impacts from Fire and Fuels Management

Effects of fire on water resources are determined largely by the severity of the fire, suppression tactics used for fire management and post-fire precipitation regimes. Hazardous fuels treatments will result in an overall decrease in wildfire potential, thereby decreasing impacts on water resources.

Fire removes vegetation cover and exposes soils to erosion, increasing the potential for sediments to be transported into water resources. Combustion can create a variety of toxic chemicals that may eventually be transported to water bodies in runoff or because of atmospheric deposition.

Fire suppression can result in soil disturbance from vehicles and equipment such as fire engines and dozers. Impacts include removal of vegetation and disturbance to soils increasing erosion potential and impacts on water. Use of retardant may impact water directly. These impacts are greater to lentic resources verses perennial streams because lentic areas are less dynamic and slower to recover. Impacts include reduced water quality and possible oxygen depletion.

Impacts from Comprehensive Travel and Transportation Management

Roads and trails generally result in impacts on water quality by removing vegetation and creating vectors for surface runoff and sediment movement directly into streams. Roads and trails act as new channels, crisscrossing the landscape and concentrating water. When these tracks cross a stream, it is an open outlet for the water and sediment to enter. Areas closed or limited to travel and transportation would have lesser impacts on water resources.

Impacts from Recreation Management

In general, recreational activities can result in impacts on water quality. Both motorized and non-motorized activities can result in ground disturbance thereby increasing erosion and sedimentation to local water bodies.

Impacts from Riparian Areas and Wetland Management

Riparian habitats are very productive and valuable parts of the ecosystem. They often act as transition zones between the aquatic and upland areas increasing benefits such as fish and wildlife habitat, erosion control, forage, late season stream flow, and water quality. It acts as a filtering system, stabilizes banks, and regulates stream water quality. The vegetation provides a buffer for the stream by slowing down water and settling out sediment and nutrients and acts as a thermal break from radiant sunlight reaching the water surface increasing water temperatures and reducing oxygen levels. Any actions that would restore or enhance riparian habitats would be beneficial to water resources.

4.18.4 Alternative A

Impacts from GRSG Management

Under Alternative A, there are currently no acres designated as PHMA and GHMA. However, the LUPs do not contain any allocations pertaining to the management of GRSG and there are no consistent goals or objectives for management of GRSG habitat in the LUPs.

Impacts from Land Uses and Realty Management

Under Alternative A, for major and minor ROWs in the existing LUPs, there are already areas in GRSG habitat designated as open and exclusion areas and avoidance areas. Additionally, the LUPs identify areas to be held in retention and areas open for disposal. Impacts on water resources would be the same as to those currently occurring under existing LUPs, refer to Nature and Types of Effects and Impacts Common to All Alternatives for specific types of impacts.

Impacts from Renewable Energy Management

Under Alternative A, for wind energy, there are areas in GRSG habitat identified as ROW/SUA exclusion areas, as open and as avoidance areas. Based on areas identified in the Solar PEIS, there are acres identified as open, ROW/SUA exclusion and as avoidance areas for solar energy. Impacts from renewable energy management would be similar to impacts from lands and realty management. Additionally, ROWs and SUAs associated with renewable energy management are typically large in size (several thousand acres) and in many cases require completely grading a site, particularly for solar projects. This amount of land disturbance can amplify impacts at the project level.

Impacts from Livestock Grazing Management

Under Alternative A, some areas are identified in GRSG habitat as available to livestock grazing and some as unavailable to livestock grazing. The BLM would continue to manage them to ensure water quality complies with the Standards and Guidelines for Livestock Grazing Administration (43 CFR, Part 4180.2 [b]). The Forest Service manages livestock grazing under the direction in 36 CFR, Part 222, Forest Service Manual 2200, and Forest Service Handbook 2209. Impacts on water resources would be similar to those currently occurring under existing LUPs; refer to *Nature and Types of Effects and Impacts Common to All Alternatives* for specific types of impacts.

Impacts from Wild Horse and Burro Management

Alternative A identifies areas in GRSG habitat in HAs, in HMAs, and in wild horse territory areas and in Forest Service horse territory areas. These areas would continue to be managed to achieve and maintain AMLs and to achieve a natural ecological balance with respect to other uses. Impacts on water resources would be similar to those currently occurring under existing LUPs, refer to Nature and Types of Effects and Impacts Common to All Alternatives for specific types of impacts.

Impacts from Leasable Minerals Management

Under Alternative A, there are areas in GRSG habitat identified as closed to fluid minerals, oil and gas and geothermal and as open to fluid minerals, oil and gas and geothermal. Impacts on water resources would be to the same as those currently occurring under existing LUPs, refer to Nature and Types of Effects and Impacts Common to All Alternatives for specific types of impacts.

Impacts from Locatable Minerals Management

Alternative A identifies areas in GRSG habitat that is designated as an existing withdrawn area from mineral entry and as open to locatable mineral exploration or development. All locatable mineral activities will continue to be managed under the regulations at 43 CFR, Part3800 through the approval of a Notice of Intent or a Plan of Operations. Impacts on water resources would be similar to those currently occurring under existing LUPs, refer to Nature and Types of Effects and Impacts Common to All Alternatives for specific types of impacts.

Impacts from Salable Minerals Management

Alternative A identifies areas in GRSG habitat that are managed as closed to mineral material disposal and that are managed as open for consideration for mineral material disposal on a case-by-case basis. Impacts on water resources would be similar to those currently occurring under existing LUPs, refer to Nature and Types of Effects and Impacts Common to All Alternatives for specific types of impacts.

Impacts from Vegetation and Soils Management

Alternative A does not identify any specific numbers of acres for vegetation treatment other than goals and objectives for managing of vegetation communities outlined in existing LUPs. Impacts on water resources would be similar to those currently occurring under existing LUPs, refer to Nature and Types of Effects and Impacts Common to All Alternatives for specific types of impacts.

Impacts from Fire and Fuels Management

Alternative A does not specify any acres for hazardous fuels management. All existing LUPs do address fire suppression and hazardous fuels management.

Impacts from Comprehensive Travel and Transportation Management

Under Alternative A, areas are identified in GRSG habitat that would be managed as closed to motorized vehicles, as limited to existing routes for motorized vehicles and as open to all modes of cross country travel. Impacts on water resources would be similar to those currently occurring under existing LUPs, refer to Nature and Types of Effects and Impacts Common to All Alternatives for specific types of impacts.

Impacts from Recreation Management

Alternative A does not specify any areas as open or closed to recreation. All BLM and Forest Service districts manage for developed and dispersed recreation and some LUPs may identify areas where specific types of management are designated. Impacts on water resources would be similar to those currently occurring under existing LUPs, refer to Nature and Types of Effects and Impacts Common to All Alternatives for specific types of impacts.

Impacts from Riparian Areas and Wetland Management

All LUPs in the sub-region recognize importance of riparian areas and wetlands and include guidance for protection or enhancement of this resource. Priority riparian habitats are targeted for improvement while impacts on riparian areas as a result of management actions or authorizations are considered through the NEPA process. Many livestock grazing systems developed through the permit renewal process and through assessments of rangeland health are focused on improving riparian habitat conditions. In some cases, mitigation programs developed for land uses such as mining have resulted in restoration of thousands of acres of riparian areas and wetlands in GRSG habitat.

Condition and trend data for riparian and wetland habitats in the planning area suggest existing programs which directly or indirectly provide for riparian area management are only partially effective (refer to **Section 3.4**, Riparian Areas and Wetlands). Generally, restoration efforts have been focused on priority streams habitats, especially those supporting fisheries. Although highly important to GRSG, lentic riparian areas have received less focus likely because they are small in size, widespread and more difficult to manage. Under this alternative, condition and trend of riparian areas and wetlands in GRSG habitat is likely to improve but progress may not be consistent across the planning area.

4.18.5 Alternative B

Alternative B generally reduces land disturbances and would result in fewer impacts on water resources associated with a particular use compared with Alternative A. Resources affected are described below.

Impacts from GRSG Management

Alternative B identifies the same acreages for PHMA and GHMA as Alternative A. However, Alternative B does identify goals and objectives for enhancing and protecting GRSG habitat, particularly from human disturbances. Protecting GRSG habitat would result in few land disturbances and would result in reduced impacts on water quality. Protection measures may also include protecting existing water sources from future use and result in increases to water availability. Alternative B would result in fewer impacts on water resources than Alternative A.

Impacts from Land Uses and Realty Management

Under Alternative B, for major and minor ROWs, more acres of PHMA would be managed as exclusion areas while more acres of GHMA would be managed as avoidance areas. This would also mean there would be fewer acres open for major ROWs in both PHMA and GHMA as compared to Alternative A. For land disposals, more acres in PHMA would be held in retention and GHMA would have the same land tenure designation as in Alternative A. Reduction of surface disturbance activities through either exclusion or avoidance would reduce potential for soil erosion thereby reducing impacts on water quality and reduce the need for water for project use, reducing impacts on water quantity. Alternative B would result in fewer impacts on water resources than Alternative A.

Impacts from Renewable Energy Management

Alternative B would manage more acres as ROW/SUA exclusion in PHMA and fewer acres as ROW/SUA open for wind energy in PHMA and GHMA, and more acres as avoidance areas for wind energy in GHMA as compared to Alternative A. For solar energy projects, Alternative B identifies the same acreages for open, exclusion areas and avoidances areas as in Alternative A. Impacts from renewable energy management would be similar to impacts from lands and realty management. Additionally, ROWs and SUAs associated with

renewable energy management are typically large in size (several thousand acres) and in many cases require completely grading a site, particularly for solar projects. This amount of land disturbance can amplify impacts at the project level. Alternative B would result in fewer impacts on water resources than Alternative A.

Impacts from Livestock Grazing Management

Under Alternative B, acres available for livestock grazing would be similar to those under as Alternative A. However, Alternative B would limit grazing in PHMA, unless the treatment would conserve, enhance, or restore GRSG habitat. This would allow for vegetation treatments and grazing management improvements, which would decrease erosion and reduce impacts on water quality. Alternative B would result in fewer impacts on water resources than under Alternative A.

Impacts from Wild Horse and Burro Management

Impacts would be the same as Alternative A.

Impacts from Leasable Minerals Management

Under Alternative B, more acres in PHMA would be managed as closed and fewer acres in PHMA would be managed as open to fluid minerals, oil and gas, and geothermal than Alternative A. In GHMA, areas would be managed as open to fluid minerals, oil and gas, and geothermal, similar to Alternative A, and subject to standard stipulations. Reduction of surface disturbance activities through either exclusion or avoidance would reduce potential for soil erosion thereby reducing impacts on water quality and reduce the need for water for project use, reducing impacts on water quantity. This alternative identifies actions and conservation measures for areas that are already leased. Alternative B would result in fewer impacts on water resources than Alternative A.

Impacts from Locatable Minerals Management

Alternative B would identify additional acres in PHMA for withdrawal from mineral entry and fewer acres as open to locatable mineral exploration or development in PHMA as compared to Alternative A. GHMA would be managed as open to locatable mineral exploration or development, similar to Alternative A. All locatable mineral activities would continue to be managed under the regulations at 43 CFR, Part3800 through the approval of a Notice of Intent or a Plan of Operations. Reduction of surface disturbance activities through either exclusion or avoidance would reduce potential for soil erosion thereby reducing impacts on water quality and reduce the need for water for project use, reducing impacts on water quantity. Alternative B would result in fewer impacts on water resources than Alternative A.

Impacts from Salable Minerals Management

Under Alternative B, more acres in PHMA would be managed as closed to mineral material disposal and fewer acres in PHMA would be managed as open for consideration for mineral material disposal on a case-by-case basis as

compared to Alternative A. GHMA would be managed as open to locatable mineral exploration or development and subject to standard stipulations, similar to Alternative A. Reduction of surface disturbance activities through either exclusion or avoidance would reduce potential for soil erosion thereby reducing impacts on water quality and reduce the need for water for project use, reducing impacts on water quantity. Alternative B would result in fewer impacts on water resources than Alternative A.

Impacts from Vegetation and Soils Management

Under Alternative B, restoration of vegetation would be a priority in GRSG habitat, prioritizing in areas thought to be limiting to GRSG distribution and/or abundance. Additionally use and collection of native seed would be apriority when possible to establish native plant communities. Restoration of vegetation, particularly with native communities helps keep soils in place reducing the potential for erosion and allowing for infiltration and recharging of groundwater. Alternative B would result in fewer impacts on water resources than Alternative A.

Impacts from Fire and Fuels Management

Alternative B would not specify any specific numbers of acres for hazardous fuels management nor does it specify suppression activities. It does identify RDFs for fire suppression activities, general actions for pre- and post-fire treatment activities, timing of treatments, resting, and use of native plants for revegetation. Reduction in fire potential reduces the risk of creating hydrophobic soils which can increase overland flow and erosion resulting in impacts on water quality. Based on these actions, Alternative B could have fewer impacts on water resources than Alternative A.

Impacts from Comprehensive Travel and Transportation Management

Under Alternative B, the same number of acres would be managed as closed to motorized vehicles as in Alternative A, more acres in PHMA would be managed as limited to existing routes for motorized vehicles and fewer acres as open to all modes of cross country travel in PHMA as compared to Alternative A. GHMA would be managed as open, similar to Alternative A. Roads and trails generally result in impacts on water quality by removing vegetation and creating vectors for surface runoff and sediment movement directly into streams. Roads and trails act as new channels, crisscrossing the landscape and concentrating water. When these tracks cross a stream, it is an open outlet for the water and sediment to enter. Alternative B would result in fewer impacts on water resources than Alternative A.

Impacts from Recreation Management

Alternative B would not close any areas to recreation activities; it does specify that any BLM SRPs or Forest Service recreation permits must have a neutral or beneficial effect on PHMA. Neutral or beneficial impacts on GRSG habitat would

result in fewer impacts on water resources. Therefore, Alternative B would result in fewer impacts on water resources than Alternative A.

Impacts from Riparian Areas and Wetland Management

Alternative B would identify specific actions to improve and restore riparian habitats through management. These actions would include managing for proper functioning condition, reducing hot season grazing, using herding and other techniques to distribute livestock, authorization of new water developments and modifications of existing developments out of riparian areas. Many of these actions are tools currently used by the agencies in the permit process to alleviate impacts due to grazing. However, many of the LUPs do not have these types of tools listed as requirements. Alternative B would result in fewer impacts on water resources than Alternative A.

4.18.6 Alternative C

Alternative C would reduce land disturbances and would result in fewer impacts on water resources associated with a particular use compared with Alternative A. Resources affected are described below.

Impacts from GRSG Management

Under Alternative C, all GRSG habitats, PHMA and GHMA, would be managed as PHMA. Therefore, management restrictions on all activities would be greater under Alternative C. Alternative C would result in fewer impacts on water resources than Alternative A.

Impacts from Land Uses and Realty Management

Under Alternative C, for major and minor ROWs, all of PHMA (and GHMA) would be managed as exclusion areas for ROWs. This would be much more restrictive and result in fewer disturbances when compared to Alternative A. For land disposals, all PHMA (and GHMA) would be held in retention as compared to Alternative A. Reduction of surface disturbance activities through either exclusion or avoidance would reduce potential for soil erosion thereby reducing impacts on water quality and reduce the need for water for project use, reducing impacts on water quantity. Alternative C would result in fewer impacts on water resources than Alternative A.

Impacts from Renewable Energy Management

Under Alternative C, all PHMA (and GHMA) would be managed as ROW/SUA exclusion areas for both wind energy and solar energy, in comparison to Alternative A which is managed as primarily open to wind energy and exclusion for solar energy on BLM-administered lands. Impacts from renewable energy management would be similar to impacts from lands and realty management. Additionally, ROWs associated with renewable energy management are typically large in size (several thousand acres) and in many cases require completely grading a site, particularly for solar projects. This amount of land disturbance can amplify impacts at the project level. Alternative C would result in fewer impacts on water resources than Alternative A.

Impacts from Livestock Grazing Management

Under Alternative C, all PHMA and GHMA would be managed as unavailable to livestock grazing, so fewer acres would be managed as available to livestock, as compared to Alternative A. Alternative C would eliminate grazing from occupied habitat. The BLM would continue to manage to ensure water quality complies with the Standards and Guidelines for Livestock Grazing Administration (43 CFR, Part 4180.2 [b]). The Forest Service manages livestock grazing under the direction in 36 CFR, Part 222, Forest Service Manual 2200, and Forest Service Handbook 2209. Additionally, any water developments associated with livestock use would be removed, allowing water in springs and streams to stay in the natural systems. Alternative C would result in fewer impacts on water resources than would Alternative A.

Impacts from Wild Horse and Burro Management

Impacts would be the same as Alternative A.

Impacts from Leasable Minerals Management

Under Alternative C, all acres in PHMA (and GHMA) would be managed as closed to fluid minerals, oil and gas, and geothermal. Alternative C closes more area than Alternative A to leasable mineral entry in GRSG habitat. Reduction of surface disturbance activities through either exclusion or avoidance would reduce potential for soil erosion thereby reducing impacts on water quality and reduce the need for water for project use, reducing impacts on water quantity. This alternative also identifies actions and conservation measures for areas that are already leased. Alternative C would result in fewer impacts on water resources than Alternative A.

Impacts from Locatable Minerals Management

Under Alternative C, all acres in PHMA (and GHMA) are recommended for withdrawal to locatable mineral exploration or development. Alternative C closes more areas than Alternative A to locatable mineral entry in GRSG habitat. All locatable mineral activities would continue to be managed under the regulations at 43 CFR, Part3809 through the approval of a Notice of Intent or a Plan of Operations. Reduction of surface disturbance activities through either exclusion or avoidance would reduce potential for soil erosion thereby reducing impacts on water quality and reduce the need for water for project use, reducing impacts on water quantity. Alternative C would result in fewer impacts on water resources than Alternative A.

Impacts from Salable Minerals Management

Under Alternative C, all acres in PHMA (and GHMA) would be managed as closed to mineral material disposal. Alternative C closes more areas than Alternative A to salable mineral entry in GRSG habitat. Reduction of surface disturbance activities through exclusion would reduce potential for soil erosion thereby reducing impacts on water quality and reduce the need for water for

project use, reducing impacts on water quantity. Alternative C would result in fewer impacts on water resources than Alternative A.

Impacts from Vegetation and Soils Management

Alternative C identifies more passive forms of restoration and has more restrictions on active vegetation treatments. Additionally, the removal of all livestock grazing will reduce grazing pressure on vegetation throughout PHMA and GHMA. Passive restoration would allow vegetation to restore back to more natural conditions overtime. Alternative C should result in fewer impacts on water resources than Alternative A.

Impacts from Fire and Fuels Management

Impacts would be the same as Alternative A.

Impacts from Comprehensive Travel and Transportation Management

Under Alternative C, more acres in PHMA (and GHMA) would be managed as limited to existing routes for motorized vehicles and fewer acres would be managed as open to motorized vehicles as compared to Alternative A. Roads and trails generally result in impacts on water quality by removing vegetation and creating vectors for surface runoff and sediment movement directly into streams. Roads and trails act as new channels, crisscrossing the landscape and concentrating water. When these tracks cross a stream, it is an open outlet for the water and sediment to enter. Alternative C would result in fewer impacts on water resources than Alternative A.

Impacts from Recreation Management

Impacts would be the same as Alternative A.

Impacts from Riparian Areas and Wetland Management

Alternative C would eliminate grazing from occupied GRSG habitat. Improper livestock use is one of the most damaging management activities to riparian habitats and water resources. By eliminating livestock grazing, impaired riparian habitats would be able to recover, allowing them to become functioning systems. This alternative also identifies actions including the removal of watering systems associated with livestock, allowing for further enhancement of riparian habitats and giving riparian systems the ability to recover more quickly. Alternative C would result in fewer impacts on water resources than Alternative A.

4.18.7 Alternative D

Alternative D would reduce land disturbances and would result in fewer impacts on water resources associated with a particular use compared with Alternative A. Resources affected are described below.

Impacts from GRSG Management

Alternative D would identify the same acreages for PHMA and GHMA and additional acres as OHMA. OHMA is mapped habitat that is potentially suitable

for GRSG habitat. Acreages identified as PHMA and GHMA habitat would be the same as GRSG habitat in Alternative A. RDFs identified for Alternative D, including removal of water developments that are negatively impacting habitat, remove or modify developments that are negatively impacting riparian habitat and require vegetation reclamation from ground disturbing activities, would all reduce impacts on water resources. Alternative D would result in fewer impacts on water resources than Alternative A.

Impacts from Land Uses and Realty Management

Under Alternative D, for major and minor ROWs, more acres in PHMA and GHMA would be managed as avoidance areas as compared to Alternative A, and OHMA would be managed as open. For land disposals, PHMA and GHMA would be held in retention whereas OHMA would be managed as both retention and disposal, with more acres held in retention as compared to Alternative A. Reduction of surface disturbance activities through avoidance would reduce potential for soil erosion thereby reducing impacts on water quality and reduce the need for water for project use, reducing impacts on water quantity. Alternative D would result in fewer impacts on water resources than Alternative A.

Impacts from Renewable Energy Management

Under Alternative D, for wind energy and solar energy, all acres in PHMA and GHMA would be managed as ROW/SUA exclusion areas compared to Alternative A where lands are open for wind energy development. In OHMA, wind energy areas would be managed as open, but for solar energy, BLM-administered lands would be managed as exclusion areas and National Forest System land would be managed as either avoidance areas or as open. Impacts from renewable energy management would be similar to impacts from lands and realty management. Additionally, ROWs and SUAs associated with renewable energy management are typically large in size (several thousand acres) and in many cases require completely grading a site, particularly for solar projects. This amount of land disturbance can amplify impacts at the project level. Alternative D would result in fewer impacts on water resources than Alternative A.

Impacts from Livestock Grazing Management

Under Alternative D, PHMA, GHMA, and OHMA would be managed as available to livestock grazing, similar to Alternative A. The BLM would continue to manage to ensure water quality complies with the Standards and Guidelines for Livestock Grazing Administration (43 CFR, Part 4180.2 [b]). The Forest Service manages livestock grazing under the direction in 36 CFR, Part 222, Forest Service Manual 2200, and Forest Service Handbook 2209.

Additionally, Alternative D includes several actions that would benefit water resources, in particular improving water quality in the planning area. These actions are as follows:

- Managing for riparian vegetation

- Applying principles of prescriptive livestock grazing to control time and timing of grazing during the hot season
- Authorizing new water developments when the diversion would benefit habitat
- Modifying developments to maintain or improve riparian habitat
- Salting and supplemental feeding at least 1 mile from riparian habitat
- Retiring grazing privileges on a voluntary basis

Alternative D should result in fewer impacts on water resources than Alternative A.

Impacts from Wild Horse and Burro Management
Impacts would be the same as Alternative A.

Impacts from Leasable Minerals Management
Under Alternative D, all acres in PHMA and GHMA would be managed as NSO to fluid minerals including oil and gas and geothermal and closed in PHMA and GHMA for nonenergy leasable fluid minerals as compared to Alternative A where the majority of lands remain open. Alternative D would list stipulations for NSO in PHMA and GHMA for currently unleased areas and require site-specific conservation measures for reducing land disturbance on leased areas. In OHMA, nonenergy leasable would be managed as open and oils and gas and geothermal would be managed as open subject to standard stipulations. Although NSO stipulations may result in decreases to surface water impacts, by reducing erosion potential and on-site spills, it would not necessarily result in a decrease to groundwater impacts. Potential impacts of drilling and extracting of fluid resources to groundwater aquifers would remain the same. RDFs associated with reducing surface disturbance, vegetation reclamation and stream crossings would all reduce erosion potential thereby reducing impacts on water resources. Alternative D should result in fewer impacts on water resources than Alternative A.

Impacts from Locatable Minerals Management
Under Alternative D, PHMA, GHMA and OHMA would be managed as open to locatable mineral exploration or development similar to Alternative A. RDFs (consistent with applicable law) associated with reducing surface disturbance, vegetation reclamation and stream crossings would all reduce erosion potential thereby reducing impacts on water resources. All locatable mineral activities would continue to be managed under the regulations at 43 CFR, Part3809 through the approval of a Notice of Intent or a Plan of Operations. Reduction of surface disturbance activities through either exclusion or avoidance would reduce potential for soil erosion thereby reducing impacts on water quality and reduce the need for water for project use, reducing impacts on water quantity. Alternative D should result in fewer impacts on water resources than Alternative A.

Impacts from Salable Minerals Management

Under Alternative D, all acres in PHMA and GHMA would be managed as closed to mineral material disposal, and OHMA would be managed as open for consideration for mineral material disposal on a case-by-case basis. Application of RDFs consistent with applicable law would reduce affects to water quality. Reduction of surface disturbance activities would reduce potential for soil erosion thereby reducing impacts on water quality and reduce the need for water for project use. Alternative D would result in fewer impacts on water resources than Alternative A.

Impacts from Vegetation and Soils Management

Alternative D would not identify any specific numbers of acres for vegetation treatment; however, it does have several actions specifying types of treatments and timing that will benefit water resources. Based on the actions associated with Alternative D, there should be fewer impacts on water resources overall than under Alternative A.

Impacts from Fire and Fuels Management

Alternative D would not specify any acres for hazardous fuels management. It does identify general actions for suppression activities, pre- and post-fire treatment activities, timing of treatments, resting, and use of native plants for revegetation. Proposed RDFs (consistent with applicable law) for designing fuels treatments and burning prescriptions to reduce impacts on vegetation and soils (reduce potential for hydrophobicity) would all reduce erosion potential thereby reducing impacts on water resources. Based on these actions, Alternative D could have fewer impacts on water resources than Alternative A.

Impacts from Comprehensive Travel and Transportation Management

Under Alternative D, all acres in PHMA and GHMA would be managed as limited to existing routes for motorized vehicles as compared to Alternative A where these lands are open, OHMA would continue to be managed as open to all modes of cross country travel. Roads and trails generally result in impacts on water quality by removing vegetation and creating vectors for surface runoff and sediment movement directly into streams. Roads and trails act as new channels, crisscrossing the landscape and concentrating water. When these tracks cross a stream, it is an open outlet for the water and sediment to enter. Alternative D would result in fewer impacts on water resources than Alternative A.

Impacts from Recreation Management

While management under Alternative D would not close any areas to recreation activities, it would specify that any SRPs or Forest Service SUAs must have a neutral or beneficial effect on PHMA. It also would also specify that no new recreational facilities would occur in PHMA and GHMA. Neutral or beneficial impacts and no new recreational facilities in GRSG habitat would result in fewer impacts on water resources. Therefore, management under

Alternative D would result in fewer impacts on water resources than Alternative A.

Impacts from Riparian Areas and Wetland Management

Alternative D identifies specific actions to improve and restore riparian habitats through management. These actions include restoration activities, vegetation treatments for native species, managing for proper functioning condition, reducing hot season grazing, using herding and other techniques to distribute livestock, authorization of new water developments and modifications of existing developments out of riparian areas. Many of these actions are tools currently used by the agencies in the permit process to alleviate impacts due to grazing. However, many of the LUPs do not have these types of tools listed as requirements. Alternative D would result in fewer impacts on water resources than Alternative A.

4.18.8 Alternative E

Alternative E does not outline specific management actions and would result in similar impacts on water resources as Alternative A. Resources affected are described below.

Impacts from GRSG Management

Under Alternative E, GRSG habitat is defined as core, PHMA, or GHMA, which correlates to PHMA, GHMA, and OHMA. Under Alternative E, GRSG management areas would be identified. It also calls for collaborating with the Nevada Governor's Sagebrush Ecosystem Council, monitoring habitat, imposing predation controls, instituting a mitigation banking program, mitigating habitat, and requiring net conservation gain. Mitigation of habitat, specifically restoring or creating habitat could reduce impacts on water resources, but the result would depend on the actions and location of the work. Alternative E would result in fewer impacts on water resources than under Alternative A.

Impacts from Land Uses and Realty Management

For major and minor ROWs, Alternative E would manage core and PHMA as avoidance areas and GHMA as open to ROWs and SUAs. For land disposals, the same number of acres in priority, core, and general habitat would be retained and would be available for disposal, as under Alternative A. Alternative E also would avoid conflicts between habitat and ROWs and would require projects to avoid, minimize, and mitigate to result in a net conservation gain. Alternative E would result in fewer impacts on water resources than under Alternative A.

Impacts from Renewable Energy Management

For wind energy, core, and PHMA, Alternative E would manage them as avoidance areas and would manage GHMA as open to ROWs and SUAs. For solar energy, BLM-administered lands would be managed as exclusion areas, and National Forest System lands would be managed as either avoidance or open areas for all habitat types. Alternative E also would avoid conflicts between

habitat and ROWs. It would result in fewer impacts on water resources than under Alternative A.

Impacts from Livestock Grazing Management

Alternative E would be the same as under Alternative A for livestock grazing. It also identifies strategies for improving GRSG habitat through prescribed grazing and for ensuring grazing maintains or enhances SGMA. Additionally, Alternative E requires meeting existing BLM and Forest Service policies, such as RAC Standards and Guidelines for Ecological Health. It also calls for meeting PFC in riparian areas. Alternative E would result in fewer impacts on water resources than under Alternative A.

Impacts from Wild Horse and Burro Management

Alternative E would be the same as under Alternative A for wild horses and burros. It requires management of wild horses and burros at AMLs. Existing BLM and Forest Service policies, as well as associated LUPS, already require management of wild horses and burros at AML. Impacts would be the same as under Alternative A.

Impacts from Leasable Minerals Management

Alternative E would manage core and priority habitat as CSU and general habitat as open. It does not identify areas as closed or open to energy fluid minerals, oil and gas, and geothermal exploration and development. For nonenergy fluid leasables, all habitats would be managed as open. It also requires project proponents to avoid, minimize, and mitigate occupied and suitable habitat, to result in a net conservation gain. Alternative E would result in fewer impacts on water resources than under Alternative A.

Impacts from Locatable Minerals Management

Under Alternative E, all habitats would be managed as open to locatable mineral exploration or development. It requires project proponents to avoid, minimize, and mitigate GRSG habitat. Alternative E would result in fewer impacts on water resources than under Alternative A.

Impacts from Salable Minerals Management

Under Alternative E, all habitats would be managed as open for consideration for mineral material disposal. It requires project proponents to avoid, minimize, and mitigate occupied and suitable habitat, to result in a net conservation gain. Alternative E would result in fewer impacts on water resources than under Alternative A.

Impacts from Vegetation and Soils Management

Alternative E would not identify any specific numbers of acres for vegetation treatment. It does identify general actions that could be taken to improve habitat and vegetation communities, including pinyon-juniper removal, plantings and seedings, and invasive weed treatments. Alternative E would result in fewer impacts on water resources than under Alternative A.

Impacts from Fire and Fuels Management

Alternative E would not specify any specific numbers of acres for hazardous fuels management or post-fire rehabilitation. It does identify general actions for suppression, particularly those associated with improving initial suppression attacks. Based on these actions, Alternative E could have fewer impacts on water resources than under Alternative A.

Impacts from Comprehensive Travel and Transportation Management

Under Alternative E, core and PHMA would be managed as limited to existing routes for motorized vehicles, and GHMA would be managed as open to all modes of cross-country travel. It would require collaboration between local, state, and federal agencies to designate OHV areas outside of GRSG management areas. Alternative E would seek to avoid, minimize, or mitigate new activities. Alternative E would result in fewer impacts on water resources than under Alternative A.

Impacts from Recreation Management

Alternative E would not identify areas as closed to recreation or specify any conservation measurements for recreation. Impacts would be the same as under Alternative A.

Impacts from Riparian Areas and Wetland Management

Alternative E would maintain or achieve PFC and would meet the standards and guidelines for ecological health. Both of these actions are required under the Standards and Guidelines for Livestock Grazing Administration (43 CFR, Part 4180.2 [b]). It identifies strategies for improving GRSG habitat through prescribed grazing actions to ensure that grazing activities maintain or enhance SGMA and improve vegetation in riparian habitats. Alternative E would result in fewer impacts on water resources than under Alternative A.

4.18.9 Alternative F

Alternative F generally reduces land disturbances and would result in fewer impacts on water resources associated with a particular use compared with Alternative A. Resources affected are described below.

Impacts from GRSG Management

Impacts would be the same as Alternative B.

Impacts from Land Uses and Realty Management

Under Alternative F, for major and minor ROWs, all acres in PHMA and GHMA would be managed as exclusion areas, as compared to Alternative A where the majority of lands are open. For land disposals, all acres in PHMA would be managed as retention areas and GHMA would be managed the same as Alternative B which is also the same as Alternative A. Under this alternative, there would be a 3 percent cap on discrete human disturbance in PHMA. Once the cap is met, no new activities that would result in land disturbance would be authorized. This would have an overall benefit on water resources, specifically

water quality. Reduction of surface disturbance activities through either exclusion or avoidance would reduce potential for soil erosion thereby reducing impacts on water quality and reduce the need for water for project use, reducing impacts on water quantity. Alternative F would result in fewer impacts on water resources than Alternative A.

Impacts from Renewable Energy Management

Under Alternative F, for wind energy and solar energy, all acres in PHMA and GHMA would be managed as ROW/SUA exclusion, as compared to Alternative A where the majority of lands are open to wind energy. Impacts from renewable energy management would be similar to impacts from lands and realty management. Additionally, ROWs and SUAs associated with renewable energy management are typically large in size (several thousand acres) and in many cases require completely grading a site, particularly for solar projects. This amount of land disturbance can amplify impacts at the project level. The 3 percent cap on discrete human disturbance would also reduce activities in PHMA. Alternative F would result in fewer impacts on water resources than Alternative A.

Impacts from Livestock Grazing Management

Under Alternative F, acreages of habitat identified as available and unavailable to livestock grazing for PHMA and GHMA would be the same as under Alternative A. However, Alternative F would rest 25 percent of PHMA and GHMA each year and would limit vegetation utilization levels to 25 percent per year. These actions combined would reduce use in PHMA and GHMA. Range improvement construction would increase due to the need to fence out PHMA and GHMA from grazing use being permitted on adjacent areas. These actions would result in less grazing in PHMA and GHMA, thereby reducing impacts on water resources. Alternative F would result in fewer impacts on water resources than Alternative A.

Impacts from Wild Horse and Burro Management

Impacts would be similar to Alternative A, except that wild horse AMLs would be reduced by 25 percent in occupied GRSG habitats. While impacts from wild horses and burros would remain, this would reduce the effects of wild horses described under Alternative A.

Impacts from Leasable Minerals Management

Under Alternative F, all acres in PHMA and GHMA would be managed as closed to energy fluid minerals, oil and gas, and geothermal, as compared to Alternative A where the majority of land is open for these uses. For nonenergy leasable, PHMA would be managed as closed and GHMA would be managed as open subject to standard stipulations, as compared to Alternative A. This alternative identifies actions and conservation measures for areas that are already leased. Reduction of surface disturbance activities through either exclusion or avoidance would reduce potential for soil erosion thereby reducing impacts on

water quality and reduce the need for water for project use, reducing impacts on water quantity. Alternative F would result in fewer impacts on water resources than Alternative A.

Impacts from Locatable Minerals Management

Under Alternative F, all acres in PHMA would be recommended for withdrawal to locatable mineral exploration or development as compared to Alternative A where the majority of lands are open for this use. Similar to Alternative A, all acres in GHMA would be managed as open to locatable mineral exploration or development. RDFs (consistent with applicable law) associated with reducing surface disturbance, vegetation reclamation and stream crossings would all reduce erosion potential thereby reducing impacts on water resources. All locatable mineral activities would continue to be managed under the regulations at 43 CFR, Part3809 through the approval of a Notice of Intent or a Plan of Operations. Reduction of surface disturbance activities through withdrawal would reduce potential for soil erosion thereby reducing impacts on water quality and reduce the need for water for project use, reducing impacts on water quantity. Under this alternative, there would be a 3 percent cap on discrete human disturbance in GRSG habitat. Once the cap is met, no new activities that would result in land disturbance would be authorized. This would have an overall benefit on climate change. Alternative F would result in fewer impacts on water resources than Alternative A.

Impacts from Salable Minerals Management

Under Alternative F, all acres in PHMA would be managed as closed to mineral material disposal and similar acreages in GHMA would be managed as open for consideration for mineral material disposal on a case-by-case basis. Under this alternative, there would be a 3 percent cap on discrete human disturbance in GRSG habitat. Once the cap is met, no new activities that would result in land disturbance would be authorized. This would have an overall benefit on water resources. Alternative F would result in fewer impacts than Alternative A.

Impacts from Vegetation and Soils Management

Impacts would be the same as Alternative A.

Impacts from Fire and Fuels Management

Impacts would be the same as Alternative B.

Impacts from Comprehensive Travel and Transportation Management

Under Alternative F, more acres in PHMA and GHMA would be managed as limited to existing routes for motorized vehicles and fewer acres would be managed as open to motorized vehicles as compared to Alternative A. Roads and trails generally result in impacts on water quality by removing vegetation and creating vectors for surface runoff and sediment movement directly into streams. Roads and trails act as new channels, crisscrossing the landscape and concentrating water. When these tracks cross a stream, it is an open outlet for

the water and sediment to enter. Alternative F would result in fewer impacts on water resources than Alternative A.

Impacts from Recreation Management

Alternative F would not close any areas to recreational activities; it would specify that any SRPs or Forest Service SUAs must have a neutral or beneficial effect on PHMA. It would also specify that timing of certain recreational activities and prohibits cross-country travel in priority GRSG habitat. Neutral or beneficial impacts and no cross-country travel in GRSG habitat would result in fewer impacts on water resources. Therefore, Alternative F would result in fewer impacts on water resources than Alternative A.

Impacts from Riparian Areas and Wetland Management

Alternative F would not identify new water developments in occupied habitat unless it can be shown to benefit GRSG. It would also modify existing developments to maintain the continuity of the predevelopment riparian area in GRSG habitats, make modifications where necessary, including dismantling water developments. Alternative F would result in fewer impacts on water resources than Alternative A.

4.18.10 The Proposed Plan

The Proposed Plan combines aspects of Alternative D and the revised Alternative E and would result in fewer impacts on water resources associated with a particular use, compared to Alternative A.

The Proposed Plan would require a 3 percent disturbance cap on surface-disturbing activities in PHMA (see **Appendix F**), and it would require RDFs consistent with applicable law in PHMA, GHMA, and OHMA. It would also require all disturbances to result in a net conservation gain for GRSG and their habitat. Lek buffers would also be required (see **Appendix B**).

Collectively, these GRSG conservation management actions would increase mitigation requirements for land use authorizations. This would result in more complex project designs, potentially excluding infrastructure placement in the most cost-effective locations and potentially resulting in overall greater development costs. A corresponding effect could be a reduction in the number of authorization applications received for activities in PHMA and longer, more complicated review periods for those that are proposed in PHMA.

Impacts from GRSG Management

The Proposed Plan identifies PHMA and GHMA and additional acres as OHMA. Of the acres designated as PHMA, some are identified as SFA. These acres are recommended for withdrawal from mining, are managed as NSO for mineral leasing, and are prioritized for management and conservation. OHMA is mapped habitat that is potentially suitable. Protecting GRSG habitat would result in few land disturbances and could reduce impacts on water quality. Measures may also include protecting water sources from future use, resulting in increased water

availability. The Proposed Plan would result in fewer impacts on water resources than under Alternative A.

Impacts from Land Uses and Realty Management

Under the Proposed Plan, for major ROWs, PHMA and GHMA would be managed as avoidance areas, whereas OHMA would be managed as open. For land disposals, PHMA and GHMA would be held in retention. OHMA would be managed for retention and disposal, which would be the same as under Alternative A. For minor ROWs, PHMA would be managed as avoidance areas, whereas GHMA and OHMA would be managed as open, similar to Alternative A. Reducing surface disturbance through avoidance would reduce the potential for soil erosion, thereby reducing impacts on water quality and reducing the need for water for project use. The Proposed Plan would result in fewer impacts on water resources than would Alternative A.

Impacts from Renewable Energy Management

Under the Proposed Plan, for wind energy, PHMA would be managed as exclusion areas and GHMA would be managed as avoidance areas. OHMA would be managed as open, which is similar to Alternative A. Under the Proposed Plan, for solar energy, all PHMA, GHMA, and OHMA would be managed as exclusion area on BLM-administered lands and avoidance and open areas on National Forest System lands, as compared to Alternative A. There would be minimal to no impacts from renewable energy management due to the restrictions being put in place. The Proposed Plan would result in fewer impacts on water resources than Alternative A.

Impacts from Livestock Grazing Management

Under the Proposed Plan, the same number of acres in PHMA, GHMA, and OHMA would be managed as available for livestock grazing as under Alternative A. The BLM would continue to manage to ensure water quality complies with the Standards and Guidelines for Livestock Grazing Administration (43 CFR, Part 4180.2 [b]). The Forest Service manages livestock grazing under the direction in 36 CFR, Part 222, Forest Service Manual 2200, and Forest Service Handbook 2209. The Proposed Plan includes several actions that would benefit water resources, resulting in improved water quality and water availability, in the planning area. These actions are as follows:

- Managing for riparian vegetation
- Applying principles of prescriptive livestock grazing to control time and timing of grazing during the hot season
- Authorizing new water developments when the diversion would benefit habitat
- Modifying developments to maintain or improve riparian habitat
- Salting and supplemental feeding at least 1 mile from riparian habitat

- Retiring grazing privileges on a voluntary basis

The Proposed Plan would result in fewer impacts on water resources than Alternative A.

Impacts from Wild Horse and Burro Management

Management areas under the Proposed Plan would be the same as those identified under Alternative A; however, actions associated with the Proposed Plan would benefit water resources. These areas would continue to be managed at the AML level and to achieve a natural ecological balance with other uses, such as completing rangeland health assessments. Additional actions would reduce impacts on water quality and water sources; examples are conducting gathers when the upper levels of AML are reached and during emergency situations, and providing for new water locations to improve dispersal and avoid more heavily impacted sites. The Proposed Plan would result in fewer impacts on water resources than Alternative A.

Impacts from Leasable Minerals Management

Under the Proposed Plan, PHMA would be managed as NSO, with limited exceptions for fluid minerals, and would be closed to nonenergy leasables. GHMA would be managed under minor stipulations (CSUs and TLs) for energy fluid minerals, including oil and gas and geothermal, and open to nonenergy leasables. Similar to Alternative A, OHMA would be managed as open to all fluid minerals, subject to standard stipulations but with RDFs applied consistent with applicable law. The stipulations for each of the habitat types are different depending on the level of the habitat. For PHMA, there are major stipulations that are more restrictive, for GHMA there are moderate stipulations that are less restrictive, and for OHMA there are standard stipulations with additional RDFs consistent with applicable law.

Reducing surface disturbances through either major or minor stipulations would reduce the potential for soil erosion, thereby reducing impacts on water quality and the need for water for projects. The Proposed Plan would result in fewer impacts on water resources than would Alternative A.

Impacts from Locatable Minerals Management

Under the Proposed Plan, PHMA would be managed as open, except for acres in the SFA, which would be recommended for withdrawal. This would result in more acres recommended for withdrawal under this alternative, as compared to Alternative A. GHMA and OHMA would both be managed as open, similar to Alternative A, but they would be subject to RDFs consistent with applicable law.

Reducing surface disturbances through land withdrawals in the SFA and RDF (consistent with applicable law) s would reduce the potential for soil erosion; this would in turn reduce impacts on water quality and the need for water for projects, thereby reducing impacts on water quantity. The Proposed Plan should result in fewer impacts on water resources than Alternative A.

Impacts from Salable Minerals Management

Under the Proposed Plan, PHMA would be managed as closed. Similar to Alternative A, GHMA and OHMA would be managed as open for consideration for mineral material disposal on a case-by-case basis, but with RDFs applied consistent with applicable law. Reduction of surface disturbances through closure, application of RDFs consistent with applicable law, or limited disturbance would reduce the potential for soil erosion; this would reduce impacts on water quality, thereby reducing the need for water for projects. The Proposed Plan would result in fewer impacts on water resources than Alternative A.

Impacts from Vegetation and Soils Management

The Proposed Plan specifies numbers of acres for pinyon-juniper removal and grass treatments by year. It also has several actions specifying habitat restoration, types of treatments, and timing that would benefit water resources. Based on the actions associated with the Proposed Plan, there should be fewer impacts on water resources overall than under Alternative A.

Impacts from Fire and Fuels Management

The Proposed Plan would not specify any acres for hazardous fuels management. It does identify general actions for suppression activities, pre- and post-fire treatments, timing of treatments, resting, and use of native plants for revegetation. Based on these actions, the Proposed Plan would have fewer impacts on water resources than Alternative A.

Impacts from Comprehensive Travel and Transportation Management

Impacts would be the same as Alternative B.

Impacts from Recreation Management

While management under the Proposed Plan would not close any areas to recreation, it would specify that any SRPs or Forest Service SUAs must have a neutral or beneficial effect on PHMA. It also would specify that no new recreation facilities would occur in PHMA and GHMA, with the exception of trailheads and parking areas where existing routes have been closed to motorized use. Neutral or beneficial impacts and no new recreation facilities in GRSG habitat would result in fewer impacts on water resources. Therefore, the Proposed Plan would result in fewer impacts on water resources than Alternative A.

Impacts from Riparian Areas and Wetland Management

Impacts would be the same as Alternative B.

4.19 TRIBAL INTERESTS (INCLUDING NATIVE AMERICAN RELIGIOUS CONCERNS)

4.19.1 Methods and Assumptions

Indicators

Indicators of impacts on GRSG are as follows:

- Tribal interests in the development of management goals and objectives for GRSG management primarily focus on conservation of the species, and therefore are not considered an impact per se. Nevertheless, several Nevada tribes hold federal grazing permits that result in economic benefits. Those tribes also recognize that livestock grazing may lead to decreases in GRSG populations. Tribes that hold grazing permits attempt to balance the needs of maintaining traditional values with the economic benefits realized through livestock grazing.

Assumptions

The analysis includes the following assumptions:

- Tribal interests in the development of goals and objectives for GRSG management primarily focus on conservation of the species. GRSG are important to tribal communities in maintaining traditional culture and values. Therefore, activities that harm GRSG populations would decrease tribal opportunities to maintain traditional practices and values such as observing lekking behavior. In addition, tribes rely on access to traditional pine nutting areas and juniper trees to maintain their cultural practices and values. Travel restrictions placed on roads could decrease tribal opportunities to access critical pine nutting areas. Thinning projects or the removal of pinyon and juniper trees to enhance GRSG habitat could decrease tribal opportunities to access pine nutting areas and juniper trees, although site-specific NEPA analyses completed prior to the implementation of any thinning project would include additional government-to-government consultation with tribes in order to avoid or minimize impacts on tribal concerns. Nevada tribes also hold federal grazing permits that result in economic benefits. Those tribes also recognize that livestock grazing may lead to decreases in GRSG populations. Tribes that hold grazing permits attempt to balance the needs of maintaining traditional values with economic benefits realized through livestock grazing.

4.19.2 Nature and Type of Effects

The nature and type of most effects on tribal interests are general and non-quantifiable in nature. In general, activities that result in ground disturbance to lands currently or historically occupied by GRSG could decrease opportunities

for tribes to maintain traditional cultural practices and values if these activities result in decreases in GRSG populations. These include, but are not necessarily limited to, granting ROWs/SUAs for road and highway construction, wind energy development, vegetation treatments in sagebrush communities, development of leasable, locatable, salable, and fluid minerals, OHV use, SRPs/RSUAs, livestock grazing, and wild horse management practices. In addition, natural processes that are impossible to control likely add to the human-caused impacts on GRSG listed above, including climate change, drought, and lightning-caused fires. The general impacts on tribal interests that would result through the implementation of each alternative analyzed in this EIS are described below.

Tribes expressed several concerns not analyzed in detail in this EIS. One concern was with sonic booms from low-flying military aircraft. The recent "F-35A Training Basing" EIS published by the United States Air Force in June, 2012, specifically analyzed the effects of low-flying military fighter jets on GRSG (USAF 2012). Effects analyzed in the F-35A EIS included noise, sonic booms, and jet-bird collisions. The F-35A EIS concluded that, based on previous scientific studies, the effects of sonic booms on wildlife were "of short duration and rarely result in injury or negative population effects" (USAF 2012). Specifically regarding GRSG, the F-35A EIS notes that few studies have been conducted on the effects of low-flying aircraft and sonic booms on lekking behavior and hatching success. However, such studies on similar upland game birds, including the wild turkey and bobwhite quail, found no decreased success rate in either breeding or hatching success from low-flying fighter jets producing sonic booms (USAF 2012).

The Summit Lake Tribe expressed concerns about on-going negotiations regarding road realignments and possible expansions of tribal reservation boundaries. The future status of these projects as they relate to GRSG planning efforts is unknown, but the potential approval of these types of projects or proposals would be subject to further analysis through the NEPA process or through legislative action.

Finally, tribes expressed concerns that hunting permits continue to be issued while GRSG populations are dwindling. None of the alternatives analyzed below specifically address this issue. The States of Nevada and California control GRSG hunting in the study area; federal agencies have no jurisdiction regarding appropriate levels of hunting.

4.19.3 Impacts Common to All Alternatives

Impacts on tribal interests that are common to all alternatives are applicable for Vegetation and Soils Management, Fire and Fuels Management, Wild Horse and Burro Management, Nonenergy Leasable Minerals Management, Fluid Minerals Management, Mineral split-estates Management, Renewable Energy Management, and Special Designations Management.

Impacts from Vegetation and Soils Management

Restoring sagebrush habitat and resting PHMA and GHMA from livestock grazing could enhance GRSG populations. If this is the case, then these practices could help to ensure the survival of traditional tribal practices such as observing lekking behavior in future generations. Resting allotments, however, could also decrease economic revenue for tribes holding grazing permits, but such impacts could be temporary if grazing levels were restored following resting periods.

Pinyon pine and juniper trees have both been identified as important to tribal communities for maintaining traditional cultural practices and values. Thinning or removal of pinyon pine or juniper trees could decrease tribal opportunities to maintain the practices and values centered on these trees. However, site-specific NEPA analyses completed prior to the implementation of any thinning project would include additional government-to-government consultation with tribes in order to avoid or minimize impacts on tribal concerns.

Impacts from Fire and Fuels Management

Fire management activities, including prescribed burns and suppression tactics implemented to protect and preserve PHMA and GHMA could increase tribal opportunities for maintaining traditional cultural practices and values if their implementation resulted in increased or stabile GRSG populations. In addition, tribal economic interests could be maintained by applying appropriate and consistent grazing levels from year to year if fire and fuels management strategies help reduce the onset of catastrophic fires that result in the closing of grazing allotments permitted to tribes. Reductions in livestock grazing AUMs as part of fire/fuel management strategies, however, could decrease economic revenue to tribes that hold grazing permits.

Impacts from Wild Horse and Burro Management

Maintaining current wild horse and burro management strategies in PHMA and GHMA could decrease tribal opportunities to maintain specific traditional practices and values such as observing lekking behavior if those current management practices have led to decreases in GRSG populations.

Impacts from Nonenergy Leasable Minerals Management

Closing or reducing opportunities in PHMA and GHMA to produce nonenergy leasable minerals could increase tribal opportunities to maintain specific traditional practices and values such as observing lekking behavior if the current leasing of nonenergy minerals has led to decreases in GRSG populations.

Impacts from Leasable Minerals Management

All lands that are currently leased for fluid mineral development would allow for development of that resource with additional restrictions. This could decrease tribal opportunities to maintain specific traditional practices and values such as observing lekking behavior if the leasing of fluid minerals has led to decreases in GRSG populations.

Impacts from Renewable Energy Management

Because all alternatives propose or could lead to ROW/SUAs exclusions and avoidance in PHMA and/or GHMA habitat for renewable energy development (wind and solar), this would result in increased tribal opportunities to maintain specific traditional practices and values such as observing lekking behavior if this management strategy leads to stabile or increased GRSG populations in the future.

Impacts from Special Designations Management

All alternatives either propose to maintain current acreage of ACECs or create new ACECs/ specifically to protect GRSG habitat. As a result, this action would be neutral or beneficial in its impacts on tribes regarding their maintenance of traditional cultural practices and values.

Alternatives C and F propose the creation of specific ACECs; in contrast, the remaining alternatives are silent or propose to maintain current acreage of ACECs.

4.19.4 Alternative A

Impacts from GRSG Management

Alternative A does not propose establishing PHMA and GHMA with special management goals and objectives for GRSG management. As a result, this alternative could lead to decreased opportunities for tribes to maintain traditional cultural practices and values such as observing lekking behavior if the non-establishment of PHMA and GHMA leads to future decreases in GRSG populations.

Impacts from Riparian Areas, Wetlands, and Water Resources Management

As riparian areas, wetlands, and other water resources are improved through management for GRSG, this could increase the opportunities for tribes to participate in traditional cultural practices associated with these resources.

Impacts from Livestock Grazing Management

By making no acres unavailable for livestock grazing in GRSG habitat, Alternative A could lessen the opportunities for tribes to maintain traditional practices, such as observing lekking behavior, if current grazing management is decreasing GRSG populations. However, Alternative A could help to maintain economic benefits to tribes that hold grazing permits, if their current AUMs are not reduced in the future due to special management in GRSG habitat.

Impacts from Climate Change Management

Unknown as this alternative is silent on specific climate change management goals and objectives.

Impacts from Locatable Minerals Management

Continued locatable mineral development could decrease tribal opportunities to practice traditional cultural behavior and values such as observing lekking behavior.

Impacts from Salable Minerals Management

Continued salable mineral development could decrease the opportunities for tribes to participate in traditional cultural practices such as observing lekking behavior.

Impacts from Unleased Fluid Minerals Management

Continued fluid mineral development could decrease the opportunities for tribes to participate in traditional cultural practices such as observing lekking behavior.

Impacts from Land Uses and Realty Management

Continued lands and realty actions/authorizations could decrease the opportunities for tribes to participate in traditional cultural practices such as observing lekking behavior.

Impacts from Comprehensive Travel and Transportation Management

There are no current travel restrictions associated with this alternative, except for those in designated wilderness or in WSAs. This would likely maintain current tribal access to important pine nutting areas and juniper trees used to maintain traditional tribal cultural practices and values.

Impacts from Recreation Management

Unknown as this alternative is silent on specific recreation management goals and objectives.

4.19.5 Alternative B

Impacts from GRSG Management

Alternative B would propose to establish approximately 16.5 million acres as PHMA and GHMA and establish management goals and objectives for specific resources in PHMA and GHMA that could stabilize or increase GRSG populations in the future. If successful, these management goals and objectives could lead to increased opportunities for tribes to maintain traditional cultural practices and values such as observing lekking behavior.

Impacts from Riparian Areas, Wetlands, and Water Resources Management

Management actions associated with this alternative for riparian, wetlands, and water sources would protect this resource, thereby providing increased opportunities for tribes to maintain traditional cultural practices and values such as observing brood rearing habitat.

Impacts from Livestock Grazing Management

By making no acres unavailable for livestock grazing in PHMA and GHMA, Alternative B could lessen opportunities for tribes to maintain traditional practices, such as observing lekking behavior, if current grazing management is decreasing GRSG populations. However, Alternative B could help to maintain economic benefits to tribes that hold grazing permits if their current AUMs are not reduced in the future due to special management in PHMA and GHMA.

Impacts from Climate Change Management

This alternative is silent on specific climate change management goals and objectives.

Impacts from Locatable Minerals Management

Recommending for withdrawal up to 9.6 million acres in PHMA from future mineral development could increase tribal opportunities to maintain specific traditional practices and values such as observing lekking behavior if the current permitting of locatable minerals has led to decreases in GRSG populations.

Impacts from Salable Minerals Management

Closing approximately 9.6 million acres could increase the opportunities for tribes to participate in traditional cultural practices such as observing lekking behavior if the closures result in increases or stabilization of GRSG populations.

Impacts from Unleased Fluid Minerals Management

Closing approximately 9.6 million acres of lands for oil/gas and geothermal exploration could increase the opportunities for tribes to participate in traditional cultural practices such as observing lekking behavior if the closures result in increases or stabilization of GRSG populations.

Impacts from Land Uses and Realty Management

Because this alternative proposes ROW/SUA exclusion in PHMA and ROW/SUA avoidance in GHMA habitat, this would result in increased opportunities for tribes to maintain traditional practices because rights of way development and activities would be excluded or limited.

Impacts from Comprehensive Travel and Transportation Management

This alternative would limit approximately 9.6 million acres of PHMA to motorized travel on existing roads in PHMA/. This would likely maintain current tribal access to important pine nutting areas and juniper trees used to maintain traditional tribal cultural practices and values.

Impacts from Recreation Management

Allowing BLM SRPs and recreational SUAs in PHMA only if they have neutral or beneficial benefits to GRSG populations could lead to increased opportunities for tribes to maintain traditional practices and values such as observing lekking behavior.

4.19.6 Alternative C

Impacts from GRSG Management

Alternative C would propose 16.5 million acres as PHMA and establish management goals and objectives for specific resources in PHMA that could stabilize or increase GRSG populations in the future. If successful, these management goals and objectives could lead to increased opportunities for tribes to maintain traditional cultural practices and values such as observing lekking behavior.

Impacts from Riparian Areas, Wetlands, and Water Resources Management

Management actions associated with this alternative for riparian, wetlands, and water sources would protect these resources, thereby providing increased opportunities for tribes to maintain traditional cultural practices and values such as observing brood rearing habitat.

Impacts from Livestock Grazing Management

By making nearly 16.5 million acres unavailable for livestock grazing, including all acres in PHMA, Alternative C could increase opportunities for tribes to maintain traditional practices, such as observing lekking behavior, if this grazing strategy stabilizes or increases future GRSG populations. However, this alternative may decrease economic revenue to tribes holding grazing permits if their current AUMs are reduced.

Impacts from Climate Change Management

Unknown as this alternative is silent on specific climate change management goals and objectives.

Impacts from Locatable Minerals Management

Petitioning to withdrawal 16.0 million acres of lands located in PHMA from future mineral development could increase tribal opportunities to practice traditional cultural behavior and values such as observing lekking behavior if this management strategy stabilizes or increases GRSG populations.

Impacts from Salable Minerals Management

Closing approximately 14.6 million acres could increase the opportunities for tribes to participate in traditional cultural practices such as observing lekking behavior if the closures result in increases or stabilization of GRSG populations.

Impacts from Unleased Fluid Minerals Management

Closing approximately 14.6 million acres could increase the opportunities for tribes to participate in traditional cultural practices such as observing lekking behavior if the closures result in increases or stabilization of GRSG populations.

Impacts from Land Uses and Realty Management

Because this alternative proposes ROW/SUA exclusion in PHMA, this would result in increased opportunities for tribes to maintain traditional practices because rights of way development and activities would be limited.

Impacts from Comprehensive Travel and Transportation Management

This alternative would limit approximately 16.5 million acres of PHMA to motorized travel on existing roads in PHMA. This would likely maintain current tribal access to important pine nutting areas and juniper trees used to maintain traditional tribal cultural practices and values.

Impacts from Recreation Management

Allowing BLM SRPs and recreational SUAs in PHMA only if they have neutral or beneficial benefits to GRSG populations could lead to increased opportunities for tribes to maintain traditional practices and values such as observing lekking behavior.

4.19.7 Alternative D

Impacts from GRSG Management

Alternative D would propose approximately 16.5 million acres as PHMA and GHMA and 6.7 million acres as OHMA and establish management goals and objectives for specific resources that could stabilize or increase GRSG populations in the future. These management goals and objectives could lead to increased opportunities for tribes to maintain traditional cultural practices and values such as observing lekking behavior.

Impacts from Riparian Areas, Wetlands, and Water Resources Management

Management actions associated with this alternative for riparian, wetlands, and water sources would protect these resources, thereby providing increased opportunities for tribes to maintain traditional cultural practices and values such as observing brood rearing habitat.

Impacts from Livestock Grazing Management

By making no acres unavailable for livestock grazing in PHMA, GHMA, and OHMA, Alternative D could decrease opportunities for tribes to maintain traditional practices, such as observing lekking behavior, if current grazing practices are decreasing GRSG populations. However, this alternative could help to maintain economic benefits to tribes that hold grazing permits if their current AUMs are not reduced in the future due to special management in PHMA, GHMA, and OHMA.

Impacts from Climate Change Management

Considering climate change and its effects on current and potential future changes in vegetation patterns in order to manage GRSG habitat may include treatments to eradicate invasive species, removal of pinyon and/or juniper trees

that have encroached into sagebrush habitats in lower elevations, and increasing the connectivity of sagebrush habitats. These management goals could increase opportunities for tribes to maintain traditional cultural practices and values such as observing lekking behavior if these management strategies stabilize or increase GRSG populations. The removal of pinyon and/or juniper trees could decrease tribal opportunities for pine nutting and using juniper trees in traditional practices. However, site-specific NEPA analyses completed prior to the implementation of any thinning project or removal of pinyon and/or juniper habitat would include additional government-to-government consultation with tribes in order to avoid or minimize impacts on tribal concerns.

Impacts from Locatable Minerals Management

Impacts would be the same as under Alternative A.

Impacts from Salable Minerals Management

Closing approximately 14.6 million acres could increase the opportunities for tribes to participate in traditional cultural practices such as observing lekking behavior if the closures result in increases or stabilization of GRSG populations.

Impacts from Unleased Fluid Minerals Management

Applying NSO stipulations (no exceptions) in PHMA and NSO in GHMA (with exceptions) to lands for oil/gas and geothermal exploration could increase the opportunities for tribes to participate in traditional cultural practices such as observing lekking behavior if the NSO stipulations result in increases or stabilization of GRSG populations.

Impacts from Land Uses and Realty Management

Because this alternative proposes ROW/SUA avoidance in PHMA and GHMA habitat, this would result in increased opportunities for tribes to maintain traditional practices because rights of way development and activities would be limited.

Impacts from Comprehensive Travel and Transportation Management

All PHMA and GHMA would be limited to existing roads and trails. This would likely maintain current tribal access to important pine nutting areas and juniper trees used to maintain traditional tribal cultural practices and values.

Impacts from Recreation Management

Allowing BLM SRPs and recreational SUAs in PHMA and GHMA only if they have neutral or beneficial benefits to GRSG populations could lead to increased opportunities for tribes to maintain traditional practices and values such as observing lekking behavior if current management strategies approving SRPs and RSUAs such as OHV race events contribute to decreases in GRSG populations.

4.19.8 Alternative E

Alternative E proposes to reduce the impact on GRSG habitat (core, priority, and general) by applying the avoid, minimize, and mitigate strategies, with the addition of the Conservation Credit System managed by the State of Nevada.

Impacts from GRSG Management

Alternative E would establish core, priority, and general habitat. It proposes special management goals and objectives for GRSG that could stabilize or increase their populations. These management goals and objectives could lead to increased opportunities for tribes to maintain traditional cultural practices and values, such as observing lekking behavior.

Impacts from Riparian Areas, Wetlands, and Water Resources Management

Management actions associated with Alternative E for riparian, wetlands, and water sources would protect these resources, thereby increasing opportunities for tribes to maintain traditional cultural practices and values, such as observing brood-rearing habitat.

Impacts from Livestock Grazing Management

Impacts would be the same as under Alternative A.

Impacts from Climate Change Management

Impacts would be the same as under Alternative A.

Impacts from Locatable Minerals Management

Although no habitat is recommended for withdrawal from future mining under Alternative E, the requirement to avoid, minimize, and mitigate, along with mitigation, such as the CCS in Nevada, could increase opportunities for traditional tribal practices, such as observing lekking behavior.

Impacts from Salable Minerals Management

Although no habitat is closed to salable mineral development under Alternative E, the requirement to avoid, minimize, and mitigate, along with mitigation, such as the CCS in Nevada, could increase opportunities for traditional tribal practices, such as observing lekking behavior.

Impacts from Unleased Fluid Minerals Management

Alternative E would maintain all unleased lands in core, priority, and general habitat open to oil and gas and geothermal exploration and development. The requirement to avoid, minimize, and mitigate, along with mitigation, such as the CCS in Nevada, could increase opportunities for traditional tribal practices, such as observing lekking behavior.

Impacts from Land Uses and Realty Management
Applying the avoid, minimize, and mitigate strategies, along with the use of the Conservation Credit System, should provide opportunities for continued traditional practices.

Impacts from Comprehensive Travel and Transportation Management
Impacts would be the same as under Alternative A.

Impacts from Recreation Management
Impacts would be the same as under Alternative A.

4.19.9 Alternative F

Impacts from GRSG Management
Alternative F would propose approximately 16.5 million acres as PHMA and GHMA and establish management goals and objectives for specific resources in PHMA and GHMA that could stabilize or increase GRSG populations in the future. If successful, these management goals and objectives could lead to increased opportunities for tribes to maintain traditional cultural practices and values such as observing lekking behavior.

Impacts from Riparian Areas, Wetlands, and Water Resources Management
Management actions associated with this alternative for riparian, wetlands, and water sources would protect these resources, thereby providing increased opportunities for tribes to maintain traditional cultural practices and values such as observing brood rearing habitat.

Impacts from Livestock Grazing Management
By not closing any acres to grazing management in PHMA and GHMA, this alternative could decrease opportunities for tribes to maintain traditional practices, such as observing lekking behavior, if current grazing practices are decreasing GRSG populations. Decreasing livestock use by 25 percent could help land health conditions and maintain opportunities for traditional uses. However, Alternative F could affect economic benefits to tribes that hold grazing permits if their current AUMs were reduced due to special management in PHMA and GHMA.

Impacts from Climate Change Management
Impacts would be the same as under Alternative A.

Impacts from Locatable Minerals Management
Impacts would be the same as under Alternative B.

Impacts from Salable Minerals Management
Impacts would be the same as under Alternative C.

Impacts from Unleased Fluid Minerals Management
Impacts would be the same as under Alternative C.

Impacts from Land Uses and Realty Management
Because this alternative proposes ROW/SUA exclusion in PHMA and GHMA habitat, this would result in increased opportunities for tribes to maintain traditional practices because rights of way development and activities would be limited.

Impacts from Comprehensive Travel and Transportation Management
All PHMA and GHMA would be limited to existing roads and trails. This would likely maintain current tribal access to important pine nutting areas and juniper trees used to maintain traditional tribal cultural practices and values.

Impacts from Recreation Management
Impacts would be the same as under Alternative C.

4.19.10 The Proposed Plan

The Proposed Plan provides for the continued tribal cultural practices by acknowledging the importance of traditional cultural practices.

Impacts from GRSG Management
The Proposed Plan would establish collaborative management goals and objectives in PHMA and GHMA that could stabilize or increase GRSG populations in the future. These management goals and objectives could lead to increased opportunities for tribes to maintain traditional cultural practices and values, such as observing lekking behavior.

Impacts from Riparian Areas, Wetlands, and Water Resources Management
The Proposed Plan would manage riparian areas for vegetation and structure, consistent with ecological site potential for GRSG seasonal habitat. This management goal could increase opportunities for tribes to maintain traditional cultural practices and values, such as observing lekking behavior.

Impacts from Livestock Grazing Management
The Proposed Plan would manage permitted livestock grazing to maintain PHMA and GHMA and to help meet all GRSG life cycle requirements. This could increase tribal opportunities to observe GRSG behavior if this strategy were to stabilize or increase GRSG populations. However, the Proposed Plan could reduce tribal economic benefits if their current AUMs were reduced to meet these management goals.

Impacts from Climate Change Management
Considering climate change and its effects on current and potential future changes in GRSG habitat vegetation patterns may include treatments to eradicate invasive species, remove pinyon-juniper that have encroached into

sagebrush habitats in lower elevations, and increase the connectivity of sagebrush habitats. These management goals could increase opportunities for tribes to maintain traditional cultural practices and values, such as observing lekking behavior, if these management strategies stabilize or increase GRSG populations. Removing pinyon-juniper could decrease tribal opportunities for collecting pine nuts and using juniper trees in traditional practices. However, site-specific NEPA analyses completed before the implementation of any thinning project or removal of pinyon-juniper habitat would include additional government-to-government consultation with tribes; this would avoid or minimize impacts on tribal concerns.

Impacts from Locatable Minerals Management

Petitioning to withdraw SFA from future mineral development could increase tribal values and opportunities to practice traditional cultural behavior if it were to stabilize or increase GRSG populations.

Impacts from Salable Minerals Management

Closing PHMA to salable minerals could increase the opportunities for tribes to participate in traditional cultural practices if the closures were to increase or stabilize GRSG populations.

Impacts from Unleased Fluid Minerals Management

Applying NSO stipulations (no exceptions) in SFA and applying NSO with two limited exceptions in PHMA for oil and gas and geothermal exploration could increase the opportunities for tribes to participate in traditional cultural practices, if the NSO stipulations were to increase or stabilize GRSG populations.

Impacts from Land Uses and Realty Management

The Proposed Plan would manage and minimize effects of land use actions on PHMA and GHMA; however, it would allow for corridors and ROWs that result in a net conservation gain for GRSG. Tribes would be able to maintain traditional practices by accessing pine nutting areas and observing lekking behavior. Restricting new development and land use authorizations near leks would likely maintain traditional tribal cultural practices and values.

Impacts from Comprehensive Travel and Transportation Management

All PHMA and GHMA would be limited to existing roads and trails. This would likely maintain current tribal access to important pine nutting areas and juniper trees used to maintain traditional tribal cultural practices and values.

Impacts from Recreation Management

Allowing BLM SRPs and recreational SUAs in PHMA and GHMA only if they have neutral or beneficial benefits for GRSG could increase opportunities for tribes to maintain traditional practices and values, if current management strategies approving SRPs and RSUAs, such as OHV races, were to contribute to decreases in GRSG populations.

4.20 CLIMATE CHANGE

4.20.1 Methods and Assumptions

Indicators

Indicators of impacts on GRSG are as follows:

- Change in available habitat for GRSG
- More areas closed to activities that contribute to greenhouse gas emissions

Assumptions

The analysis includes the following assumptions:

- There is a correlation between global concentrations of greenhouse gases and climate change.
- Future changes in precipitation and temperature regimes due to climate change will result in changes in vegetation, fire and fuels and water availability.

4.20.2 Nature and Type of Effects

Management actions that could affect climate change would include actions that increase GHG emissions, actions that reduce GHGs emissions, actions that create carbon sinks, and actions that eliminate or damage carbon sinks.

While GHG emissions or carbon sequestration may result from many of the proposed management actions, these changes would be quite small relative to state, national, or global GHG emissions. Relative to state and national GHG emissions, emission changes due to management actions associated with this LUPA would be negligible.

Implementing management for the following resources would have negligible or no impact on climate change and are therefore not discussed in detail: recreation, mineral split-estate, and ACECs.

4.20.3 Impacts Common to All Alternatives

The Central Basin and Range REA developed climate envelope models to provide an indication of the magnitude and direction shift in climate regime as it relates to the current distribution of upland conservation elements (Comer et al. 2012a). These models indicate potential changes in vegetation species or distributions based solely on climatic changes and are not an attempt at predicting actual species movement since that can be a result of several factors (Comer 2012a). These climate envelopes were developed for the 2060 time frame for a few species including pinyon and/or juniper woodland, big sagebrush shrubland, mixed salt desert scrub, and GRSG. In these models, 'contraction' indicates areas where the current climate characteristics will be replaced by a

different climate regime. Overlap indicates areas where current climate characteristics will remain the same. 'Expansion' indicates where the climate regime for a modeled resource is forecasted to occur outside of the current distribution.

Results of the climate envelopes for the conservation elements of interest in PHMA and GHMA are shown in **Figures 4-1** to **4-5**. Common among the vegetation assemblages, each model showed a shift in the movement and direction of assemblages in both elevation and a northerly direction. Between the sagebrush and salt desert scrub assemblages, it appears that where sagebrush is predicted to contract, salt desert scrub is predicted to expand. Additionally, salt desert scrub appears to be contracting mostly in the south where there could be potential for increasing Mojave species. This transition seems likely when coupled with the predicted temperature changes. Areas where future vegetation may become sparser could also become more susceptible to wind erosion, resulting in increasing expanses of desert pavement.

Climate envelope results for the GRSG show a potential for a considerable change in GRSG core occupied habitat. The majority of the existing habitat will see contraction. Areas with overlap are located mostly in the north with little expansion of habitat (see **Figure 4-1**). This map indicates where between 1 and 8 types are forecasted by 2060 to have climate envelopes overlapping current distributions; thus providing one indication of potential habitat resilience to climate-change refugia from Comer et al. 2012a.

Figure 4-2, **Figure 4-3**, and **Figure 4-4** show the bioclimate change envelopes for these of these vegetation communities.

For the pinyon and/or juniper assemblage, it appears that expansion will mostly occur to the north and most of the contraction areas appear to occur at higher elevations. The majority of the pinyon and/or juniper habitat appears to overlap existing habitat.

Results for each category (contraction, overlap, expansion) reflect agreement among 2 or more of 6 distinct spatial models (Comer et al. 2012a).

This would result in shifts in vegetation changes between sagebrush-dominated low elevations to more pinyon and/or juniper woodlands as well as altering current wildfire dynamics (Comer et al. 2012a).

Figure 4-5 displays the combining of the climate change envelopes for the major vegetation classes by overlaying the results of each forecast. By displaying the 'overlap' areas for each vegetation type climate envelope forecast and focusing on where multiple 'overlap' areas intersect, one can identify where future climate regimes will potentially be the same as today (Comer et al. 2012a). These areas could be further evaluated and identified as potential GRSG focal areas.

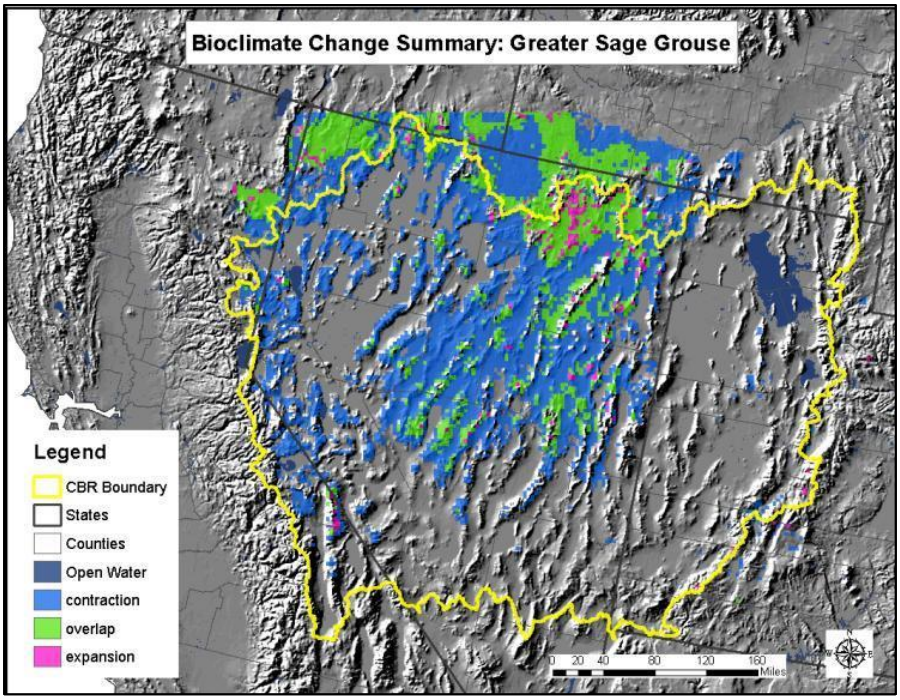

Figure 4-1. Climate Envelope Changes for Greater Sage-Grouse (Core Occupied Habitat) as of 2060 (Comer et al. 2012a).

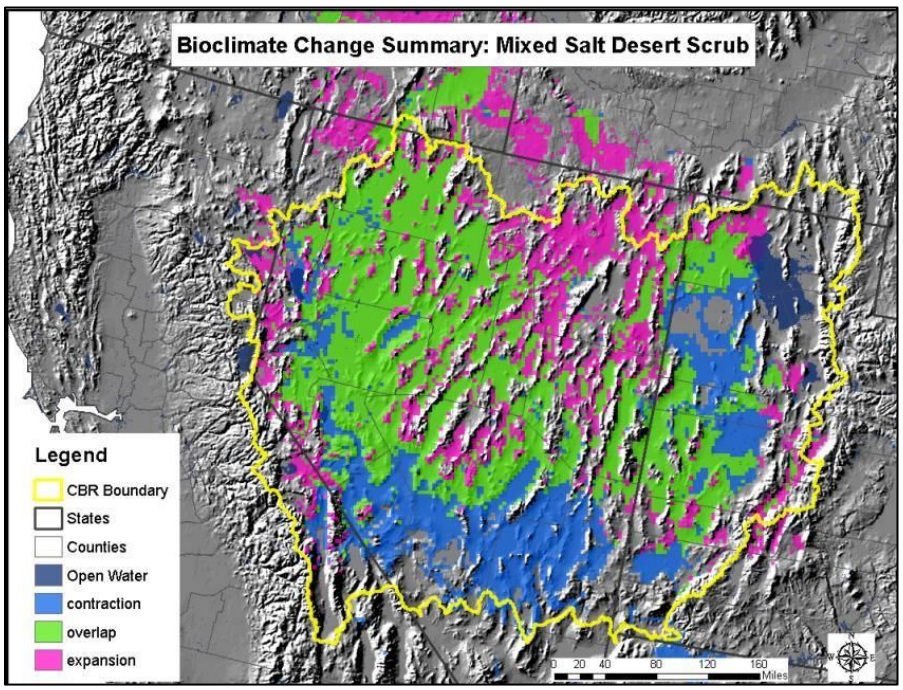

Figure 4-2. Forecasted Climate Envelope Changes for Inter-Mountain Basins Mixed Salt Desert Scrub as of 2060.
Results for each category (contraction, overlap, expansion) reflect agreement among 2 or more of 6 distinct spatial models (Comer et al. 2012a).

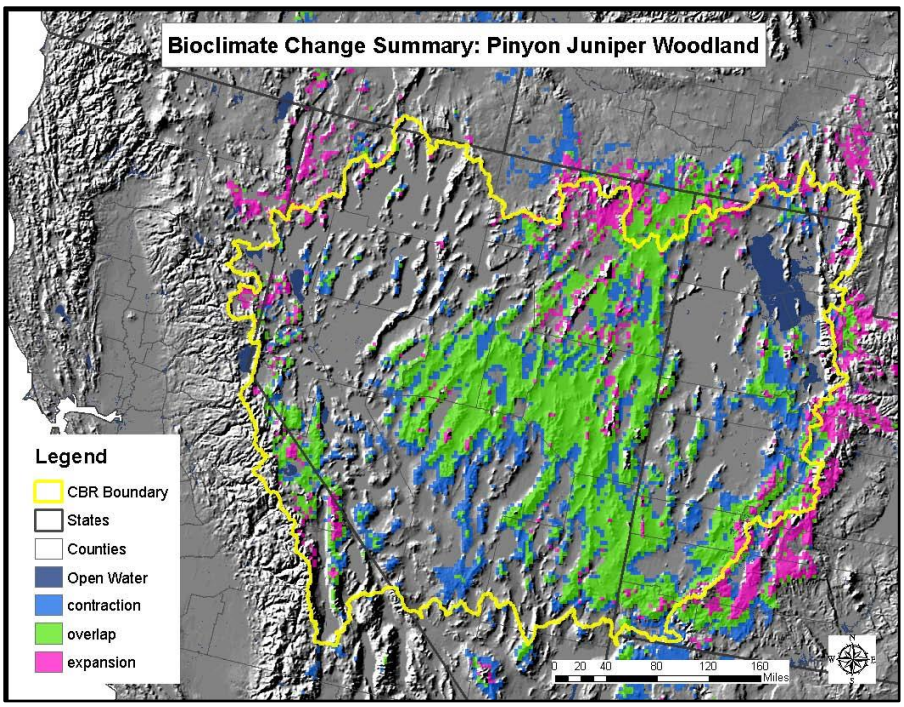

Figure 4-3. Forecasted Climate Envelope Changes for Great Basin Pinyon and/or Juniper Woodland as of 2060.

Results for each category (contraction, overlap, expansion) reflect agreement among 2 or more of 6 distinct spatial models (Comer et al. 2012a).

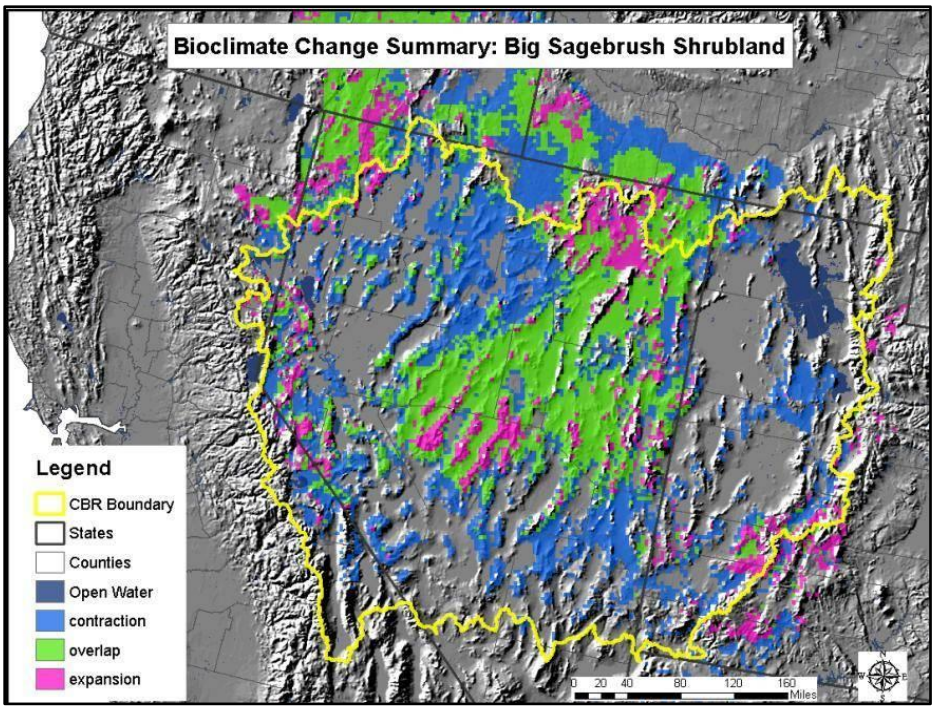

Figure 4-4. Forecasted Climate Envelope Changes for Inter-Mountain Basins Big Sagebrush Shrubland In the Central Basin and Range as of 2060.

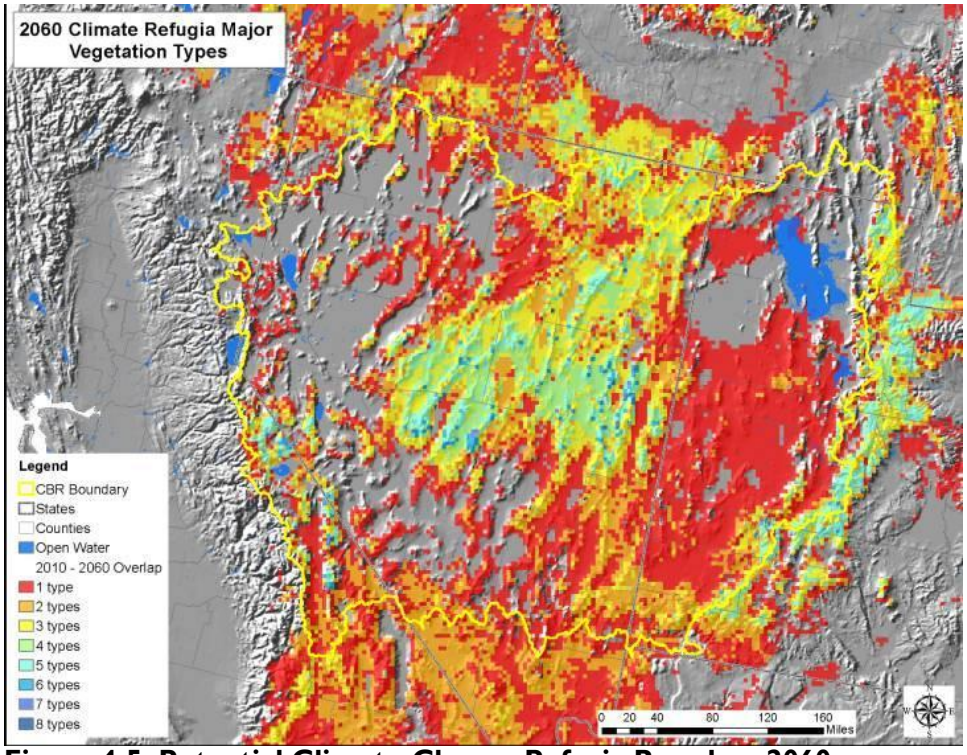

Figure 4-5. Potential Climate-Change Refugia Based on 2060 Forecasts of Climate Envelopes for Major Vegetation Types in the Ecoregion (Comer et al. 2012a).

As discussed in the affected environment, the climate change forecast for temperature showed increases in daily maximum temperatures. The forecast for precipitation showed no strong trend toward either wetter or drier conditions for a majority of the planning area. This could mean that the current conditions of several years of drought with a few wet years could continue on into the future. Increasing temperatures coupled with the existing precipitation patterns could have an effect on the timing and quantity of water availability in most watersheds. Smaller snowpack melting earlier in the spring will result in earlier peak flows in streams and lower base flows later in the year. Lower base flows during typical drought years will be more severe and would result in loss of flows in several stream and spring systems and loss of riparian habitat. Additionally, changes in timing of peak flows could impact storage potential in existing reservoirs.

This map indicates where between 1 and 8 types are forecasted by 2060 to have climate envelopes overlapping current distributions; thus providing one indication of potential climate-change refugia from Comer et al. 2012a.

Implementing management for the following resources would have negligible or no impact on climate change and are therefore are not discussed in detail: riparian areas and wetland management, recreation management, CTTM, and ACECs.

4.20.4 Alternative A

Climate impacts under Alternative A are identical to impacts resulting from current management as described above in Nature and Type of Effects and Impacts Common to All Alternatives. No changes to GHG emissions would occur.

Impacts from GRSG Management

Under Alternative A, there are currently no acres designated as PHMA and GHMA, however, GRSG habitat is identified. The LUPs do not contain any special management actions pertaining to managing GRSG and there are no consistent goals or objectives for management of GRSG habitat in the LUPs. The impacts from GRSG management would continue to be the same as those resulting from current management identified in existing LUP documents, land health standards, and applicable agency policy or guidance. Management of projects and activities in habitat would be done on a case-by-case basis. Overall impacts on climate change would be negligible at the landscape scale; however, there may more noticeable impacts at the project-site level depending on project specific activities and mitigation actions.

Impacts from Land Uses and Realty Management

Under Alternative A, for major and minor ROWs in the existing LUPs, there are already areas in GRSG habitat that are designated as open, exclusion areas, and avoidance areas. Additionally, the LUPs identify areas to be held in retention and areas open for disposal. Existing management could potentially slightly reduce GHG emissions as well as reduced surface disturbances allowing for management areas to be more resilient to climate change.

Impacts from Vegetation and Soils Management

Under Alternative A, the impacts from vegetation, invasive species and soils would continue to be the same as those resulting from current management identified in existing LUP documents, land health standards, and applicable agency policy or guidance. Vegetation treatments would continue on BLM-administered and National Forest System lands. Depending on the extent, type and effectiveness of the treatment, certain vegetation treatments could result, making habitats more resilient to climate change, while others could reduce carbon sinks, specifically those that remove large quantities of pinyon-juniper stands. However, the overall impact would be negligible at the landscape-scale and more noticeable at the project-level scale where restoration is occurring.

Impacts from Renewable Energy Management

Under Alternative A, for wind energy, there are areas in PHMA and GHMA identified as ROW/SUA open areas, avoidance areas, and some exclusion areas in wilderness and WSAs. Based on areas identified in the Solar PEIS, most BLM-administered lands are identified as exclusion areas for solar energy, while some forest service lands remain open. Increases in renewable energy development would help reduce GHG emissions in the planning areas, thereby decreasing the

impacts of climate change. However, less available acreage for renewable energy could result in increasing need of fossil fuel development which could result in more GHG emissions.

Impacts from Fire and Fuels Management

Under Alternative A, the impacts from wildland fire and fuels management would continue to be the same as those resulting from current management identified in existing LUP documents, and applicable agency policy or guidance. Depending on fire frequency and severity, impacts on climate change could be more severe at the local-scale, resulting in increases to GHGs and reductions of carbon sinks due to vegetation losses. Increasing changes in vegetation to invasive species from native plant communities would exacerbate those impacts.

Impacts from Livestock Grazing Management

Under Alternative A, impacts from livestock grazing would continue to be the same as those from current management identified in LUP documents, land health standards, and applicable agency policy or guidance. Ungulate grazing can worsen the effects of climate change on public land resources by impacting vegetation, soils, and water resources and by acting as an additional source of greenhouse gases (Beschta 2012; Ripple et al. 2014; Gerber et al. 2013). Continual grazing at existing levels during drought conditions, particularly when vegetation communities are stressed, would worsen those impacts. Grazing use may be changed annually by allotment; however, given the extent of grazing in the planning area, these impacts could be seen at the landscape scale if done consistently.

Impacts from Wild Horse and Burro Management

Under Alternative A, impacts from wild horse and burro management would continue to be the same as those resulting from current management identified in existing LUP documents, land health standards, and applicable agency policy or guidance. Ungulate grazing can exacerbate the effects of climate change on public land resources by impacting vegetation, soils, water resources and acting as an additional source of greenhouse gases (Beschta 2012; Ripple et al. 2014; Gerber et al. 2013). Impacts from WHB management would be similar to impacts from livestock grazing management.

Impacts from Leasable Minerals Management

Under Alternative A, impacts from fluid minerals, oil and gas and geothermal management would continue to be the same as those resulting from current management identified in existing LUP documents and applicable agency policy or guidance. Increases in oil and gas production in particular would reduce available carbon sinks and increase carbon production and GHG emissions.

Impacts from Locatable Minerals Management

Alternative A identifies GRSG habitat as open to locatable mineral exploration or development, with wilderness areas withdrawn. All locatable mineral activities will continue to be managed under the regulations at 43 CFR, Part3800

through the approval of a Notice of Intent or a Plan of Operations. Impacts on climate change would be similar to those currently identified in existing LUP documents and applicable agency policy or guidance.

Impacts from Salable Minerals Management

Alternative A identified most GRSG habitat as open for consideration for mineral material disposal on a case-by-case basis. Impacts on climate change would be similar to those currently identified in existing LUP documents and applicable agency policy or guidance.

4.20.5 Alternative B

Alternative B would constrain resource use and would decrease any GHG emissions associated with a particular use compared with Alternative A. Resources affected are described below.

Impacts from GRSG Management

Alternative B identifies PHMA and GHMA with goals and objectives for enhancing and protecting GRSG habitat, particularly from human disturbances. The majority of restrictive management actions were in PHMA. Protecting GRSG habitat would result in few land disturbances reducing human disturbances and potential for GHG emissions.

Impacts from Land Uses and Realty Management

Under Alternative B, for major and minor ROWs, PHMA would be managed as exclusion areas while GHMA would be managed as avoidance areas. This would also mean there would be fewer acres open for major ROWs in both PHMA and GHMA as compared to Alternative A. For land disposals, more acres in PHMA would be held in retention and GHMA would have the same land tenure designation as in Alternative A. Reduction of surface disturbance activities through either exclusion or avoidance would reduce potential for GHG emissions as well as reduced surface disturbances allowing for management areas to be more resilient to climate change. Alternative B would result in fewer impacts on climate change than Alternative A.

Impacts from Vegetation and Soils Management

Under Alternative B, restoration of vegetation would be a priority in GRSG habitat, prioritizing in areas thought to be limiting to GRSG distribution and/or abundance. Additionally use and collection of native seed would be apriority when possible to establish native plant communities. Restoration of vegetation, particularly with native communities could potentially help make vegetation more resilient to climate change.

Impacts from Renewable Energy Management

Alternative B would manage PHMA as exclusion areas and GHMA as avoidance areas for wind energy. This would result in more acres of exclusion and avoidance areas for wind energy in PHMA and GHMA as compared to Alternative A. For solar energy projects, Alternative B excludes all PHMA and

GHMA from solar energy, except for lands in the Forest Service that intersect with GHMA. Impacts from renewable energy management would be similar to impacts from lands and realty management. Additionally, ROWs and SUAs associated with renewable energy management are typically large in size (several thousand acres) and in many cases require completely grading a site, particularly for solar projects. This amount of land disturbance can amplify impacts at the project level. Alternative B could result in fewer impacts on climate change than Alternative A.

Impacts from Fire and Fuels Management

Alternative B does not specify any specific numbers of acres for hazardous fuels management nor does it specify suppression activities. It does identify RDFs for fire suppression activities (consistent with applicable law), general actions for pre- and post-fire treatment activities, timing of treatments, resting, and use of native plants for revegetation. Reduction in fire potential would reduce release of carbon from loss of vegetation and potentially allow for vegetation to be more resilient to climate change. Based on these actions, Alternative B could have fewer impacts on climate change than Alternative A.

Impacts from Livestock Grazing Management

Under Alternative B, acres available for livestock grazing would be similar to those under Alternative A. However, Alternative B would limit grazing on vegetation treatment areas in PHMA until they had reached project objectives. This would allow for vegetation treatments and grazing management improvements that could make site-specific areas more resilient to climate change. Alternative B could result in fewer impacts on water resources than Alternative A.

Impacts from Wild Horse and Burro Management

Impacts would be the same as Alternative A.

Impacts from Locatable Minerals Management

Alternative B would identify PHMA for withdrawal from mineral entry which would result in fewer acres as open to locatable mineral exploration or development in PHMA as compared to Alternative A. GHMA would be managed as open to locatable mineral exploration or development, similar to Alternative A. Mining activities results in short-term and long-term emissions of GHGs during fuel combustion in vehicles and construction equipment (EPA 2012); it also removes vegetation and releases sequestered carbon. Closing areas of high potential to development would have the potential to result in fewer releases of GHGs in the planning area compared with Alternative A.

Impacts from Salable Minerals Management

Under Alternative B, PHMA would be managed as closed to mineral material disposal which would result in fewer acres being managed as open for consideration for mineral material disposal on a case-by-case basis as compared to Alternative A. GHMA would be managed as open to salable mineral

exploration or development and subject to standard stipulations, similar to Alternative A. Salable activities result in short-term and long-term emissions of GHGs during fuel combustion in vehicles and construction equipment (EPA 2012); it also removes vegetation and releases sequestered carbon. Closing areas of high potential to development would have the potential to result in fewer releases of GHGs in the planning area compared with Alternative A.

Impacts from Leasable Minerals Management

Under Alternative B, PHMA would be managed as closed, which would result in fewer acres being managed as open to fluid minerals, oil and gas, and geothermal than Alternative A. In GHMA, areas would be managed as open to fluid minerals, oil and gas, and geothermal, similar to Alternative A, and subject to standard stipulations. Oil and gas development results in short-term and long-term emissions of GHGs during fuel combustion in vehicles, drill rigs, and construction equipment (EPA 2012); it also removes vegetation and releases sequestered carbon. Closing areas of high potential to development would have the potential to result in fewer releases of GHGs in the planning area compared with Alternative A.

4.20.6 Alternative C

Alternative C would constrain resource use and would decrease any GHG emissions associated with a particular use compared with Alternative A. Resources affected are described below.

Impacts from GRSG Management

Under Alternative C, all GRSG habitat would be managed as PHMA. Removing grazing and excluding human disturbances would change habitat conditions, potentially increasing resistance to climate change effects. Therefore, management restrictions on all activities would be greater under Alternative C resulting in overall lower GHG emissions and greater resiliency to climate change than under Alternative A.

Impacts from Land Uses and Realty Management

Under Alternative C, for major and minor ROWs, all PHMA would be managed as exclusion areas, resulting in fewer acres being managed as open for ROWs as compared to Alternative A. For land disposals, all PHMA (and GHMA) would be held in retention as compared to Alternative A. Reduction of surface disturbance activities through either exclusion would reduce potential for GHG emissions as well as reduced surface disturbances allowing for management areas to be more resilient to climate change. Alternative C would result in fewer impacts on climate change than Alternative A.

Impacts from Vegetation and Soils Management

Alternative C identifies more passive forms of restoration and has more restrictions on active vegetation treatments. Additionally, the removal of all livestock grazing will reduce grazing pressure on vegetation throughout PHMA and GHMA. Passive restoration would allow vegetation to restore back to more

natural conditions overtime. It may also allow for more native communities to adapt to changing climate regimes overtime. Alternative C should result in fewer impacts on climate change than Alternative A.

Impacts from Renewable Energy Management

Under Alternative C, all PHMA would be managed as ROW/SUA exclusion areas for both wind energy and solar energy, resulting in fewer acres being managed as open to both wind energy and solar energy as compared to Alternative A. Impacts from renewable energy management are typically large in size (several thousand acres) and in many cases require completely grading a site, particularly for solar projects. This amount of land disturbance can amplify impacts at the project level. However, less available acreage for renewable energy could result in increasing need of fossil fuel development which could result in more GHG emissions. Alternative C would result in fewer impacts on climate change than Alternative A.

Impacts from Fire and Fuels Management

Impacts would be the same as Alternative A.

Impacts from Livestock Grazing Management

Under Alternative C, all PHMA would be managed as unavailable to livestock grazing, and fewer acres would be managed as available to livestock, as compared to Alternative A. Alternative C would eliminate grazing from occupied habitat. Ungulate grazing can worsen the effects of climate change on public land resources by impacting vegetation, soils, and water resources and by acting as an additional source of greenhouse gases (Beschta 2012; Ripple et al. 2014; Gerber et al. 2013). Alternative C should result in fewer impacts on climate change than Alternative A.

Impacts from Wild Horse and Burro Management

Impacts would be the same as Alternative A.

Impacts from Leasable Minerals Management

Under Alternative C, all PHMA) would be managed as closed to fluid minerals, oil and gas, and geothermal, resulting in fewer acres being managed as open to fluid minerals, oil and gas, and geothermal as compared to Alternative A. Alternative C closes more area, all of PHMA, than Alternative A to leasable mineral entry in occupied and suitable habitat. Oil and gas development results in short-term and long-term emissions of GHGs during fuel combustion in vehicles, drill rigs, and construction equipment (EPA 2012); it also removes vegetation and releases sequestered carbon. Closing areas of high potential to development would have the potential to result in fewer releases of GHGs in the planning area compared with Alternative A. Alternative C closes more area than Alternative A to leasable mineral entry in GRSG habitat. GHG emissions would be less than under Alternative A.

Impacts from Locatable Minerals Management

Under Alternative C, all PHMA is recommended for withdrawal to locatable mineral exploration or development, resulting in fewer acres open to locatable mineral exploration or development, as compared to Alternative A Mining activities results in short-term and long-term emissions of GHGs during fuel combustion in vehicles and construction equipment (EPA 2012); it also removes vegetation and releases sequestered carbon. Closing areas of high potential to development would have the potential to result in fewer releases of GHGs in the planning area compared with Alternative A. Alternative C closes more area than Alternative A to locatable mineral entry in GRSG habitat. GHG emissions would be less than under Alternative A.

Impacts from Salable Minerals Management

Under Alternative C, all PHMA would be managed as closed to mineral material disposal, resulting in fewer acres managed as open for consideration for mineral material disposal than Alternative A. Mining activities results in short-term and long-term emissions of GHGs during fuel combustion in vehicles and construction equipment (EPA 2012); it also removes vegetation and releases sequestered carbon. Closing areas of high potential to development would have the potential to result in fewer releases of GHGs in the planning area compared with Alternative A.

4.20.7 Alternative D

Alternative D would constrain resource use and would decrease any GHG emissions associated with a particular use compared with Alternative A "no net unmitigated loss" strategy, coupled with RDFs (consistent with applicable law), would help protect and preserve GRSG and their habitat. Resources affected are described below.

Impacts from GRSG Management

Alternative D includes PHMA and GHMA and additional areas as OHMA. OHMA is mapped habitat that is potentially suitable. RDFs (consistent with applicable law) identified for Alternative D such as requiring vegetation reclamation from ground disturbing activities, would all increase habitat resiliency to climate change. Alternative D would result in fewer impacts on climate change than Alternative A.

Impacts from Land Uses and Realty Management

Under Alternative D, for major and minor ROWs, all PHMA and GHMA would be managed as avoidance areas and OHMA would be managed as open, as compared to Alternative A. For land disposals, PHMA and GHMA would be held in retention whereas OHMA would be managed as both retention and disposal, with more acres held in retention as compared to Alternative A. Reduction of surface disturbance activities through avoidance would reduce potential for GHG emissions as well as reduced surface disturbances allowing

for management areas to be more resilient to climate change. Alternative D would result in fewer impacts on climate change than Alternative A.

Impacts from Vegetation and Soils Management

Alternative D does not identify any specific numbers of acres for vegetation treatment; however, it does have several actions specifying types of treatments and timing, which would increase resiliency of vegetation communities to climate change. Goals and objectives would include promoting the landscape approach to enhance habitat resiliency and sustainability and focusing treatments to restore connectivity and habitat in fragmented areas. Based on the actions associated with Alternative D, there should be fewer impacts on climate change overall than in Alternative A.

Impacts from Renewable Energy Management

Under Alternative D, for wind energy and solar energy, all of PHMA and GHMA would be managed as ROW/SUA exclusion areas, resulting in fewer acres being managed as open to ROW/SUA as compared to Alternative A. In OHMA, wind energy areas would be managed as open, but for solar energy, BLM-administered lands would be managed as exclusion areas and National Forest System land would be managed as either avoidance areas or as open. Impacts from renewable energy management are typically large in size (several thousand acres) and in many cases require completely grading a site, particularly for solar projects. This amount of land disturbance can amplify impacts at the project level. However, less available acreage for renewable energy could result in increasing need of fossil fuel development which could result in more GHG emissions Alternative D could result in fewer impacts on climate change than Alternative A.

Impacts from Fire and Fuels Management

Alternative D does not specify any specific numbers of acres for hazardous fuels management. It does identify RDFs consistent with applicable law for suppression activities, pre- and post-fire treatment activities, timing of treatments, resting, and use of native plants for revegetation which could make management areas more resilient to climate change and reduce the risk of emissions due to large wildland fires. Based on these actions, Alternative D could have fewer impacts on climate change than Alternative A.

Impacts from Livestock Grazing Management

Under Alternative D, PHMA, GHMA, and OHMA would be managed as available to livestock grazing, which is similar to Alternative A. Ungulate grazing can worsen the effects of climate change on public land resources by impacting vegetation communities, soils, and water resources and by acting as an additional source of greenhouse gases (Beschta 2012; Ripple et al. 2014; Gerber et al. 2013). Alternative D includes several actions that would benefit climate change by reducing impacts on vegetation in the planning area. These actions include the following:

- Managing for riparian vegetation
- Applying principles of prescriptive livestock grazing to control time and timing of grazing during the hot season
- Salting and supplemental feeding at least 1 mile from riparian habitat
- Retiring grazing privileges on a voluntary basis

These actions would reduce livestock use on upland habitat and riparian areas, allowing them to recover and potentially be more resilient to climate change. Alternative D would result in fewer impacts on climate change than Alternative A.

Impacts from Wild Horse and Burro Management
Impacts would be the same as Alternative A.

Impacts from Leasable Minerals Management
Under Alternative D, all PHMA and GHMA would be managed as NSO for fluid minerals oil and gas and geothermal. PHMA and GHMA would be closed to nonenergy leasables, resulting in fewer acres available as compared to Alternative A. Alternative D would list stipulations for NSO in PHMA and GHMA for currently unleased areas and require site-specific conservation measures for reducing land disturbance on leased areas. In OHMA, nonenergy leasable would be managed as open and oils and gas and geothermal would be managed as open subject to standard stipulations. Oil and gas development results in short-term and long-term emissions of GHGs during fuel combustion in vehicles, drill rigs, and construction equipment (EPA 2012); it also removes vegetation and releases sequestered carbon. Closing areas of high potential to development would have the potential to result in fewer releases of GHGs in the planning area compared with Alternative A.

Impacts from Locatable Minerals Management
Under Alternative D, PHMA, GHMA and OHMA would be managed as open to locatable mineral exploration and development, similar to Alternative A. RDFs associated with reducing surface disturbance and vegetation reclamation would limit surface disturbance allowing for management areas to be more resilient to climate change. Alternative D would result in fewer impacts on climate change than Alternative A.

Impacts from Salable Minerals Management
Under Alternative D, PHMA and GHMA would be managed as closed to mineral material disposal, resulting in fewer acres being managed as open, as compared to Alternative A. OHMA would be managed as open for consideration for mineral material disposal on a case-by-case basis. Mining activities results in short-term and long-term emissions of GHGs during fuel combustion in vehicles and construction equipment (EPA 2012); it also removes vegetation and releases sequestered carbon. Closing areas of high potential to

development would have the potential to result in fewer releases of GHGs in the planning area compared with Alternative A. Alternative D would result in fewer impacts on climate change than Alternative A.

4.20.8 Alternative E

Alternative E does not outline specific management actions but is expected to result in fewer impacts on climate change than Alternative A. This alternative proposes to reduce the impact on GRSG habitat (core, priority, and general) by applying the avoid, minimize, and mitigate strategies, with the addition of the Conservation Credit System, managed by the State of Nevada. Resources affected are described below.

Impacts from GRSG Management

Under Alternative E, GRSG habitat is defined as core, priority, and general, which correlates to PHMA, GHMA, and OHMA. Alternative E would identify GRSG management areas and discuss collaboration through the Governor's Sagebrush Ecosystem Council, monitoring of habitat, predation controls, a mitigation banking program, mitigation of habitat, and a requirement of net conservation gain. Habitat mitigation, specifically restoring or creating habitat could reduce impacts on climate change, but the result would depend on the actions occurring and location of the work. Alternative E could result in fewer impacts on climate change than Alternative A.

Impacts from Land Uses and Realty Management

Alternative E, for major and minor ROWs, would manage core and PHMA as avoidance areas and GHMA as open to ROWs and SUAs. For land disposals, the same number of acres in priority, core, and general habitat would be held in retention and available for disposal as they would be under Alternative A. Alternative E also would follow a strategy to avoid conflicts between habitat and ROWs and requires project proponents to avoid, minimize, and mitigate for a net conservation gain. Alternative E could result in fewer impacts on climate change than Alternative A.

Impacts from Vegetation and Soils Management

Alternative E does not enumerate acres for vegetation treatment. It does identify a few general actions specifying types of treatments for reducing invasive species and increasing the potential for post-fire rehabilitation. Increases in invasive vegetation communities reduce the habitats' resilience to climate change. By managing for invasive species, Alternative E could have fewer impacts on climate change than Alternative A.

Impacts from Renewable Energy Management

Under Alternative E, wind energy in core and PHMA would be managed as avoidance areas and GHMA would be managed as open to ROWs and SUAs. For solar energy, BLM-administered lands would be managed as exclusion areas and National Forest System lands would be managed as either avoidance or open areas for all habitat types. Alternative E follows a strategy to avoid

conflicts between habitat and ROWs. It would result in fewer impacts on climate change than Alternative A.

Impacts from Fire and Fuels Management

Alternative E does not enumerate acres for hazardous fuels management or post-fire rehabilitation treatments. It does identify general actions for suppression activities, particularly those associated with reducing habitat loss to wildland fire and improving initial suppression attacks. Based on these actions, Alternative E would have fewer impacts on climate change than Alternative A.

Impacts from Livestock Grazing Management

Alternative E would be similar to Alternative A.

Impacts from Wild Horse and Burro Management

Impacts would be the same as under Alternative A.

Impacts from Locatable Minerals Management

Under Alternative E, all habitats would be managed as open to locatable mineral exploration or development. It would require project proponents to avoid, minimize, and mitigate occupied and suitable habitat, but this strategy may not result in fewer GHG emissions. Alternative E would result in the same impacts on climate change as would Alternative A.

Impacts from Salable Minerals Management

Under Alternative E, all habitats would be managed as open for consideration for mineral material disposal. It requires project proponents to avoid, minimize, and mitigate occupied and suitable habitat to result in a net conservation gain. This strategy may not lower GHG emissions and so would be similar to Alternative A.

Impacts from Leasable Minerals Management

Alternative E would manage core and priority habitat under moderate constraints (CSUs and TLs) and general habitat as open. For nonenergy fluid leasables, all habitats would be managed as open. It also would require project proponents to avoid, minimize, and mitigate occupied and suitable habitat to result in a net conservation gain. This strategy may not result in fewer GHG emissions, and climate change effects would be similar Alternative A.

4.20.9 Alternative F

Alternative F generally constrains resource use and would decrease any GHG emissions associated with a particular use compared with Alternative A. Resources affected are described below.

Impacts from GRSG Management

Impacts would generally be the same as Alternative B.

Impacts from Land Uses and Realty Management

Under Alternative F, for major and minor ROWs, PHMA and GHMA would be managed as exclusion areas, resulting in fewer acres in being managed as open for ROWs as compared to Alternative A. For land disposals, PHMA would be managed as retention areas and GHMA would be managed the same as Alternative B. Under this alternative, there would be a 3 percent cap on discrete human disturbance in GRSG habitat. Once the cap is met, no new activities that would result in land disturbance would be authorized. Reduction of surface disturbance activities through either exclusion or avoidance would reduce potential for GHG emissions as well as reduced surface disturbances allowing for management areas to be more resilient to climate change. Alternative F could result in fewer impacts on climate change than Alternative A.

Impacts from Vegetation and Soils Management

Impacts would be the same as Alternative A.

Impacts from Renewable Energy Management

Under Alternative F, for wind energy and solar energy, PHMA and GHMA would be managed as ROW/SUA exclusion resulting in fewer acres being managed as open to ROW/SUA as compared to Alternative A. Impacts from renewable energy management would be similar to impacts from lands and realty management. Impacts from renewable energy management are typically large in size (several thousand acres) and in many cases require completely grading a site, particularly for solar projects. This amount of land disturbance can amplify impacts at the project level. The 3 percent cap on discrete human disturbance would also reduce activities in GRSG habitat, making areas more resilient to climate change. However, less available acreage for renewable energy could result in increasing need of fossil fuel development which could result in more GHG emissions. Alternative F could result in fewer impacts on climate change than Alternative A.

Impacts from Fire and Fuels Management

Impacts would be the same as Alternative B.

Impacts from Livestock Grazing Management

Under Alternative F, acreages of habitat identified as available and unavailable to livestock grazing for PHMA and GHMA would be the same as Alternative A. Alternative F would rest 25 percent of PHMA and GHMA each year and would limit vegetation utilization levels to 25 percent per year. These actions, combined would reduce impacts on vegetation, soils, and water/riparian resources in PHMA and GHMA, thereby reducing impacts from livestock grazing. Range improvement construction would increase due to the need to fence PHMA and GHMA from grazing permitted in adjacent areas. These actions would result in less grazing activities in PHMA and GHMA, thereby

reducing impacts on water resources. Alternative F could result in fewer impacts on climate change than Alternative A.

Impacts from Wild Horse and Burro Management

Impacts would be similar to Alternative A, except that wild horse AMLs would be reduced by 25 percent in occupied GRSG habitats. While impacts from wild horses and burros would remain, this would reduce the effects of wild horses on climate change. Alternative F could result in fewer impacts on climate change than Alternative A.

Impacts from Leasable Minerals Management

Under Alternative F, more acres in PHMA and GHMA would be managed as closed to energy fluid minerals, oil and gas, and geothermal and fewer acres in PHMA and GHMA would be managed as open to energy fluid minerals, oil and gas, and geothermal as compared to Alternative A. For nonenergy leasable, PHMA would be managed as closed and GHMA would be managed as open subject to standard stipulations as compared to Alternative A. This alternative identifies actions and conservation measures for areas that are already leased. Under this alternative, there would be a 3 percent cap on discrete human disturbance in GRSG habitat. Once the cap is met, no new activities that would result in land disturbance would be authorized. This would have an overall benefit on climate change. Alternative F would result in fewer impacts than Alternative A.

Impacts from Locatable Minerals Management

Under Alternative F, PHMA would be recommended for withdrawal to locatable mineral exploration or development, resulting in fewer acres being available for this activity in PHMA. GHMA would be managed as open to locatable mineral exploration or development which would be the same as Alternative A. RDFs associated with reducing surface disturbance and vegetation reclamation, consistent with applicable law would limit surface disturbance allowing for management areas to be more resilient to climate change. Alternative D would result in fewer impacts on climate change than Alternative A.

Impacts from Salable Minerals Management

Under Alternative F, PHMA would be managed as closed to mineral material disposal and GHMA would be managed as open for consideration for mineral material disposal on a case-by-case basis. Under this alternative, there would be a 3 percent cap on discrete human disturbance in GRSG habitat. Once the cap is met, no new activities that would result in land disturbance would be authorized. This would have an overall benefit on climate change. Alternative F would result in fewer impacts than Alternative A.

4.20.10 The Proposed Plan

The Proposed Plan would constrain resource use and would decrease any GHG emissions associated with a particular use, compared to Alternative A.

The Proposed Plan would require a 3 percent disturbance cap on surface-disturbing activities in PHMA (see **Appendix F**), and it would incorporate RDFs consistent with applicable law in PHMA, GHMA, and OHMA. It would also require all human disturbances to result in a net conservation gain for GRSG and their habitat. Lek buffers would also be required (see **Appendix B**).

Collectively, these GRSG conservation management actions would increase mitigation requirements for land use authorizations and could result in more complex project designs, potentially excluding infrastructure placement in the most cost-effective locations and potentially resulting in overall greater development costs. A corresponding effect could be a reduction in the number of authorization applications received for activities in PHMA and longer, more complicated review periods for those that are proposed in PHMA.

Impacts from GRSG Management

The Proposed Plan identifies some acres as PHMA and GHMA and additional acres as OHMA. Of the acres designated as PHMA, some are SFA and are recommended for withdrawal from the mining act. These would be managed as NSO for mineral leasing, with no waiver, exception, or modification, and would be prioritized for management and conservation. OHMA is mapped and potentially suitable habitat for GRSG. Protecting GRSG habitat would result in few land disturbances and could reduce GHG emissions. The Proposed Plan could result in fewer impacts on climate change than Alternative A.

Impacts from Land Uses and Realty Management

Under the Proposed Plan, for major ROWs, PHMA and GHMA would be managed as avoidance areas, whereas OHMA would be managed as open. This would result in fewer areas being open for land and realty action than under Alternative A. For land disposals, more acres in PHMA and GHMA would be held in retention, while OHMA would be managed for retention and disposal, as compared to Alternative A. For minor ROWs, more acres in PHMA would be managed as avoidance areas, whereas GHMA and OHMA would be managed as open. Reducing surface disturbance through avoidance would reduce the potential for GHG emissions and would reduce surface disturbances. This would allow for management areas to be more resilient to climate change. The Proposed Plan would result in fewer impacts on climate change than Alternative A.

Impacts from Vegetation and Soils Management

The Proposed Plan specifies numbers of acres for pinyon-juniper removal and grass treatments by year. It also has several actions specifying habitat restoration and types of treatments. Based on the actions associated with the Proposed Plan, there should be fewer impacts on climate change overall than under Alternative A.

Impacts from Renewable Energy Management

Under the Proposed Plan for wind energy, PHMA would be managed as exclusion areas, and GHMA would be managed as avoidance areas, resulting in fewer acres available for development than under Alternative A. OHMA would be managed as open, similar to Alternative A.

Under the Proposed Plan, for solar energy, all of PHMA, GHMA, and OHMA would be managed as exclusion areas on BLM-administered lands. Some lands in OHMA would be managed as open on National Forest System lands. Far fewer acres would be available for development of renewable energy, as compared to Alternative A. Impacts from renewable energy management are on typically larger areas (several thousand acres) and in many cases require completely grading a site, particularly for solar projects. This level of land disturbance can amplify impacts at the project level. However, less available acreage for renewable energy could result in the increasing need of fossil fuel development, which could result in more GHG emissions. The Proposed Plan would have fewer impacts on climate change than Alternative A.

Impacts from Fire and Fuels Management

The Proposed Plan does not specify any specific numbers of acres for hazardous fuels management. It does identify RDFs (consistent with applicable law) for suppression activities, pre- and post-fire treatment activities, timing of treatments, resting, and use of native plants for revegetation. This could make management areas more resilient to climate change and reduce the risk of emissions due to large wildland fires. Based on these actions, the Proposed Plan would have fewer impacts on climate change than Alternative A.

Impacts from Livestock Grazing Management

Under the Proposed Plan, lands available to livestock grazing are the same as under Alternative A. The Proposed Plan includes several actions that would reduce impacts on climate change by reducing those on vegetation in the planning area. These actions are as follows:

- Managing for riparian vegetation
- Applying the principles of prescriptive livestock grazing to control time and timing of grazing during the hot season
- Salting and supplemental feeding at least 1 mile away from riparian habitat
- Retiring grazing privileges on a voluntary basis

The Proposed Plan would result in fewer impacts on climate change than Alternative A.

Impacts from Wild Horse and Burro Management

Impacts would be the same as under Alternative A.

Impacts from Leasable Minerals Management

Under the Proposed Plan, PHMA would be managed as NSO subject to major stipulations (NSO) for energy fluid minerals, including oil and gas and geothermal resources, and would be closed to nonenergy leasables. GHMA would be managed with moderate constraints (CSUs and TLs) for energy fluid minerals, including oil and gas and geothermal, and open to nonenergy leasables. OHMA would be managed as open to all fluid minerals subject to standard stipulations.

The stipulations for each of the habitat types are different, depending on the level of the habitat. For PHMA, there are major stipulations that are more restrictive, for GHMA there are moderate stipulations that are less restrictive, and for OHMA the standard stipulations are the RDFs consistent with applicable law. Oil and gas development results in short-term and long-term emissions of GHGs from in vehicles, drill rigs, and construction equipment (EPA 2012); development also removes vegetation, releasing sequestered carbon. Restricting development would result in fewer releases of GHGs in the planning area, compared to Alternative A.

Impacts from Locatable Minerals Management

Under the Proposed Plan, PHMA would be managed as open, except for acres in SFA, which would be recommended for withdrawal. This would result in more acres recommended for withdrawal, compared to Alternative A. GHMA and OHMA would both be managed as open, similar to Alternative A, but they would be subject to RDFs, consistent with applicable law. Mining results in short-term and long-term emissions of GHGs from vehicles and construction equipment (EPA 2012); it also removes vegetation, releasing sequestered carbon. Withdrawing areas from mineral development could result in fewer releases of GHGs in the planning area, compared to Alternative A.

Impacts from Salable Minerals Management

Under the Proposed Plan, PHMA would be managed as closed, resulting in fewer acres available for development, compared to Alternative A. GHMA and OHMA would be managed as open for consideration for mineral material disposal on a case-by-case basis, similar to Alternative A. Salable minerals extraction would result in short-term and long-term emissions of GHGs from vehicles and construction equipment (EPA 2012); it also removes vegetation, releasing sequestered carbon. Closing areas to development would result in fewer releases of GHGs in the planning area, compared to Alternative A.

4.21 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

This section discusses social and economic impacts from proposed GRSG management actions related to other resources and resource uses. Existing social and economic conditions are described in **Section 3.23**, Socioeconomics and Environmental Justice. This section also addresses environmental justice

impacts and the differences between alternatives for the social and economic impacts identified.

4.21.1 Methodology and Assumptions

For the analysis of economic impacts, quantitative estimates are provided where sufficient data or estimates are available on the potential changes in authorized uses of Federal lands under each alternative. When quantitative estimates of economic impacts were not possible, a qualitative discussion of the potential economic impacts of management actions associated with specific authorized uses is presented. Therefore, the overall economic impacts are a combination of quantitative estimates and qualitative discussion.

The quantitative estimates reflect annual values for output, employment, and earnings that would be reached over time under each alternative. Some impacts (e.g., impacts through management of livestock grazing) would likely occur as soon as the selected management alternative is implemented.

Other impacts (e.g., oil and gas development) were estimated based on an assumed 20 year period for development, and therefore may be larger or smaller than the annual average depending on when development actually occurs.

IMPLAN was used to estimate impacts on outcomes, employment, and earnings in the study area, including those derived from the multiplier effect. The multiplier effect captures the impact of initial expenditures on subsequent rounds of expenditures derived from the initial income generated as well as the impact of initial expenditures in one sector of the economy on other interrelated sectors. This allows for a more complete picture of the economic impacts of the management alternatives in the planning area; these include impacts derived directly from changes in employment and output in managed sectors (e.g., ranching, recreation, and minerals). Indirect impacts would fall on industrial and service sectors that provide input to those sectors directly affected, or where earnings of those affected sectors are spent. However, the IMPLAN model is static and does not capture changes in the industrial composition of a region over time. Nor does it capture dynamic effects that may be associated with processes of growth or decline, such as changes in technology or labor productivity or the feasibility of economic operations that require scale. There is, therefore, a degree of uncertainty in the estimates of impacts obtained through the IMPLAN model.

For the analysis of social impacts, two other types of impacts were considered. The first is that derived from migration induced by management actions. These impacts are induced by economic opportunities that drive population into or out of specific areas and affect population growth as well as the demand for housing and public services. The second is that associated with specific interest groups, community livelihoods, or minority and low income populations (Environmental Justice). Because these impacts are largely derived from the

changes in economic activity expected under each alternative, they would occur over a 20 year period, the period used for the quantitative impact estimates.

The following are summaries of the types of social and economic impacts and associated indicators of those impacts, from management actions related to the protection of GRSG in the study area:

- Direct economic activity dependent on BLM-administered and National Forest System land and resource management
  - Qualitative assessment of the volume of economic activity dependent on BLM-administered and National Forest System lands and resources
  - Indirect impacts could be broader changes in economic activity
- Overall employment, earnings, output, and earnings per job associated with economic activities impacted by management alternatives
  - Dollar value of output, earnings, and earnings per job; number of jobs, including indirect impacts
- Tax revenues and payments to states and counties
  - Dollar value of tax revenues
- Other (nonmarket) values
  - Dollar value of consumer surplus associated with recreation activities; qualitative assessment of the non-use values attributable to GRSG populations and ranching activity
- Population
  - Qualitative assessment of potential increase or decrease in population
- Housing and public services
  - Qualitative assessment of local availability of housing and public services
- Consistency with county LUPs
  - Qualitative assessment of consistency with county LUPs
- Interest groups and communities of place
  - Qualitative assessment of alignment with interest group objectives and community livelihoods

- Environmental Justice
  - Disproportionately high and adverse human health and/or environmental impacts

Alternatives B, F and the Proposed Plan include a 3 percent disturbance cap on PHMA, independent of surface ownership. If this disturbance cap is reached, economic activity on BLM-administered lands could be curtailed further than what is described in this section. The Proposed Plan also includes an adaptive management plan where additional measures could be taken to protect GRSG habitat based on triggers linked to indicators monitored by BLM. If triggered, these additional measures could also impose additional restrictions on economic activity on BLM-administered lands. However, because the 3 percent disturbance cap applies only to PHMA, it would not generate additional socioeconomic impacts through economic activities that are already limited in PHMA under various management alternatives. Application of disturbance caps and adaptive management triggers may exclude activities (e.g., new ROWs) in specific habitats where 'avoidance' originally applied.

The Proposed Plan designates sagebrush focal areas (SFA), representing recognized "strongholds" for GRSG that have the strongest levels of protection. These SFA are mostly in PHMA, but also GHMA and some nonhabitat areas, thereby increasing the potential for restrictions to economic activity with impacts in some areas under the Proposed Plan.

This section is organized differently from other impact sections. Rather than grouping the analysis of impacts by alternative, the analysis of economic impacts is grouped by affected resource followed by an overall discussion of social impacts. This grouping assists with the reader's understanding of the analytical approach and assumptions used to analyze economic and social impacts associated with each resource use and facilitates interpretation of results. Impacts are grouped by alternative in the **Summary of Social and Economic Impacts** and in **Table 4.31**. Varying types and levels of adaptive management, habitat objectives, disturbance caps, and habitat designations under each alternative help determine the relative effectiveness or efficiency of implementing measures and achieving habitat conservation. A qualitative discussion of effectiveness is included in **Summary of Social and Economic Impacts**.

Assumptions

The following list presents the basic assumptions related to social and economic impact assessment for Alternatives A through F as well as the Proposed Plan.

- The analysis of economic impacts of management alternatives on grazing uses billed AUMs as a baseline, estimated as a ten-year average share of active AUMs. Active AUMs measure the amount of forage from land available for grazing. Forest Service terms this measure "permitted" AUMs. Billed AUMs measure the amount of

forage for which BLM and Forest Service bill annually. Forest Service uses the term "authorized" AUMs for the same concept. The analysis uses two scenarios to describe a range of potential economic impacts of management alternatives on economic activity related to livestock grazing.

- The quantitative (model-based) analysis of management alternatives affecting oil and gas development on federal lands assumes that operators who are unable to drill on federal lands would not access the same oil and gas from nearby private or state lands. This assumption makes the model-based analysis more conservative, showing worse impacts than might be the case. Note, however, that a shift to private or state lands could occur, meaning that the economic impacts of reduced drilling and production on federal lands could be softened by the concomitant increase in drilling on private or state lands.
- The quantitative economic impacts associated with potential changes to authorized uses of Federal lands assume that the estimated impacts occur within the socioeconomic study area defined in Chapter 3. Thus, the results do not consider the possibility that a *de minimis* proportion of the impacts, those associated with approximately 0.02% of GHMA, could occur in Lyon and Storey counties in Nevada and Sierra County in California. This assumption avoids diluting the assessment of impacts by comparing them to a larger employment and earnings baseline that includes populations that would largely not be expected to be affected in any meaningful way. However, all qualitative discussions of potential social and economic impacts within GHMA would apply to GHMA within Lyon, Storey and Sierra counties as well.

Based on available information, several resource uses would not result in measurable or systematic social or economic impacts that would differ by alternative. Therefore, resource uses that are not discussed in detail are ACECs, wild horses and burros, solar energy, and wildland fire management.

The analysis also does not address solar energy development in detail. There are no existing solar projects on GRSG habitat in the study area, and GRSG habitat does not overlap any Solar Energy Zones. The BLM also has not received any applications for solar energy development on GRSG habitat in the study area, and does not anticipate receiving any such applications. Therefore, the BLM does not anticipate any economic impacts associated with solar energy development across any of the alternatives. For further information, see **Section 4.16**, Renewable Energy.

As a landscape level planning effort, none of the alternatives prescribe project-level or site-specific activities on BLM or National Forest System lands.

Furthermore, the agencies' selection of an alternative does not authorize funding to any specific project or activity nor does it directly tie into the agencies' budgets as appropriated annually through the Federal budget process. As a consequence, agencies' costs and differences in program costs across alternatives have not been quantified. Information has been presented in several resource impact sections on the types of costs that might be associated with various GRSG conservation measures.

4.21.2 Economic Impacts

Impacts from Management Actions Affecting Grazing Allotments

Economic impacts for grazing are quantified for Alternatives C and F, where grazing would be closed on some or all portions of GRSG habitat. Impacts for all alternatives are qualitatively discussed for other types of restrictions or design feature requirements that are contingent on proximity to lek areas and/or meeting desired land health conditions.

Overall Employment, Earnings, and Output per Job Impacted by Management Alternatives

The potential impacts of grazing closures on output and employment were estimated quantitatively using the IMPLAN economic model. Detailed assumptions for the quantitative analysis are described in **Appendix V**, Economic Impact Analysis Methodology. Alternatives A, B, D, E, and the Proposed Plan do not impose grazing closures in GRSG habitat. Other sections of the FEIS (i.e., **Chapter 2**, Alternatives, and **Section 4.10**, Livestock Grazing) document other types of proposed management changes in detail, including grazing management of strategy modifications and changes in range improvements and vegetation treatments. A qualitative discussion of these impacts is presented in a separate section below.

Estimates of impacts on jobs, earnings and output were obtained using the IMPLAN model. The model used 2011 data for active AUMs, except for active AUMs in the Humboldt-Toiyabe National Forest, for which 2012 data were used. The model used an average of 2000 to 2011 data for billed AUMs, because billed AUMs fluctuate from year to year.

From an economic perspective, the counties likely to be most affected by restrictions on livestock grazing would be those in which a relatively large portion of the economic base stems from livestock grazing. **Table 3-78**, Farm Earnings Detail, 2010 (2010 dollars), in **Section 3.23**, Socioeconomics and Environmental Justice, shows the approximate contribution of livestock grazing to overall county earnings, and indicates the counties in which livestock grazing contributes the greatest portion of overall earnings: Modoc (7.4 percent), Pershing (4.1 percent), and Nye (2.9 percent). In all other counties, the figure is lower than two percent.

The analysis calculated a range of economic impacts. The low impact scenario represents the case where ranchers continue to use as many of the initial billed AUMs as possible, using non-billed active AUMs as a buffer to absorb reductions in AUMs imposed by management alternatives. This scenario assumes livestock operators have the ability to do so, although this may not always be the case.

As further discussed in **Appendix V**, billed AUMs may be less than active AUMs for various reasons and may be the result of decisions by the livestock operator, a mutual decision between the BLM and permittee in response to land health conditions, or required by BLM under the authority of Conservation and Protection (C&P) Non-use on an annual basis.

The high impact scenario represents the case where ranchers maintain a constant billed to active AUM ratio and reduce billed AUMs in proportion to the reduction in active AUMs. In addition, the high impact scenario assumes each AUM reduced on BLM-administered and National Forest System lands would cause additional losses of AUMs for the livestock operator. This assumption is based on a scenario where BLM-administered and National Forest System lands are used for seasonal grazing and no other lands are available to replace closures of BLM-administered or National Forest System lands for grazing during those seasons. Consequently, livestock operators would have to reduce their numbers of livestock and lose AUMs during the remainder of the year.

The high impact scenario uses estimates elaborated by Torell et al. (2014) for a model ranch in Nevada to incorporate these additional losses of AUMs. Further details are provided in **Appendix V**. **Table 4-24** presents this range of estimates. These estimates were obtained generally multiplying the reduction in AUMs by alternative relative to Alternative A, shown in Table R-2, by the impacts per AUM shown in Table R-3. Note that the employment estimates include the labor of farm proprietors, although not of unpaid family labor; if family labor were included, then labor use differences among alternatives would be larger.

Table 4-24
Annual Impact of Management Actions Affecting Livestock AUMs on Output, Employment, and Earnings Compared with Alternative A

	Alternatives B, D, E, and The Proposed Plan[1]		Alternative C		Alternative F	
	Low	High	Low	High	Low	High
Output	See notes	See notes	-$144.9	-$297.4	-$57.8	-$177.8
Employment	See notes	See notes	-1,585	-3,191	-634	-1,910
Earnings	See notes	See notes	-$52.8	-$109.4	-$21.1	-$65.4

Source: Calculated using the IMPLAN model for each alternative (BLM 2013e), as explained in the text and in **Appendix V**.
Note: Output and earnings are in millions of 2010 dollars.
[1]Based on available AUMs, there would be no change in economic activity from grazing in Alternatives B, D, E, or the Proposed Plan. However, as described in the text, management actions in Alternatives B, D and the Proposed Plan would result in restrictions on livestock movement, vegetation treatments, and range improvements, which may increase ranch operators' costs or lead to other adverse economic impacts.

Beyond economic impacts linked to closing federal lands to livestock grazing under Alternatives C and F, management alternatives could impose other costs on livestock operators as follows:

- For Alternatives B and F and the Proposed Plan in areas where disturbance caps are exceeded, or for Alternative E in areas where disturbance is avoided, there is potential for restrictions on new disturbance (e.g., roads) that could increase costs.
- For Alternatives B, D, E, and the Proposed Plan, in habitat and/or active lek areas during certain seasons (e.g., nesting or breeding seasons where desired conditions for GRSG are not being met) seasonal modifications to grazing management strategies may be needed such as changes in pasture rotation or fencing. These modifications have the potential for increased costs and/or limitations to grazing duration, intensity or location for some allotments. For example, changes in the areas available for pasture, fencing, or interruptions of cattle paths could increase distances for cattle movement, need for alternative water sources, and associated costs. Habitat conditions for GRSG are less explicit under Alternative E which may afford greater flexibility for modifying management strategies. Potential for impacts related to seasonal management modifications is therefore relatively greater for Alternatives B, D, and the Proposed Plan, and relatively lower for Alternative E. Additional Forest Service guidelines for habitat (e.g., 7 inch stubble height for nesting habitat) may increase potential for impacts for some permittees, depending on specific conditions on allotments.
- For Alternatives B, C, D, E, F, and the Proposed Plan, design features (e.g., fence tags) or best management practices may be required to protect active lek areas, implying potential for increased costs; potential is relatively greater for Alternatives B, C, D, F, and the Proposed Plan compared to Alternative E. Additional guidelines under the proposed plan (e.g., trailing, fencing, range improvements) may affect some allotments.

Terms and conditions for permits in GRSG habitat could include, or be modified to include, provisions allowing for reductions in authorized grazing (AUMs) in combination with, or as an alternative to implementing grazing management modifications or design features under Alternatives B, D, E, and the Proposed Plan.

While requirements under the action alternatives may impose direct short-term impacts on operator costs and/or jobs, long-term improvements in land conditions may have a beneficial effect on grazing productivity. Specifically, vegetation treatments in all alternatives would generally have the effect of

improving ecological condition and land health, which would generally sustain current livestock operations and be beneficial to both wildlife and livestock (as well as livestock operators and local communities and counties). Forage availability may increase in the long term due to improved land health and forage productivity. However, required rest periods following treatments may impact the ability of livestock operators to fully use permitted AUMs in the short term. These short-term impacts would be limited except in cases where treatments involve large numbers of acres. Also, weed control treatments would increase forage availability in the long term by improving native plant productivity. Details about impacts under each alternative are provided below.

Alternative A—Under Alternative A, there would be no change in annual output, annual jobs, or annual earnings associated with grazing on federal lands, with respect to current trends. Based on the location of current federal grazing lands, the economic contribution of grazing would be similar to the pattern under current management, with particular concentrations in Modoc County, California, and the Nevada counties of Pershing and Nye.

Alternative B—Under Alternative B, economic activity attributable to grazing on federal lands with GRSG habitat is likely to be broadly similar to Alternative A because there would be no changes in the amount of GRSG habitat open for grazing. Some decisions on livestock movement, range improvements, and vegetation treatments would be subject to the conservation, enhancement, or restoration of GRSG habitat. As noted above, vegetation treatments would generally have the effect of improving ecological condition and land health, as forage availability typically increases following vegetation treatments in the long term due to improved land health and forage productivity. However, required rest periods following treatments may impact the ability of livestock operators to fully use permitted AUMs in the short term. Seasonal restrictions and design features (e.g., fence tags) could also be imposed, with changes in the areas available for pasture, fencing, or interruptions of cattle paths, that could increase distances for cattle movement, need for alternative water sources, and associated costs. The extent to which these additional constraints would reduce grazing economic activity is not clear, but Alternative B would likely result in some reductions in economic activity compared with Alternative A.

Alternative C—Under Alternative C, economic activity attributable to grazing on federal lands would be reduced. PHMA and GHMA would be closed to livestock grazing, and livestock grazing on federal lands would be restricted to those allotments with no GRSG habitat. Adverse impacts on output, employment, and earnings would be greater under Alternative C than any other alternative. Output and employment are projected to decrease by $144 to $297 million and 1,585 to 3,191 jobs respectively, compared to Alternative A. The economic impact of Alternative C may also be greater if the change in management actions, such as the removal of GRSG habitat from livestock

grazing, impairs the economic viability of some grazing operations – especially if the land previously used by a ranch is then left deserted and unused.

Alternative D—Economic activity due to grazing on federal lands with GRSG habitat is likely to be similar to Alternatives A and B because there would be no changes in the amount of GRSG habitat open for grazing. As noted above, vegetation treatments would generally have the effect of improving ecological condition and rangeland health, as forage availability typically increases in the long term due to improved land health and forage productivity. However, required rest periods following treatments may impact the ability of livestock operators to fully use permitted AUMs in the short term. Seasonal restrictions and design features (e.g., fence tags) could be imposed, with changes in the areas available for pasture, fencing, or interruptions of cattle paths, that could increase distances for cattle movement, need for alternative water sources, and associated costs. The extent to which these additional constraints would affect economic activity from grazing on federal lands is not clear. However, Alternative D would likely result in some reductions in economic activity compared with Alternative A (and the magnitude of impact would be lower than under Alternative B).

Alternative E—Economic activity from grazing on federal lands with GRSG habitat would be similar to that under Alternatives A, B, and D. This is because there would be no changes in the extent of GRSG habitat open for grazing. Vegetation treatments would generally have the effect of improving ecological condition and land health, as forage availability increases in the long term due to improved land health and forage productivity. Required rest periods following treatments may impact the ability of livestock operators to fully use permitted AUMs in the short term. Seasonal restrictions and such design features as fence tags could be imposed, with changes in the areas available for pasture, fencing, or interruptions of cattle paths. These could increase the distances for cattle movement, the need for alternative water sources, and associated costs. The extent to which these additional constraints would affect economic activity from grazing is not clear. However, Alternative E could reduce some economic activity, compared to Alternative A (in Nevada only; in California, the effects would be identical to Alternative A). The magnitude of the impact would probably be lower than under Alternatives B or D.

Alternative F—Under Alternative F, economic activity due to grazing on federal lands would be reduced because of the 25 percent reduction of livestock grazing in PHMA and GHMA, as well as the action to rest a portion (25 percent) of PHMA and GHMA each year and limit utilization levels. Economic impacts on output, employment, and earnings are shown in **Table 4-24**. The impact of Alternative F may be greater than shown if the reduction in federal AUMs impairs the economic viability of some grazing operations; this would be truer if the land previously used by a ranch is then left deserted and unused.

Proposed Plan—Under the Proposed Plan, areas open and closed for grazing would be the same as under Alternative A. The economic contribution of grazing would continue to be particularly concentrated in Modoc County, California, and in Pershing and Nye Counties, Nevada. Under the Proposed Plan, permit renewals would be prioritized in SFA and in PHMA outside of the SFA. If the standards for land health are not met, livestock grazing would be adjusted at the allotment level. This could include a variety of management approaches, such as changing rotation systems, season or timing or use, distribution of livestock use, intensity of use, type of livestock, class of livestock (e.g., yearlings or cow-calf pairs), duration of grazing use and rest period, or stocking rates. It is unknown to what extent permittees may need to change livestock management, and what economic costs those changes might entail.

Because the BLM and the Forest Service take a collaborative, site-specific approach to modifying livestock grazing, permittees are afforded the opportunity to work with agencies to develop management approaches that minimize impacts on their operations, while addressing identified habitat issues. When provided with more than one viable alternative, some permittees may prefer to reduce grazing overall, while others may prefer to increase management inputs (e.g., herding or maintaining let-down fences) to prevent a reduction in their authorized use.

The Proposed Plan allows for design and implementation of allotment-specific management. This would meet GRSG habitat objectives appropriate for each area, while providing the flexibility to minimize economic impacts on operators, rather than implementing a blanket reduction in grazing. This could provide benefits in some areas, while unnecessarily inflicting economic impacts in areas where ongoing management is resulting in satisfactory on-the-ground habitat conditions for GRSG.

In summary, economic impacts from unconditional closures to livestock grazing in PHMA and GHMA and potential increases in costs to operators are greatest under Alternative C, followed by Alternative F. Reductions in AUMs under Alternatives B, D, E, and the Proposed Plan are conditional on the land meeting seasonal GRSG habitat objectives and desired conditions, operator discretion about how to modify grazing strategies when needed, and other conditional restrictions. As a consequence, the likelihood of AUM reductions and potential for increased operator costs under Alternatives B, D, and E and the Proposed Plan are substantially lower than under Alternatives C and F. The relative potential for cost or operating impacts of implementing design features and seasonal restrictions is somewhat lower under Alternative E. Adopting a 3 percent disturbance cap under the Proposed Plan could limit range improvements. Actual cost impacts cannot be quantified.

Figure 3-12, Existing Lands Open to Livestock Grazing, shows the location of BLM and National Forest System lands open to livestock grazing relative to

GRSG habitat. Almost all counties would be impacted by the loss of grazing allotments with GRSG habitat under Alternatives C and F. The areas least affected would be the southern portions of Nye and Lincoln Counties and most of Modoc, Pershing and Churchill Counties.

Table 3-78 shows that farm earnings in 2010 constituted over 2 percent of total earnings in Modoc, Pershing, Lassen, Humboldt, Nye, Churchill and Lander Counties. The same table shows that in these seven counties, livestock operations are an important share of farm cash receipts. The intersection of these seven counties with the set of counties where there are grazing allotments with GRSG habitat indicates counties where economic impacts of management alternatives on livestock grazing may be of particular importance. These counties are Lassen, Humboldt and Lander, as well as the northern parts of Nye County. Other counties where impacts of management alternatives on livestock grazing are also likely to be considerable are Elko and White Pine, where farm earnings are less than 2 percent of total earnings, but where the large majority of these farm earnings come from livestock operations (**Table 3-78**).

Other Values Associated with Livestock Grazing

As noted in **Section 3.23**, Socioeconomics and Environmental Justice, research has demonstrated that in most cases BLM-administered and National Forest System land grazing permits increase ranch property value beyond the additional forage value provided because federal permits are perceived as adding semi-private open space to the property. Thus, any restrictions to grazing on BLM-administered and National Forest System lands would result in reductions in property values for the ranches. The extent of any impact could vary depending on the extent of restrictions of grazing on BLM-administered and National Forest System lands, whether a grazing permit is not renewed in its entirety, and the land management decisions in the selected alternative. It should be noted that any premium to property values associated with a federal grazing permit is a result of amenity perception rather than ownership – since any BLM-administered and National Forest System land grazing permit is associated with publicly, not privately, owned land.

As described in **Chapter 3**, BLM-administered and National Forest System land managed for livestock grazing provides both market values and nonmarket values; the latter include open space and western ranch scenery, which provide value to some residents and outside visitors, and ranches may also provide some value to the non-using public (e.g., the cultural icon of the American cowboy). Some of the lifestyle value of ranching is likely to be captured in markets (e.g., property values of ranches adjacent to public lands). Other residents and visitors also perceive nonmarket opportunity costs associated with livestock grazing; in addition, some of the lifestyle value of ranching is likely to be captured in markets (e.g., property values of ranches adjacent to BLM-administered and National Forest System lands). The "Other Values" section in

Section 3.23, Socioeconomics and Environmental Justice, and **Appendix U** provide additional discussion of these values. Overall, the process for incorporating potential nonmarket values associated with the management of BLM-administered and National Forest System land for livestock grazing into analyses of net public benefits remains difficult as it implies the need to consider non-market values and uses associated with landscapes characteristics and opportunities that would exist in absence of grazing and ranch activity (i.e., non-market values and benefits from alternative landscapes may help offset potential losses in non-market values linked to grazing and ranching). The BLM and the Forest Service did not attempt to quantify these values for the present study.

To the degree that there are net benefits associated with nonmarket values attached to livestock grazing and ranching, these would be greatest in Alternatives A and E, as both of these alternatives are likely to result in similar levels of livestock grazing operations in the study area. If the net nonmarket value associated with livestock grazing and ranching is positive, then that value would be greatest under Alternatives A and E, lower under Alternatives B, D, and the Proposed Plan, lower under Alternative F, and lowest of all under Alternative C, in line with the expected impacts on market values discussed above. Non-market benefits linked to alternative landscapes and land uses may help offset potential losses in non-market benefits associated with grazing.

Impacts from Management Actions Affecting Recreation

Overall Employment, Earnings, Output, and Earnings per Job Impacted by Management Alternatives

As discussed in **Chapter 3**, service related sectors, including many typically linked to recreational activities such as the accommodation and food services industry, are important sources of employment and earnings throughout the study area. Although management activities included in the proposed alternatives could affect recreational activities (e.g., OHV use in dispersed areas), the effects are not projected to be substantial. Designating OHV use as limited in certain areas (i.e., limited to existing roads and routes, possibly during specific times of year) would have the effect of creating a network of OHV routes rather than allowing open exploration in these areas. However, there would still be ample opportunities for adventure and exploration, and BLM recreation specialists expect that overall use would not change.

Currently, most vehicle use in the planning area occurs on existing routes during summer and fall. There is little use of the existing route network during winter and spring due to the generally wet conditions. Random cross-country travel through sagebrush vegetation is likely not a common occurrence. Sagebrush has thick woody stems that can puncture the sidewalls of tires, limiting cross-country travel. While the frequency of cross country travel tends to increase near highways and population centers, recent inventories of the route network shows no evidence of cross-country travel in the more remote

areas of the planning area and some of the existing routes in the more remote areas have started to reclaim due to lack of use. Therefore, on both BLM-administered and National Forest System lands, agency recreation specialists predict the alternatives would not result in measurable impacts on recreation visitor days.

BLM Special Recreation Permits and Forest Service Special Use Permits that are in PHMA and GHMA could be modified in some alternatives. This would result in a loss of commercial revenue to recreation service providers, as well as loss of permit-generated fee revenue for the BLM and the Forest Service as managing agencies. However, for several reasons, the BLM predicts that any losses would be relatively small. This is because the distance needed to avoid sensitive habitat is relatively small (usually four miles at most). The BLM and the permit holder would sometimes be able to avoid impacts altogether by modifying the time of use; and there are relatively few activities that the BLM would permit in the first place that would have impacts on GRSG. Thus, although specific permit modifications are not prescribed at the level of this EIS and, it is not possible to quantify the economic impacts, any impacts are likely to be small.

For Alternatives B through F and the Proposed Plan, the net economic effect on recreational activity is not possible to quantify, but would likely be very small. The primary effect on recreational activity would be related to change in designation from open to limited for OHV use, and as noted above (and in **Section 4.18**, Recreation), BLM recreation specialists expect that use overall would not change.

Alternative A—Under Alternative A, existing recreation opportunities in the study area would be maintained. Alternative A would not result in impacts on revenue of commercial recreation service providers or managing agencies attributable to BLM SRPs and Forest Service SUAs, as it would result in no changes to current management.

Alternative B—The restrictions on BLM SRPs and Forest Service SUAs documented in **Section 4.18**, Recreation, may result in modifications for some types of permitted uses (e.g., OHV races) on PHMA, potentially resulting in fewer opportunities for this type of event. As noted above, the OHV area designation change on PHMA (from open to limited) may result in small changes in patterns of OHV travel in the study area, but BLM-administered and National Forest System lands recreation specialists do not anticipate any changes in recreational use. The economic effect from recreational activity is not possible to quantify, but if there is any difference versus Alternative A from restrictions on BLM SRPs and Forest Service SUAs, it is likely to be very small.

Alternative C—Economic impacts of Alternative C with respect to BLM SRPs and Forest Service SUAs are the same as Alternative A. There would be no anticipated change in economic impacts with respect to the OHV area

designation change on PHMA and GHMA because public lands recreation specialists do not anticipate any changes in recreational use. Thus, economic impacts with respect to recreation would be the same as in Alternative A.

Alternative D—Under Alternative D, BLM SRPs and Forest Service SUAs could be restricted for some types of permitted uses (e.g., OHV races) on PHMA and GHMA, which may (but would not necessarily, for the reasons noted above) result in reduced economic activity associated with these events. There would be no anticipated change in economic impacts with respect to the OHV area designation change on PHMA and GHMA, because public lands recreation specialists do not anticipate any changes in recreational use. The economic effect from recreational activity is not possible to quantify, but if there is any difference versus Alternative A from restrictions on BLM SRPs and Forest Service recreation permits, it is likely to be very small.

Alternative E—Alternative E would result in the same economic impacts on recreation as would Alternative A.

Alternative F—Alternative F would result in the same economic impacts related to recreation as in Alternatives B and D.

Proposed Plan—Under the Proposed Plan, management actions restricting the construction of new recreation facilities would be imposed in PHMA only, allowing for some development in GHMA. For example, where a road is closed by travel management actions, a trailhead or parking area may be developed to allow recreationists to park and access the area via non-motorized means, such as on horseback or on foot. This would possibly allow continued recreation use of the area. The Proposed Plan would result in economic impacts similar to Alternatives B, D, and F.

Other Values Associated with Recreation

As described in **Chapter 3**, only a portion of the value of recreation on public lands is captured in the marketplace. Here, the concept of consumer surplus is used to measure the "non-market" portion of recreation value. As noted in **Chapter 3** and **Appendix U**, these nonmarket values are not directly comparable to output, earnings, or jobs associated with various resource uses on BLM-administered and National Forest System lands, which are described elsewhere in this section.

As discussed above, recreation specialists believe the alternatives would not result in measurable changes in recreational activities or patterns. Therefore, there would be no change in non-market recreation values.

Impacts from Management of Oil and Gas Leases

Overall Employment, Earnings, Output, and Earnings per Job Impacted by Management Alternatives

The potential impacts of management alternatives affecting oil and gas drilling, completion, and production on overall employment, earnings, and output were estimated quantitatively using the IMPLAN model. BLM calculated these impacts from an estimate of the number of wells expected to be drilled and completed, and the amount of oil and gas produced, as well as per-well and per-barrel estimates of economic output, earnings, and employment. These estimates are documented in detail in **Appendix O**.

Based on the restrictions identified for the management alternatives, BLM oil and gas specialists projected the number of wells and volume of production for each alternative. Existing wells, and wells not on GRSG habitat, would not be affected under any alternative. In Alternatives B, and E, management actions would restrict exploration and development activity but to a lesser extent than in Alternatives C, D, F and the Proposed Plan. Alternative E would not impose additional restrictions relative to Alternative A, but BLM oil and gas specialists project a slightly reduced number of new wells and production under Alternative E, because of increasing environmental restrictions that would only apply to new permitting processes. The Proposed Plan would have similar economic impacts to Alternatives C and F. SFA and PHMA would be subject to a NSO stipulation, with no exception in SFA. For a more detailed discussion of the impacts of each alternative on exploration and development of oil and gas, see **Section 4.14.1** Fluid Minerals.

For analytical purposes, new wells were assumed to be drilled and completed over 20 years at a uniform rate, and the oil from completed wells was also assumed to be produced at a uniform rate once completed wells enter production. Thus, the total economic activity associated with oil and gas development and production was estimated by summing economic activity from drilling, completion, and total oil production for each completed well. The economic activity from drilling and completion was divided by 20 to produce an annual average impact estimate, and the economic activity from production was divided by 20 and then again by 2, to capture the economic impact in year 10, when about half of production wells will have been drilled and completed. The total impact of drilling, completion and production generates an approximate annual figure for comparison with baseline data. The results are presented in **Table 4-25**. The number of wells drilled and completed and the production per alternative, relative to Alternative A are presented in Appendix V. The results in Table 4-31 were obtained by multiplying the numbers in Table V-8 by impacts per well and per million barrels of oil produced, presented in Table V-9.

Table 4-25
Average Annual Impact of Management Actions Affecting Oil and Gas on Output, Employment, and Earnings Compared with Alternative A

Item	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Proposed Plan
Output	-$33.2	-$63.7	-$56.0	-$17.8	-$63.7	-$62.1
Employment	-72.1	-138.0	-121.5	-38.8	-138.0	-127.7
Earnings	-$4.5	-$8.6	-$7.6	-$2.4	-$8.6	-$7.9

Source: Calculated using BLM (2013f) and the IMPLAN model, as explained in the text and in **Appendix V**, Economic Impact Analysis Methodology.
Note: Dollar figures are in millions of year-2010 dollars.

The economic impact of decreases in oil and gas development in the study area under Alternatives B, C, D, E, F, and the Proposed Plan would be principally felt in areas that are being explored for oil, where workers and service providers reside and in areas of current exploration activity. To better understand the impacts on these areas, a separate regional impact analysis was done for a five-county area including Elko, Eureka, Nye, White Pine and Lincoln Counties, where impacts would likely be concentrated. (BLM 2013f). The results are presented in **Table 4-26**.

Table 4-26
Average Annual Impact of Management Actions Affecting Oil and Gas on Output, Employment, and Earnings Compared with Alternative A, Five County Area

Item	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Proposed Plan
Output	-$30.1	-$57.8	-$50.9	-$16.2	-$57.8	-$56.9
Employment	-50.9	-97.5	-85.8	-27.4	-97.5	-91.4
Earnings	-$3.3	-$6.3	-$5.6	-$1.8	-$6.3	-$5.9

Source: Calculated using BLM (2013f) and the IMPLAN model, as explained in the text and in **Appendix V**, Economic Impact Analysis Methodology.
Note: Dollar figures are in millions of year-2010 dollars.

Table 4.31 shows that employment losses in the five counties would correspond to up to 0.2 percent of the employment in those five counties in 2010 under Alternative C or F (97.5 divided by total employment of 53,127, per **Table T.1** in **Appendix T**). Employment losses under the Proposed Plan or Alternative D would be slightly less than Alternative A. Employment losses under Alternatives B or E, relative to Alternative A, would correspond to less than 0.1 percent of the 2010 employment levels in those five counties.

Impacts from Management of Locatable Minerals

As described in **Chapter 3**, the study area produces several locatable minerals, including gold, silver, and copper. GRSG habitat management alternatives would impose restrictions on development of mineral production, particularly under Alternatives B, C, F and the Proposed Alternative, under which some lands would be recommended for withdrawal from locatable mineral entry. Under the

Proposed Plan, SFA would be recommended for withdrawal (see **Section 4.15.2**, Minerals – Locatable).

Any entity that holds valid existing rights to locatable mineral development would not be affected by a petition or formal withdrawal of lands from locatable mineral entry because the valid existing right would supersede a withdrawal if it occurs. **Section 4.15.2**, Minerals – Locatable, provides more information about valid existing rights; also, see the definition of valid existing rights in **Chapter 8**, Acronyms and Glossary. For areas recommended for withdrawal under Alternatives B, C, F, and the Proposed Plan, existing claims would go through a mineral validity examination when a plan of operations is submitted to BLM to develop the locatable mineral deposit. In these cases, the operator would have to pay for the examination, per 43 CFR, Part3809.100. This cost could potentially hinder exploration for operators. If an operation exists prior to the withdrawal and BLM wishes to challenge the claim's validity, the BLM would pay for the examination.

BLM specialists generally expect that the production of gold, silver, and copper would remain the same across all alternatives (BLM 2013g), at least in the first three to five years after any withdrawal from locatable mineral entry is implemented. As of June of 2014, there were 43 Nevada and 1 California plans of operation in the study area that potentially overlap with GRSG habitat (BLM 2014c). For these operations, in the long run, production of locatable minerals would be affected only to the degree that the cost of conducting a mineral examination would affect individual operators' decisions to modify their plans of operation, which would depend on site-specific and operator-specific conditions.

No Reasonably Foreseeably Development scenario for locatable minerals was developed for this landscape level planning amendment that forecasts production of locatable minerals on Federal lands in the study area. In the absence of this information, it is not possible to quantify potential economic impacts across alternatives over the planning horizon. However, as discussed above, under Alternatives B, C, F, and the Proposed Plan., costs could arise for validity exams for claims or operations looking to expand in areas recommended for withdrawal. In addition, no new claims could be made to explore or mine locatable minerals in withdrawn areas.

In addition to the 3 percent of the decision area currently withdrawn, Alternatives B and F would recommend for withdrawal an additional 57 percent of the decision area. Alternative C would recommend for withdrawal all the decision area. The Proposed Alternative would recommend for withdrawal 17 percent of the decision area, in addition to the current 3 percent withdrawn. There are currently no active mines in the area recommended for withdrawal under the Proposed Alternative. To the extent that exploration and mining were to occur in these areas under Alternatives A, D and E, there would be less

economic activity supported by exploration and mining under Alternatives B, C, F and the Proposed Alternative.

In addition to land petitioned for withdrawal, several alternatives include added RDFs to protect GRSG (consistent with applicable law) when compared to Alternative A. In particular, RDFs are added under Alternatives D, E and the Proposed Plan, consistent with applicable law. These RDFs could add costs to mining operations.

Overall, economic activity associated with management of locatable minerals would be the same for Alternatives A, D, and E, and may be lower under Alternatives B, C, F and the Proposed Plan depending on site-specific and operator-specific conditions.

Impacts from Management of Salable Minerals and Nonenergy Leasable Minerals

GRSG habitat management alternatives would impose restrictions on development of salable and nonenergy leasable mineral production, particularly under Alternatives B, C, D, F, and the Proposed Plan. Specifically, all new mineral material disposal and nonenergy leasable mineral leasing would be closed in PHMA under Alternatives B, F and the Proposed Plan and in both PHMA and GHMA under Alternatives C and D. No areas would be closed to new mineral material disposal and nonenergy leasable mineral leasing under Alternative E, but any new pits or non–energy mineral leases would require consultation and application of the "avoid, minimize, mitigate" process to ensure no net unmitigated loss of GRSG habitat. Under Alternative D existing mineral materials pits could be expanded under certain requirements (see **Section 4.15.3**, Salable Minerals).

Closing areas to mineral material sales in Alternatives B, C, D, F, and the Proposed Plan could increase costs for commercial and public users of mineral materials. Because transportation of mineral materials is typically a cost driver, especially for municipal users, closing pits could have a measurable financial impact on entities that depend on sand and gravel from BLM-administered lands. The BLM would attempt to reduce this impact by identifying new pits proximate to identified needs, but at the stage of this analysis – without knowing the location, timing, and amounts needed – it is not possible to determine the economic impacts on either municipal or commercial entities.

Overall, economic activity associated with salable mineral materials and nonenergy leasable mineral development would be generally the same for Alternatives A and E, and may be lower under Alternatives B, C, D, F, and the Proposed Plan.

Impacts from Management Actions Affecting Geothermal Exploration and Development

Economic impacts from geothermal exploration and development are a function of construction and operation expenditures for geothermal electricity development, including drilling wells, constructing power plants, and operating facilities. BLM developed a RFDS for geothermal development, which serves as a basis for analyzing impacts resulting from future leasing and development of federal geothermal resources in the decision area over the next 20 years. The RFDS analysis predicts that in Alternative A, approximately 25 power plants will come online over the next 20 years as a result of continued exploration and development activity. The RFDS analysis also notes that in the remaining alternatives, exploration and development activity would be restricted (to varying degrees) due to restrictions associated with GRSG habitat conservation.

For the purposes of the economic analysis, BLM assumed that all of the new power plants would use traditional hydrothermal technology and none of the plants would use Enhanced Geothermal Systems. BLM also assumed that the plants would come online on a roughly uniform schedule, so that half of the plants would be online halfway through the 20-year forecast period. Thus, the analysis of economic activity from plant construction reflects a typical year (i.e., for Alternative A, about .6 plants constructed) and the analysis of economic activity from plant operation reflects the midpoint year (ten new plants online).

To estimate economic activity associated with geothermal development, BLM first used the National Renewable Energy Laboratory's JEDI model to determine approximate capital and operating costs associated with a representative power plant, based on a 28.8 MW nameplate capacity (based on current average capacity in the planning area and typical conditions for the planning area. BLM then used IMPLAN, calibrated to the specific region of the socioeconomic study area, to calculate the total (i.e., direct, indirect and induced) impacts associated with a given direct expenditure. **Table 4-27** presents the resulting estimates of output, employment, and earnings estimates for activities related to geothermal development for Alternatives B, C, D, E and F, compared with Alternative A. These estimates were obtained based on the estimated impacts per plant presented in Table V-6 of Appendix V.

Table 4-27
Economic Impact of Management Actions Affecting Geothermal Exploration and Development Compared with Alternative A

	Alternative B – Alternative A	Alternative C – Alternative A	Alternative D – Alternative A	Alternative E – Alternative A	Alternative F – Alternative A	Proposed Plan – Alternative A
	Construction (representative for one year)					
Output	-$7.8	-$13.0	-$10.7	-$6.5	-$13.0	-$11.5
Employment	-50	-84	-68	-42	-84	-74
Earnings	-$2.9	-$4.8	-$3.9	-$2.4	-$4.8	-$4.2

Table 4-27
Economic Impact of Management Actions Affecting Geothermal Exploration and Development Compared with Alternative A

	Alternative B – Alternative A	Alternative C – Alternative A	Alternative D – Alternative A	Alternative E – Alternative A	Alternative F – Alternative A	Proposed Plan – Alternative A
Operations (for year 10 of planning period)						
Output	-$2.0	-$3.3	-$2.7	-$1.6	-$3.3	-$2.9
Employment	-16	-27	-22	-13	-27	-24
Earnings	-$1.5	-$2.5	-$2.0	-$1.3	-$2.5	-$2.2

Source: Calculated using the IMPLAN model as explained in the text and in **Appendix V**, Economic Impact Analysis Methodology.
Notes: Output and earnings are in millions of year 2010 dollars. The economic impact for operations in year 10 of the planning period represents the point at which half of the expected geothermal power plants have been developed and are operating.

Alternative A—Under Alternative A, BLM predicts geothermal exploration and development activity would proceed according to the Geothermal RFDS scenario. This entails 56 new production wells and 38 new injection wells. As a result of these wells, 12 power plants would come online (BLM 2013h, BLM 2015).

Alternative B—Under Alternative B, lands with high geothermal potential that overlap PHMA would be closed to geothermal leasing, exploration and development. It is uncertain which future geothermal projects would be located in these lands; however, based on the share of PHMA in moderate and high geothermal potential areas, the BLM estimated that geothermal exploration and development could be reduced by 12.7 percent (BLM 2013h, BLM 2015a). BLM used the midpoint of this range to estimate expected reductions in output, employment, and earnings compared with Alternative A.

Alternative C—Under Alternative C, closure of BLM-administered and National Forest System lands to fluid mineral leasing would restrict the amount of new geothermal leasing exploration and development that would otherwise occur. Based on the amount of PHMA and GHMA in moderate and high geothermal potential areas, the BLM estimated that geothermal exploration and development would be reduced by 21.1 percent (BLM 2013h, BLM 2015a).

Alternative D—Under Alternative D, NSO restrictions would reduce the availability of PHMA and GHMA to geothermal exploration and development. As a result, it is estimated that geothermal exploration and development could be reduced by approximately 13.4 to 21.1 percent (BLM 2013h, BLM 2015a). BLM used the midpoint of this range to estimate expected reductions in output, employment, and earnings compared with Alternative A.

Alternative E—Under Alternative E, drilling and exploration would be close to that identified in Alternative A. The BLM estimated that geothermal exploration and development could be reduced by approximately 0 to 21.1 percent (BLM

2013h, BLM 2015a). BLM used the midpoint of this range to estimate expected reductions in output, employment, and earnings compared to Alternative A.

Alternative F—Constraints on geothermal leasing, exploration and development in this alternative would be similar to those under Alternative C (BLM 2013h, BLM 2015a). Thus, the BLM estimated that reductions in output, employment, and earnings, relative to Alternative A, would be identical to those of Alternative C.

Proposed Plan—Under the Proposed Plan, NSO restrictions would reduce the availability of SFA, PHMA, and GHMA to geothermal exploration and development. SFA and PHMA would be subject to a NSO stipulation, with no waivers, exceptions, or modifications in SFA. As a result, the BLM estimated that geothermal exploration and development could be reduced by approximately 13.7 to 23.7 percent (BLM 2013h, 2015). The BLM used the midpoint of this range to estimate expected reductions in output, employment, and earnings, compared to Alternative A.

Geographically, the impacts associated with reduced geothermal exploration and development would most likely be felt in Churchill, Humboldt, Lander, and Washoe Counties, since that is where most geothermal electrical generation is occurring on federal lands today (see **Chapter 3**).

Impacts from Management Actions Affecting Wind Energy Development

As described in **Chapter 3**, Affected Environment, some wind projects have either been proposed or are in the monitoring stage in the study area. Currently existing or proposed wind energy ROWs in the study area include approximately 150 MW of installed capacity. The BLM currently has four applications for development of wind energy projects in the study area. These applications have not been granted a ROW and are still undergoing analysis. These projects could add up to an additional 1,131 MW in White Pine, Washoe, and Lassen Counties. However, wind applications may increase or decrease in the near future and developers may choose to build less MW than applied for. There is currently one operational project in the sub-region that produces 150 MW. Under Alternative A, projects could be implemented in existing mitigation measures and policies that are currently in place. Under Alternatives B, C, D, F, and the Proposed Plan, applications could be rejected due to management of GRSG habitat as avoidance or exclusion areas. In Nevada, Alternative E would have similar effects on socioeconomics as Alternative A through management that would require consultation and the application of RDFs consistent with applicable law. In California, Alternative E management and associated effects would be the same as Alternative A. The socioeconomic impacts of the Proposed Plan would be similar to Alternative B, would be less limiting than Alternatives C, D, and F, but would be more restrictive than Alternatives A and E.

Table 4-28 presents the estimates of output, employment, and earnings for activities related to wind energy development compared to Alternatives A and E, based on the existing application for wind energy development. These estimates were obtained based on impacts per MW shown in Table V-11 of Appendix V and should be interpreted as an illustrative scenario of the magnitude of socioeconomic impacts associated with wind energy development.

Table 4-28
Economic Impact of Management Actions Affecting Wind Energy Development. Alternatives B, C, D, F and the Proposed Plan Compared with Alternatives A and E [1]

	Study Area	Elko/White Pine Area	Washoe/Lassen Area
Construction (representative for one year) [2]			
Output	-$25	-$19	-$3
Employment	-151	-115	-20
Earnings	-$10	-$8	-$1
Operations (representative for year 10 of the planning period)			
Output	-$12	-$9	-$2
Employment	-116	-96	-16
Earnings	-$7	-$6	-$1

Source: Calculated using the IMPLAN model with inputs from the NREL JEDI model as explained in the text and in **Appendix V**, Economic Impact Analysis Methodology.
Notes: 1. Output and earnings are in millions of year 2010 dollars; 2. Assumes construction would occur over the 20 year period.

Table 4-28 shows the impact on output, employment, and labor earnings of the loss of the 1,131 MW of installed capacity of the four applications currently in place under Alternatives B through F as well as under the Proposed Plan. These applications are concentrated largely in the White Pine area with some development also located in Washoe and Lassen Counties. The loss of up to 211 (115+96) jobs in year 10 would correspond to approximately four percent of the current employment in the White Pine area (211 divided by 5,155).

Aside from the existing applications for wind energy development, under all alternatives some wind development would still be possible, even in exclusion areas, because exclusions only apply to utility scale/industrial projects (20 MW or greater). Industrial wind facilities could also be allowed if associated with an existing industrial infrastructure to provide on-site power. Under Alternatives E and the Proposed Plan, proposed industrial wind energy facilities on PHMA and GHMA would be accessed in consultation with the SETT and authorizations could involve the use of Nevada's Conservation Credit System,[1] with potential associated costs to project proponents.

[1] This system allows disturbance to GRSG habitat compensated by habitat protection measures such as to generate net benefits to the species

Impacts from Management Actions Affecting Land and Realty and Travel Management

Direct Economic Activity Dependent on BLM-Administered and National Forest System Land and Resource Management

Management actions that affect development of infrastructure could have important hindering effects on the growth of economic activity in the area. Limitations on new ROWs for power lines, pipelines, and access routes or restrictions to route construction and to travel on existing roads could increase the cost of new investments or make them no longer economically viable. For projects intended to increase the reliability of the infrastructure network, an inability to complete those projects would result in continued costs to the ROW holder and consumers for maintaining the existing network. Additional information about changes in cost effectiveness and efficiency associated with restrictions on ROW, corridors, and treatments are discussed in **Section 4.13**, Land Use and Realty and **Section 4.5**, Vegetation and Soils. A qualitative discussion of the potential for economic impacts from restrictions to land use and transportation is provided below for each alternative.

Alternative A—Alternative A would place the fewest restrictions on ROW and SUA development and route construction and maintain the largest area open to travel, among the alternatives.

Alternative B—Management actions under Alternative B to protect GRSG habitat would impact lands and realty through the exclusion of PHMA to new ROW and SUAs, additional criteria for land exchanges, and limitations on new mineral development and road construction. Motorized travel would be limited to existing routes in PHMA unless BLM or Forest Service has completed travel management plans which designate specific roads (routes) for motorized travel. Routes constructed in excess of a 3 percent disturbance cap in PHMA would face increased costs with mitigation resulting from the loss of habitat. Existing power lines would be evaluated for removal, burying, or modification. Alternative B would impose limitations and added costs to future economic investments in the study area compared with Alternative A.

Alternative C—Under Alternative C, impacts on ROW authorizations and SUAs would be similar to Alternative B, but exclusion would apply to all GRSG habitat, affecting 7 million more acres than Alternative B. All designated corridors would be managed as ROW exclusion areas and would therefore be unavailable to accommodate new ROW infrastructure. Additionally, travel management under Alternative C would have similar impacts as Alternative B, with added restrictions: route construction would require a 4-mile buffer from leks in PHMA and GHMA. Alternative C would impose the most limitations and added costs to future economic investments in the study area.

Alternative D—ROW development and SUAs under Alternative D would also face restrictions, but these would be more limited than under Alternatives B and C, except for wind and solar development, which remain excluded in GRSG habitat under Alternative D. Management would direct new and existing (during amendment or renewal processes) power lines to be buried unless not technically feasible. Technical feasibility would be determined on a project-by-project basis. A determination as to whether something is considered technically feasible would be based on local conditions, such as vegetation, topography, or project size. Restriction and costs to infrastructure development under Alternative D would be greater than under Alternative A but less than under Alternatives B or C.

Alternative E—Under Alternative E, the impacts on GRSG lands in California would be the same as under Alternative A. In Nevada, impacts would be similar to those under Alternative A and less than those under Alternatives B, C, and D. Power lines of up to 35 kV would be buried where ground disturbance can be minimized, and power lines of higher voltage would be buried when economically and technically feasible. All new ROWs in SGMA would require consultation and application of the Nevada GRSG Conservation Plan's avoid, minimize, and mitigate strategy to ensure no net unmitigated loss of GRSG habitat. The Nevada Conservation Credit System may be used to achieve a goal of no net unmitigated loss of GRSG habitat.

Alternative F—Impacts from Alternative F would be similar to Alternative C, except that designated utility corridors with existing ROW development would be available for new collocated ROW development. However, the limited amount of lands in the planning area associated with corridors containing existing ROW development could eventually preclude additional development as those corridors become fully occupied. Collocating new infrastructure would likely increase the complexity and costs of new ROW development. The resulting impact of Alternative F could be a reduction in service availability and/or higher costs of service to customers in and outside of the planning area.

Proposed Plan—With the exception of utility corridors, the Proposed Plan would have slightly fewer impacts than under Alternative D. The main difference is that GHMA would remain open to minor ROW development, as opposed to the avoidance of minor ROWs in GHMA under Alternative D, Linear ROW applicants would have fewer opportunities to site infrastructure in the corridors. This is because the Proposed Plan would result in 80 percent fewer acres of designated utility corridors than under Alternative A and because it limits corridor widths to 3,500 feet. Should a corridor become fully occupied by ROW development, the developer could incur added costs. These would be associated with alternative alignments outside GRSG habitat, collocation of ROWs, and adherence to the GRSG screening criteria and RDFs consistent with applicable law. In some instances, projects could be deemed financially or technically infeasible, in which cases the applicant would not pursue the project.

Under the Proposed Plan, management in PHMA and GHMA would encourage new roads to align with existing roads and would encourage the upgrading of existing roads to limit disturbance. The Proposed Plan would be less limiting than Alternatives B, C, D, and F but more restrictive than Alternatives A and E.

Alternatives B, D, E, F and the Proposed Plan include the possibility of burying or relocating power lines. Some commenters on the Draft LUPA/EIS expressed concern with the costs of these measures and potential impacts on ratepayers.

Unit cost information for constructing transmission lines provides context for potential impacts of relocating or rerouting a transmission line. A 2012 WECC study provides information on transmission line costs per mile, ranging from $927,000 to $2,967,000, depending on the voltage and whether lines are single or double circuit. The same study provides cost multipliers for difficult terrains, reaching up to 2.25 in the case of forested lands (WECC 2012). The cost to construct underground transmission lines can be between 4 and 14 times higher (PSC 2011), depending on terrain, although burying existing lines would be a fraction of the cost of new lines. Burying distribution lines would be considerably less, averaging under $500 per mile in rural areas (EIA 2012).

According to the Energy Information Administration, on average in the United States, transmission costs account for approximately 11 percent of the cost of energy bills, and distribution costs account for 31 percent, with the remaining being power generation costs (EIA 2013). Because utility providers allocate costs to their ratepayers, per-customer rate impacts would be greater where the ratepayer base is smaller, all else being equal; that is, given an identical fixed cost associated with burial of transmission lines. Areas with smaller local utility providers with fewer ratepayers would be required to absorb a greater proportion of the costs of relocation or rerouting, compared to areas serviced by larger multistate providers. Sufficient information is not available to estimate the effect of these costs on ratepayers under the various management alternatives.

Impacts from Management Actions Affecting Special Status Species

Other Values Associated with Populations of GRSG

As described in **Chapter 3**, economists and policy makers have long recognized that rare, threatened, and endangered species have economic values beyond those associated with active "use" through viewing or hunting. **Chapter 3** and **Appendix U** document current methods to estimate these "non-use" values, including a description of the literature review that the BLM and the Forest Service conducted to determine if there were existing non-use value studies for GRSG. Although there are no existing studies on valuation specific to the GRSG, several studies published in peer-reviewed scientific journals for bird species with similar characteristics find average stated willingness-to-pay 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 non-use values, but the non-use 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 and if even a small portion of the per-household value represents a non-use value, then the aggregate regional non-use value could be substantial. However, the BLM and the Forest Service did not quantify the aggregate value because of several factors, including uncertainty associated with the comparability of the existing studies to the GRSG context and the documented difference between stated and actual willingness-to-pay.

From a qualitative perspective, however, the non-use values associated with populations of GRSG would correspond to the degree of habitat protection associated with each alternative. Current management, Alternative A, provides the least amount of protection for GRSG in the planning area and consequently would result in the most impacts on GRSG. As a result, to the degree that there are non-use values associated with populations of GRSG, management under Alternative A would have the greatest adverse impacts on those values.

As discussed in **Section 4.6**, Special Status Species, most of the management actions under the alternatives would be beneficial for GRSG. It is therefore estimated that, compared with Alternative A, each alternative would have a positive impact on non-use values associated with populations of GRSG. However, because so many factors (e.g., vegetation and soils management, livestock grazing management, fire and fuels management, and wild horse and burro management) impact the protectiveness of each alternative, it is difficult to anticipate the comparative protection, and therefore non-use values, provided by Alternatives B through F. In general, the more restrictive an alternative is on habitat disturbance, the more it will favor non-market values associated with the GRSG and their habitat. Under Alternative E, The Nevada Conservation Credit System may be used to achieve a goal of net conservation gain of GRSG habitat.

Impacts on Tax Revenues and Payments to States and Counties

Reductions in economic activity have the potential to result in reduced tax revenues for local and state governments as well as the federal government. At the state level, these could take the form of reductions net proceeds of minerals tax or oil and gas production taxes, sales and use taxes, or (in California only) personal and corporate income taxes. At the local level, revenues could be reduced if property or sales taxes decrease.

The alternatives are unlikely to have a significant impact on state tax revenues. As described in **Section 3.23**, Socioeconomics and Environmental Justice, most

Nevada state revenues come from sales and use taxes, the Modified Business Tax, and minerals taxes (predominantly on gold and silver production).

Nevada's overall economic output, which provides a measure of its sales tax base, was over $124 billion in 2010, and the reductions in output anticipated due to the most restrictive alternative (Alternative C), relative to Alternative A, would result in a reduction of an estimated $399 million, amounting to approximately 0.3 percent of total output. Furthermore, some of these reductions in output would occur in California, which had a 2010 gross state product of over $1.8 trillion (BEA 2013). In both states, the stability of other sources of economic activity and resulting revenue—including severance taxes from gold, silver, and copper production in Nevada and corporate and individual income taxes from a wide variety of industries in California—would avert significant impacts on state government revenues.

As noted in the analysis of economic impacts from locatable mineral production, BLM specialists generally expect that the production of gold, silver, and copper would remain the same across all alternatives (BLM 2013g), at least in the first three to five years after any withdrawal from locatable mineral entry is implemented. In the long run, production of locatable minerals would be affected to the degree that the cost of conducting a mineral examination would affect individual operators' decisions to modify existing plans of operations, which would depend on site-specific and operator-specific conditions. If operators' decisions are constrained, this could have a corresponding impact on state and local tax revenues.

Local government tax revenues may however, be substantially affected in specific areas that would experience dramatic reductions in economic activity. Although specific impacts on local government tax revenues could not be quantified, the anticipated reductions in economic activity, compared to Alternative A, suggest that certain regions could be most affected by reductions in local tax revenues:

- In Alternatives B, C, D, E, F, and the Proposed Plan: White Pine County (and to a lesser extent Lassen and Washoe Counties) due to reduction in wind energy development.
- In Alternatives C and F: Modoc County, California, and the Nevada counties of Pershing and Nye (because of reduced livestock grazing)
- In Alternatives B, C, D, F, and the Proposed Plan : Churchill, Humboldt, Lander, and Washoe Counties in Nevada (because of reduced geothermal exploration and development)
- In Alternatives B, C, D, E, F, and the Proposed Plan : Elko, Eureka, White Pine, Nye and Lincoln Counties (because of reduced oil and gas exploration and production)

4.21.3 Social Impacts

Impacts from Management Actions Affecting Migration

Population

The decrease in employment opportunities in the study area that would accompany Alternatives B, C, D, F, and the Proposed Plan, when compared to Alternative A, may impact the capacity of the study area to attract and retain its labor force, with possible consequences for population growth. Specific counties and communities most likely affected would be those linked to employment reductions, which vary by alternative but are discussed immediately above. The counties that would likely experience most of the reductions are:

- In Alternatives C F and the Proposed Plan : Modoc County, California, and the Nevada counties of Pershing and Nye (because of reduced livestock grazing)
- In Alternatives B, C, D, F, and the Proposed Plan : Churchill, Humboldt, Lander, and Washoe Counties in Nevada (because of reduced geothermal and oil and gas exploration and development)
- In Alternative E: White Pine County (because of reduced wind energy production)
- In Alternative B, C, D, E, F, and the Proposed Plan: Elko Eureka, White Pine, Nye, and Lincoln Counties (because of reduced oil and gas development)

As shown in **Chapter 3**, all of these counties experienced substantial population growth over the period 1990-2010, except Lander County, Nevada, which saw a decrease of about 8 percent, and Modoc County, California, whose population stayed essentially constant. All of the counties experienced somewhat more measured growth over the period 2000-2010, except Lander and Modoc (which stayed about the same) and Nye and Washoe (which saw substantial increases). Given this fact and the relatively small projected changes in employment in Alternatives B, D, and the Proposed Plan, population impacts would not be substantial in these alternatives. However, population impacts could be measurable in Alternatives C and F, especially for the counties that are most affected by reductions in livestock grazing.

Housing and Public Services

Housing demand would not be affected in a substantial way by any of the alternatives. Reductions in employment opportunities could affect population, but under no alternatives would population be increased, meaning that the alternatives would not affect housing demand in a way that could be adverse for most populations in the area.

Demand for public services also would not increase, for the same reason. However, the abilities of counties to supply public services could be reduced in Alternatives C and F, in accordance with potential reductions in local tax revenues. State tax revenues would not be affected substantially, as documented in the section on fiscal conditions.

Impacts from Management Actions Affecting Specific Groups and Communities

Consistency with County Land Use Plans

The decision under consideration may result in amended BLM and Forest Service management and LUPs throughout Nevada and Northeast California. The BLM and the Forest Service management and LUPs must be consistent with state and local LUPs to the extent possible and allowable by law. This would be the case under all alternatives.

Interest Groups and Communities of Place

As described in **Chapter 3**, there is a range of interest groups in the study area with overlapping and divergent interests. Groups centered on recreation interests, grazing, mining, land development, infrastructure development, business development, and conservation of natural resources would be impacted differently by the management alternatives. In these interest groups, there are more specific ones that could be particularly affected. Among the interest groups most likely to be affected by the choice of alternative are those associated with livestock grazing, geothermal and wind energy resource exploration and development, oil exploration, and wildlife conservation.

Specific communities will also not be impacted in the same way by the management alternatives. Communities with more diversified economies, and particularly those less dependent on grazing, will likely be less impacted than those that do depend heavily on grazing. Although economic impacts would also occur for oil development and geothermal and wind energy interests, the reductions in grazing availability proposed in Alternatives C and F would likely have a more substantial impact on the ranching industry than reductions in oil and geothermal and wind energy exploration would have those industries. The development of wind energy could also be substantially curtailed.

BLM-administered and National Forest System lands and federal grazing permits are relatively important for maintaining the economic viability of grazing, and reducing or eliminating grazing on GRSG habitat could have adverse effects on quite a few ranch operators. Comparatively, the proposed restrictions on oil and geothermal development would affect several operators but would not have a substantial adverse effect on oil or geothermal development generally in the counties that make up the study area. In addition, oil and gas developers could move to private or state land – potentially even tapping the same federal resources using directional drilling – and still be profitable.

The BLM and the Forest Service reviewed the scoping report to identify any comments related to specific communities that may be particularly affected by various management alternatives. Two scoping comments identified the agricultural sector in Lassen County, California, as making a significant contribution to the county's economy; county-level data on employment and earnings (see **Appendix T**) shows that this is indeed the case, although crops provide two-thirds of farm receipts, and changes to livestock grazing and ranching would likely have relatively small effects on the county's economy (see **Table 3-78** of **Section 3.23**, Socioeconomics and Environmental Justice). In addition, in public comments to the Draft LUPA/EIS, Elko County identified grazing as an important contributor to the county's economy. Based on **Table 3-78**, grazing is in fact important to most counties in the study area, although it contributes the greatest share of earnings in Modoc and Pershing Counties. In Elko County, for example, Harris et al. (2007) estimated permitted federal AUMs to represent 1,212 jobs, which would represent 4.8 percent of total jobs in the County in 2010 (if compared with 25,411 total jobs as shown in **Table T-1** in **Appendix T**).

In scoping comments, several commenters expressed concern that employment, fiscal contributions, and other economic effects of mining – including communities surrounding mining operations – could be negatively impacted by the choice of management alternative. This concern was expressed again in public comments to the Draft LUPA/EIS, where commenters argued that land withdrawals under various alternatives would lead to reduced mineral exploration with impacts on a diversity of stakeholders, and that these impacts had not been accessed in the Draft LUPA/EIS (**Appendix C**).

The BLM's analysis shows that production of locatable minerals would likely be unaffected by the choice of alternatives at least in the short run. In the long run, production of locatable minerals could be affected under Alternatives B, C, F and the Proposed Plan due to the recommended withdrawals from locatable mineral entry. These withdrawals would require validity examinations for expansion of existing operations and for claims once a Plan of Operation is submitted. BLM would not accept any new claims in these areas recommended for withdrawal. The extent of any economic impact resulting from potential increased costs or changes in locatable mineral production during the planning horizon could not be quantified in the absence of a Reasonable Foreseeable Development scenario. Similarly, closing areas to mineral material disposal in Alternatives B, C, D, F, and the Proposed Plan could increase costs for commercial and public users of mineral materials, but as discussed above, without knowing the location, timing, and amounts needed, it is not possible to determine the economic impacts on either municipal or commercial entities. In addition, under Alternatives D and the Proposed Plan, the BLM and the Forest Service would allow expansion of existing pits under certain conditions.

One scoping comment identified Eureka County, Nevada as a particularly vulnerable area, explaining that 81 percent of Eureka County's land area is made up of federally administered land. A public comment to the Draft LUPA/EIS states that 40 percent of all GRSG habitat in the State of Nevada is in Elko County and George Leaming (2010) estimates the cumulative impacts of various "threats" to the Elko economy stemming from restrictions to economic activity on federal lands. Both Eureka and Elko Counties would likely be impacted under certain alternatives by restrictions to grazing and oil and gas development and possibly locatable minerals. However, the importance of mineral production for the economy of these counties and the limited impact that management alternatives are expected to have on mineral development, suggest reductions in overall economic activity in these counties would be limited. On the other hand, as noted earlier, long term impacts of management alternatives on mining development are uncertain, and depend on site-specific and operator-specific characteristics. Also, although mining is an important source of earnings and fiscal revenues for Eureka County, it is actually a smaller share of earnings of residents in that County, since an important contingent of mining workers in Eureka reside in neighboring counties such as Elko.

During cooperating agency review of this LUPA/EIS, counties expressed concern with the extent of their lands managed by the Federal government and about certain impacts identified in the administrative draft LUPA/EIS to their counties. The BLM and the Forest Service modified portions of the analysis in order to ensure that impacts on counties in the study area are characterized as specifically as possible given the information available. This request was reiterated in public comments on the Draft LUPA/EIS. Given the landscape and planning nature of this effort, the level of analysis for social and economic impacts is appropriately disclosed. However, to the extent feasible, the BLM and the Forest Service provided additional information on local impacts associated with certain authorized uses.

Generally, several public comments to the Draft LUPA/EIS, especially those comments submitted by representatives of study area counties, expressed concern that this planning effort would have adverse impacts on their local economies as well as to the quality of life of local residents. Some comments noted that economic impacts on the region and local areas were far more extensive than recognized in the Draft LUPA/EIS, including loss of quality of life features such as education, recreation, housing, and constituent general quality of life (**Appendix C**).

Quality of life encompasses a myriad of aspects that bring pleasure and happiness to one's life and impacts on quality of life aspects can be perceived differently by individuals based on what they value and prioritize as important. The analysis provides how the alternatives may impact many of the quality of life aspects by showing whether there may be increases or decreases relative to

existing conditions, such as, in jobs, labor income, community services, housing, and population.

While the analysis provides potential impacts, it is up to the individual and community to determine if the potential impacts add or subtract from their quality of life. The social and economic analysis concluded that overall social and economic indicators in the study area, including those that are often considered quality of life measures, are unlikely to be substantially impacted under any of the alternatives relative to existing conditions.

The analysis does recognize that certain communities and interest groups would likely be impacted differently depending on many factors such as economic diversity, future demand for authorize uses, and alternative selected. As noted above, given the study area scale, the analysis is unable to indicate with more specificity how specific communities may be impacted. Certain communities and interest groups would likely be impacted differently depending on the values and priorities that are placed on such factors as economic diversity, future demand for authorized uses, desired lifestyle, and Alternative selected.

Summary of Social and Economic Impacts

As noted in the discussion of planning issues in Chapter 1, the public has expressed concern regarding *limitations on land uses and the socioeconomic impacts* and, in particular, *socioeconomic impacts on the ranching industry.* Alternative actions evaluated in this FEIS consist of different packages of conservation measures that include land use restrictions, management practices or design features, habitat priorities or desired conditions, and monitoring protocol. These conservation measures, in aggregate, are intended to address threats to, and provide protection for GRSG (see Chapter 2 of this FEIS).

This section has evaluated the social and economic impacts resulting from conservation measures that address threats associated with specific land and resource uses (e.g., grazing; minerals) which are easily linked to social and economic conditions (e.g., employment). There is are other conservation measures included in the alternatives (to varying degrees) that address other threats such as fire, invasive plants, and vegetation (e.g., Pinyon and/or Juniper) encroachment on GRSG habitat that will have direct impacts on local economies of communities. However, the extent of these impacts is not known at this planning stage and due to uncertainty (e.g., occurrence of fire). Therefore while the regional economic impact of these conservation measure were not evaluated in this section, they will not only play a critical and complementary role in helping meet the goal of effectively protecting GRSG from a full spectrum of threats, but also support local economic activity.

The discussion and tables below summarize the range of potential social and economic impacts that may occur as a result of the subset of conservation measures that affect land or resource uses linked to readily identifiable social or economic conditions.

Table 4-29 provides a summary of potential effects of management alternatives on employment, earnings, and employment in the study area. Alternative A represents impacts associated with current management. The differences shown in the table are derived from summing the estimated reductions, relative to Alternative A, for each alternative related to livestock grazing (using the midpoint of the low and high scenarios), and related to geothermal, oil and gas and wind energy development (using both construction and operations impacts in year 10). Although the quantitative analysis includes only earnings and employment affected by management impacts on grazing, oil and gas, geothermal exploration and development and wind energy development, these activities capture the substantial majority of the economic impact of the alternatives.

The analysis shows that reductions in economic employment and earnings would be greatest under Alternatives C and F, and there would also be reductions in Alternatives B, D, E, and the Proposed Plan. The reductions in Alternative C would correspond to approximately 0.8 percent of total 2010 employment in the study area (2,904 out of 361,315 jobs, per **Table 3-73**). Reductions in Alternative F would correspond to approximately 0.5 percent of 2010 employment in the study area.

In Alternative B, the reductions are due largely to reduction in wind energy development, although reductions in oil exploration and development and in geothermal exploration and development would also occur. Elko and White Pine Counties could be particularly affected because they are the main location of both wind energy development and oil and gas leasing on federal lands.

In Alternative C, about 80 percent of the reductions would be due to reductions in livestock grazing; these impacts would be felt to a considerable extent in Lassen, Humboldt, Lander, Elko and White Pine Counties and possibly northern portions of Nye County.

In Alternative D, the magnitude of the impacts is similar to those in Alternative B, although slightly lower due to fewer restrictions on oil and gas and geothermal development. Impacts would be distributed among wind energy development and oil development areas such as Elko and White Pine Counties and geothermal development areas such as Churchill County.

The reductions in Alternative E would be the lowest relative to Alternative A and would be mostly due to reductions in wind energy development; as such, they would likely be particularly concentrated in White Pine County.

Table 4-29
Average Annual Impact on Employment and Earnings by Alternative, Compared with Alternative A

		Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	The Proposed Plan
Employment relative to Alternative A	Grazing	0	-2,388	0	0	-1,272	0
	Geothermal	-66	-111	-90	-55	-111	-98
	Oil and Gas	-72	-138	-122	-39	-138	-128
	Wind	-267	-267	-267	0	-267	-267
	Total	**-405**	**-2,904**	**-479**	**-94**	**-1,788**	**-493**
Earnings relative to Alternative A (2010$)	Grazing	$0	-$81	$0	$0	-$43	$0
	Geothermal	-$4	-$7	-$6	-$4	-$7	-$6
	Oil and Gas	-$5	-$9	-$8	-$2	-$9	-$8
	Wind	-$17	-$17	-$17	$0	-$17	-$17
	Total	**-26**	**-114**	**-31**	**-6**	**-76**	**-31**
Average Earnings Per Job Lost (2010$)	Grazing	N/A	$33,920	N/A	N/A	$33,805	N/A
	Geothermal	$66,667	$65,766	$65,556	$67,273	$65,766	$65,306
	Oil and Gas	$62,413	$62,319	$62,551	$61,856	$62,319	$61,864
	Wind	$63,670	$63,670	$63,670	#DIV/0!	$63,670	$63,670
	Total	$63,935	$39,222	$63,741	$65,032	$42,450	$63,528

Source: Impacts calculated using the IMPLAN model as explained in the text and **Appendix V**.
Notes: for grazing impacts, the mid-point between the low impact and high impact scenarios is shown; for geothermal, oil and wind energy, impacts for year 10 are shown and sum the estimated impacts of construction and operations activities in that year.

Alternative F would have the second largest reductions in employment and earnings relative to Alternative A. Impacts would be distributed among grazing, oil and gas development, geothermal development and wind energy development, but approximately 70 percent of impacts would be due to grazing.

The Proposed Plan would have impacts similar to Alternative D. As in Alternative D, impacts would be distributed among wind energy development and oil development areas such as Elko and White Pine Counties and geothermal development areas such as Churchill County.

Some differences among the alternatives cannot be quantified. Among these are impacts on locatable and salable minerals, land authorizations such as power lines, and state and local tax revenues. Because tax revenues are largely tied to economic output and earnings, the relative magnitude of impacts on local and state governments across alternatives, and geographic areas, would be consistent with the impacts on employment and earnings presented above. In this respect the comparisons of expected impact on current conditions (e.g., one percent of year-2010 employment in Alternative C) are probably most useful for understanding the impacts on tax revenues in the context of other (unaffected) existing and anticipated future revenues.

Under Alternatives E and the Proposed Plan, disturbance to GRSG habitat may often be compensated by the use of Nevada's Conservation Credit System, with the goal of achieving no net unmitigated loss of GRSG habitat.

Alternatives B, C, D, E, F, and the Proposed Plan – and especially Alternatives C and F – could have the effect of limiting the attraction and retention of population in the study area. These impacts would not be homogeneous throughout the study area, but would be concentrated in specific communities where GRSG habitat intersects with resources important to employment opportunities.

Communities with strong interest groups focused on livestock grazing or oil and geothermal and wind energy development would likely experience adverse impacts from Alternatives B, C, D, E, and the Proposed Plan, but especially from Alternatives C and F. Impacts on grazing are likely to be of importance to most counties in the study area, while impacts on other resources may be more concentrated in a few counties.

Table 4-30 summarizes the social impacts of the management alternatives.

Non-market benefits from this action will be derived from the ability of the full spectrum of conservation measures to conserve, enhance, and/or restore GRSG habitat by reducing, eliminating, or minimizing threats to GRSG habitat. Furthermore, as discussed, alternatives also specify different types and levels of mechanisms, such as disturbance caps, adaptive management protocols, and

Table 4-30
Social Impacts Relative to Alternative A

	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	The Proposed Plan
Population growth; demand for housing and public services	Between A and F	Potential impacts on specific communities	Between A and B	Between A and D	Between A and C	Impacts would be the same as D
Consistency with county LUPs	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
Impacts on interest groups and communities of place	Between A and F	Most benefits to conservation groups; adverse impacts on grazing interests	Between A and B	Most benefits to energy and mineral interests	Between A and C; adverse impacts on grazing interests	Impacts would be the same as D

desired conditions or objectives, to guide when and where conservation measures, design features, and treatments are implemented and that will have an important influence on the overall effectiveness and efficiency of the alternatives. The magnitude of benefits associated with stabilizing or improving GRSG populations or habitat has not been monetized or quantified due to the absence of specific data on the values of non-market benefits of GRSG and uncertainty about quantifying projected responses of GRSG habitat and populations to conservation measures.

A qualitative evaluation of the benefits from potential changes in GRSG populations and habitat resulting from the subset of conservation measures addressing land and resource uses and extraction, as evaluated in this section, indicates alternatives have the following capability to protect or improve benefits from GRSG:

- Alternative A has the lowest capability.
- Alternative B has greater capability than A, but lower capability than Alternative F.
- Alternative C has the greatest capability.
- Alternative D has greater capability than A, but less than B, C, or F.
- Alternative E has the second lowest capability after Alternative A.
- Alternative F has second greatest capability after Alternative C
- The Proposed Plan has the same capability as Alternative D.

In addition to the conservation measures directly associated with social or economic impacts considered in this section, there are other conservation measures that address other threats (e.g., fire, nonnative plants, and encroachment) that also contribute to GRSG and GRSG habitat protection and

corresponding benefits that are not addressed here. As a consequence, for a complete description of potential improvements in GRSG habitat protection resulting from the full spectrum of conservation measures under each alternative, the reader is referred to effects summary tables provided in Chapter 2. Social and economic impacts cannot be considered in isolation or exclusive of other impact indicators discussed in this EIS.

4.21.4 Environmental Justice Impacts

The BLM and the Forest Service considered information on the presence of minority and low-income populations (from **Chapter 3**) along with additional information, described in this section, to assess the potential for the alternatives to result in disproportionately high and adverse impacts on minority or low-income populations. Although conservation measures would be implemented consistently across all identified habitat, with no discrimination over particular populations, environmental justice guidance requires agencies to consider also whether their actions could unintentionally result in disproportionately high and adverse effects.

To help guide the analysis of potential environmental justice impacts, the BLM and the Forest Service considered the information gathered in the June 2012 Economic Strategies Workshop. That workshop was convened to identify public concerns related to potential social, economic and environmental justice impacts that would result from the management alternatives. None of the public comments received during that workshop called out a specific concern related to minority populations (BLM 2012g).

The BLM and the Forest Service also reviewed the scoping report for the present EIS to identify any comments related to environmental justice issues. The only scoping comments identified that related to minority or low-income populations were several comments pertaining to the cultural significance of the GRSG to Native American tribes, with one commenter specifically calling out the Yomba Shoshone.

Potential Impacts on Minority Populations

As discussed in **Chapter 3**, CEQ guidance identifies a community or a specific population group as a minority population when either: (1) minorities in the affected area exceed 50 percent of the total population; or (2) the percentage of minorities in the affected area is meaningfully greater than the percentage in the general population or appropriate unit of geographical analysis. Based on the description of minority presence in the study area in **Chapter 3**, and based on definitions in relevant guidance, no minority populations were identified in the study area. Smaller communities where minority presence is "meaningfully greater" than in the state as a whole, although not identified in **Chapter 3**, may also exist in the study area, given its large geographic coverage.

The extent to which existing minority populations are disproportionately impacted by high and adverse human health or environmental effects depends

on the existence of high and adverse human health or environmental effects from management alternatives on any of the resources analyzed, and whether minority populations are particularly vulnerable to these impacts or more likely to be exposed to such impacts. Adverse impacts of alternatives were identified under the various resources analyzed and are described in their respective sections of **Chapter 4**.

One issue of potential concern relates to interests of Native American tribes. BLM's consultation and outreach efforts to Native American tribes resulted in a number of concerns expressed by tribal leaders and members: see **Section 3.18**, Tribal Interests (including Native American Religious Concerns). Most of these concerns relate to viability of GRSG populations, although at least one tribe, the Summit Lake Tribe, expressed concern that habitat conservation in some alternatives could negatively impact road realignment projects near their reservation and plans to expand their reservation boundaries because their reservation is surrounded by PHMA. **Section 4.21**, Tribal Interests, describes these and other tribal concerns in detail, and also addresses how the alternatives would affect tribal interests. That section notes that the future status of the Summit Lake Tribe road realignment and reservation boundary expansion projects as they relate to GRSG planning efforts is unknown.

In addition, several tribes (the Pyramid Lake Paiute Tribe, Fort McDermitt Tribe, and Yomba Shoshone Tribe) hold grazing permits on either BLM or Forest Service lands. In all three cases, the allotments could be affected by GRSG management actions (i.e., they have no tribal treaty rights associated with the grazing permit or the allotment they use). Although this may affect the tribes' ability to manage livestock, from an environmental justice perspective it does not represent a disproportionate impact since the tribes would not be singled out or disproportionately affected. Rather, they would experience the same adverse effects as other users of federal grazing allotments, which could include the loss of part or all of their allotment in Alternatives C and F.

The BLM and the Forest Service also considered the possibility that the employment losses, especially those anticipated in Alternatives C and F, could disproportionately affect minority populations. If employment losses – such as the estimated reduction of 2,994 jobs in Alternative C relative to Alternative A – were to affect minority populations disproportionately, this could be considered a disproportionately high and adverse impact on minority populations. However, these job losses would occur over a relatively broad geographic area, and over a number of different economic sectors (keeping in mind that the employment losses include related industries, not just the industries directly affected), including mining, agriculture, construction, manufacturing, wholesale trade, retail trade, and others. Given the sectoral and geographic dispersion of the impacts, and the fact that employment in these industries is not overly concentrated in any particular racial or ethnic group, the

BLM and the Forest Service find no evidence to support the idea that these job losses would affect minority populations disproportionately.

Thus, based on available information about the nature and geographic incidence of impacts, neither specific minority populations nor tribal populations would be exposed to disproportionately high and adverse impacts under any of the management alternatives considered.

Potential Impacts on Low-Income Populations

Virtually all of the counties in the study area have a concentration of low income populations that exceeds the state average, as discussed in **Chapter 3**, including both Lassen and Modoc Counties in California and seven of the ten Nevada counties (Eureka, Humboldt, Lander, Nye, Pershing, Washoe, and White Pine). It is also possible that there are smaller communities in the remaining counties (Churchill, Elko, and Lincoln) that constitute low-income populations, given the large geographic spread of each county.

The extent to which low-income populations are disproportionately impacted by high and adverse human health or environmental effects depends on the existence of high and adverse human health or environmental effects from management alternatives on any of the resources analyzed, and whether low-income populations are specifically vulnerable to these impacts or more likely to be exposed to such impacts.

Accordingly, similar to the analysis for minority populations, the BLM and the Forest Service reviewed the impacts of alternatives described in the respective sections of **Chapter 4**. Based on available information about the nature and geographic incidence of impacts, the BLM and the Forest Service identified a potential concern about disproportionately high and adverse impacts on low-income populations in Lassen County (California), White Pine County (Nevada) and possibly northern portions of Nye County (Nevada), related to economic and social effects. This is based on relatively high poverty rates (14.2 percent for Lassen, 15.5 percent for White Pine, and 18.9 percent for Nye County) and the identification of these counties as experiencing potentially substantial reductions in employment or earnings associated with livestock grazing in Alternatives C and F, when compared to Alternative A. In the case of White Pine County, additional reductions in employment would be expected associated with oil and gas and wind energy development. Poverty rates in several other counties in the study area are as high (Eureka at 16.2, and Modoc County at 18.4 percent), but these counties are not identified as having substantial effects due to anticipated reductions in employment from oil, geothermal, wind energy or grazing in any of the alternatives.

Of the three counties, White Pine is the one with the least population (see **Table 3-71**) and it is also the one that experienced the least population growth between 1990 and 2010 (**Table 3-71**). Lassen and Nye counties, however, would be more dependent on livestock grazing for earnings (**Table 3-78**).

With these considerations in mind, Alternatives C and F would result in disproportionately high and adverse impacts on low-income populations in Lassen County, White Pine County and possibly northern portions of Nye County. Based on available evidence, there would not be disproportionately high and adverse impacts on other counties, nor would there be disproportionately high and adverse impacts associated with Alternatives A, B, D, E or the Proposed Plan.

Table 4-31 provides a summary of the findings of this analysis with respect to disproportionately high and adverse effects of the alternatives.

Table 4-31
Environmental Justice Impacts

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Proposed Plan
Disproportionately high and adverse impacts on minority populations	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
Disproportionately high and adverse impacts on low-income populations	No Impact	No Impact	Disproportionately high and adverse impact related to employment/ earnings from ranching and grazing (Lassen and White Pine Counties and northern portions of Nye County)	No Impact	No Impact	Disproportionately high and adverse impact related to employment/ earnings from ranching and grazing (Lassen and White Pine Counties and northern portions of Nye County)	No Impact

4.22 UNAVOIDABLE ADVERSE IMPACTS

Section 102(c) of NEPA requires disclosure of any adverse environmental impacts that could not be avoided should the proposal be implemented. Unavoidable adverse impacts are those that remain following the implementation of mitigation measures or impacts for which there are no mitigation measures. Some unavoidable adverse impacts occur as a result of implementing the LUPA. Others are a result of public use of BLM-administered and National Forest System lands in the planning area. This section summarizes major unavoidable impacts discussions of the impacts of each management action (in the discussion of alternatives) and provides greater information on specific unavoidable impacts.

Planned activities would produce some level of air emissions, even with mitigation. However, none of the activities proposed in this LUPA/EIS would produce adverse impacts on the air quality resource, based on the definitions above.

Surface-disturbing activities would result in unavoidable adverse impacts. Although these impacts would be mitigated to the extent possible, unavoidable damage would be inevitable.

Permanent conversion of areas to other uses, such as transportation and mineral and energy development or OHV use, would be unlikely under all of the action alternatives. These would most likely decrease erosion and increase the relative abundance of species in plant communities, the relative distribution of plant communities, and the relative occurrence of seral stages of those communities. These activities would also intrude on the visual landscape. This type of development is most likely to occur under Alternative A. The other action alternatives place many restrictions on many types of development, which would most likely result in fewer visual intrusions and fewer instances of unavoidable wildlife habitat loss.

Unavoidable damage to cultural resources from permitted activities could occur if resources undetected during surveys were identified during surface-disturbing activities. In these instances, further activity would cease on discovery of a cultural resource, and mitigation measures would be implemented to minimize damage or loss. This scenario is most likely to occur under Alternative A since it would place the fewest restrictions on surface-disturbing activities. Unavoidable loss of cultural resources would also occur, due to nonrecognition, lack of information and documentation, erosion, casual collection, and inadvertent destruction or use. Broad-scale sampling and classification of areas with a high likelihood of containing cultural and resources would greatly reduce the probability of unavoidable adverse impacts on the resource.

Wildlife, livestock, and wild horses as well as other herbivores consume vegetation and impact soils through hoof action and possible compaction. When these impacts are kept at appropriate levels natural processes such as plant growth and recovery, freeze-thaw periods and microbial activity in the soil surface result in recovery from these impacts and maintain site stability and health. Vegetation treatments promoting recovery of GRSG would result in the destruction of the target species, be it annual grass, noxious weed, encroachment of juniper or changes in the age classes of a sagebrush stand. Some level of competition for forage between these species, although mitigated to the extent possible, would be unavoidable. Instances of displacement, harassment, and injury could also occur. These types of scenarios are most likely to occur under Alternative A. The other action alternatives would place restrictions on many development and surface-disturbing activities, which would

make the likelihood that displacement, harassment, and injury would occur to be much lower than Alternative A.

Recreation, development of mineral resources, and general use of the decision area would introduce additional ignition sources into the planning area, which would increase the probability of wildland fire and the need for its suppression. These activities, combined with continued fire suppression, would also affect the overall composition and structure of vegetation communities; this could increase the potential for high-intensity wildland fires. Restrictions on development under all of the action alternatives would decrease the potential for ignitions in the decision area.

As recreation demand increases, recreation use would disperse, creating unavoidable conflicts between recreation users, such as those seeking more primitive types of recreation, and motorized users sharing recreation areas. In areas where development would be greater, the potential for displaced users would increase. Under all of the action alternatives, restrictions on development would reduce the potential for displaced recreational users.

Numerous land use restrictions imposed throughout the decision area to protect GRSG habitat and other important values, by their nature, affect the ability of operators, individuals, and groups who use the BLM-administered and National Forest System lands to do so without limitations. Although attempts would be made to minimize these impacts, unavoidable adverse impacts in the number and miles of roads or trails available for recreational use could occur under all of the action alternatives. Minimization would include limiting them to the level of protection necessary to accomplish management objectives and providing alternative use areas for affected activities.

4.23 Irreversible and Irretrievable Commitment of Resources

Section 102(2)(c) of NEPA requires a discussion of any irreversible or irretrievable commitments of resources that would be involved in the proposal should it be implemented. An irretrievable commitment of a resource is one in which the resource or its use is lost for a period (e.g., extraction of any locatable mineral ore or oil and gas). An irreversible commitment of a resource is one that cannot be reversed (e.g., the extinction of a species or loss of a cultural resource site without proper documentation).

Implementation of the LUPA management actions for all alternatives, except Alternative A, would result in fewer surface-disturbing activities, mineral and energy development, and ROW development that results in loss of irreversible or irretrievable resources.

Although new soil can develop, it is a slow process. Soil erosion or the loss of productivity and soil structure might be considered irreversible commitments to resources. Surface-disturbing activities, therefore, would remove vegetation and accelerate erosion, which would contribute to irreversible soil loss. However,

many of the management actions in the LUPA are intended to reduce the magnitude of these impacts and to restore some of the soil and vegetation lost. Such disturbances would occur to the greatest degree under Alternative A, which would allow many more surface-disturbing activities, compared with the action alternatives.

Laws protecting cultural resources would mitigate irreversible and irretrievable impacts on cultural resources from permitted activity. BLM OHV use areas open to cross-country use could have some resources destroyed. This would be especially true in areas of high cultural sensitivity. Such destruction would be irreversible and irretrievable. Alternative A would have the greatest potential for a loss of cultural resource information.

Development of mineral resources (e.g., oil, gas, coal, sand, and gravel) is irreversible. If these nonrenewable resources were extracted for consumption or use, they would be irreversibly removed. BLM Handbook H-1624-1, Planning for Fluid Minerals (BLM 1990a), acknowledges leasing of oil and gas resources as an irreversible commitment. As noted above, this would be most likely under Alternative A. Locatable minerals in PHMA under Alternatives B and C and in SFA under the Proposed Plan would be irretrievable due to proposed mineral withdrawals. Implementation of the LUPA management actions for all alternatives with the exception of Alternative A would result in an increased commitment of irretrievable resources of socioeconomic value for the duration of management actions, to the extent that resources such as oil and gas, federal lands for grazing and other resources are no longer available to support employment and income generation. On the other hand, all alternatives with the exception of Alternative A would decrease the commitment of irretrievable resources for the support of non-market values associated with the GRSG, open spaces and associated activities such as primitive recreation.

4.24 Relationship Between Local Short-Term Uses and Long-Term Productivity

Section 102(c) of NEPA requires discussion of the relationship between local, short-term uses of human environment and the maintenance and enhancement of long-term productivity of resources. As described in the introduction to this chapter, short-term is defined as anticipated to occur within the first 5 years of implementation of the activity; long term is defined as following the first 5 years of implementation but in the life of the LUPA.

Management actions would result in various short-term impacts, such as increased localized soil erosion, fugitive dust emission, and vegetation loss or damage and decreased visual resource quality.

Other surface-disturbing activities, including transportation and utility corridor construction, and mineral resource development would result in the greatest potential for impacts on long-term productivity. Management prescriptions and RDFs (consistent with applicable law) are intended to minimize the effect of

short-term commitments and to reverse change over the long term. These prescriptions and the associated reduction of impacts would be greatest under Alternative C, with Alternative F close behind for such resources as vegetation and wildlife habitat. However, some impacts on long-term productivity might occur, despite the prescriptions intended to reduce impacts on GRSG habitat.

ROWs/SUAs and short-term use of an area to foster energy and minerals would result in long-term loss of soil productivity and vegetation diversity. Impacts would persist as long as surface disturbance and vegetation loss continue. In general, the loss of soil productivity would be directly at the point of disturbance; even so, long-term vegetation diversity and habitat value could be reduced due to fragmentation and the increased potential for invasive species to spread from the developments or disturbances where reclamation is not successful. Alternative A would have the greatest potential for short-term loss of productivity and diversity due to the high level of potential development and the lack of stringent mitigation and reclamation standards. The Proposed Plan provides for the greatest opportunity for increased soil productivity and vegetation diversity in GRSG habitat.

ROWs/SUAs and the short-term use of GRSG habitat, for energy and minerals could impair the long-term productivity of GRSG populations. This would happen by displacing animals from primary habitats and removing components of these habitats that might not be restored for more than 20 years. These short-term uses could also affect the long-term sustainability of some special status species. The potential for these impacts would vary by alternative because long-term deterioration of GRSG habitat as a result of mineral activity would be more evident under Alternative A. The short-term resource uses associated with travel and transportation and mineral development (individual short OHV trips, oil and gas seismic exploration, natural gas test well drilling, and the noise associated with these activities) would have adverse impacts on the long-term productivity of GRSG populations. This would be the case if these resource uses were to infringe on GRSG winter habitat, brood-rearing habitat, and summer habitat. These activities, though short-term individually, could have collective long-term impacts on GRSG productivity and health if they were to increase in the long term.