Chapter 3. Affected Environment

3.1 INTRODUCTION

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

Certain resources that may be present in the planning area are not addressed because issues relating to their management were not identified during scoping by the public, or by the BLM (see summary in Chapter 1). Information from broad-scale assessments was used to set the context for the decision-making process. The information and direction for BLM resources and resource uses has been further broken down into fine-scale assessments and information. The level of information presented in this chapter is commensurate with and sufficient to assess potential effects discussed in Chapter 4, based on the alternatives presented in Chapter 2.

Each resource section in this chapter contains a discussion of existing conditions, including trends. Existing conditions describe the location, extent, and current condition of the resource in the planning area (described in **Section 1.4**). For each resource, a general description of existing conditions is provided for the planning area, regardless of land status to provide a regional context. More detailed discussion of the existing conditions at various scales may be provided depending on the resource topic and availability of applicable information.

Acreage figures and other numbers are approximate projections; readers should not infer that they reflect exact measurements. Acreages were calculated using Geographic Information Systems (GIS) technology, and there may be slight variations in total acres between resources. Some information presented here has also been incorporated by reference from the individual state GRSG 2015 and 2019 plans and is cited as such.

3.2 SPECIAL STATUS SPECIES – GREATER SAGE-GROUSE

3.2.1 Species Background

Status and Distribution

On March 23, 2010, the USFWS determined that rangewide listing of GRSG was warranted but precluded by higher priority listing actions (75 FR 13910). On November 21, 2012, the USFWS assigned GRSG a listing priority number of 8, indicating that the rangewide threat to GRSG was moderate to low (77 FR 699940). On September 22, 2015, a status review conducted by the USFWS determined that the GRSG remains relatively abundant and well-distributed across the species' 173-million acre range and does not face the risk of extinction now or in the foreseeable future. The species was withdrawn from the candidate species list on October 2,015 (80 FR 59857). GRSG remains a BLM sensitive species.

The USFWS's decision not to list the bird followed an unprecedented conservation partnership designed to reduce threats to the GRSG across 90 percent of the species' breeding habitat. In making that decision, the USFWS stated a number of relatively large GRSG populations were distributed across the landscape and were supported by undisturbed expanses of habitat. The agency acknowledged some habitat loss associated with energy development, infrastructure, wildfire, and invasive plants will continue into the future. However, regulatory mechanisms provided by federal agencies and three states (Montana, Oregon, and Wyoming), as well as mitigation required by the state of Nevada, reduced threats. They also stated wildfire and invasive species continue to occur in GRSG habitats, especially in the Great Basin, but existing management and commitments for suppression, restoration, and noxious weed treatments were in place and could reduce these impacts.

Since 2015, additional states have added GRSG protection plans, amendments, laws, or executive orders. Federal land use plans, executive orders, or laws for the states of Idaho, Montana, North Dakota, Nevada, Oregon, South Dakota, Utah, and Wyoming build upon the progress made during past planning processes. The plans aim to protect, maintain, and increase GRSG populations and habitats by addressing localized threats, incorporating new science in monitoring and management, and including greater integration of adaptive management into land-use planning.

GRSG are considered a sagebrush ecosystem-obligate species; they rely on sagebrush on a landscape level and on a micro-habitat scale for their survival. Prior to 19th century European settlement, GRSG habitat is estimated to have covered 296,526,080 acres ranging from 4,000 feet to over 9,000 feet in elevation in the Great Basin and Colorado Plateau regions (Schroeder et al. 2004). Since European settlement of the West began, the amount, distribution, and quality of sagebrush habitats and GRSG populations have declined by approximately 50 percent (Schroeder et al. 2004; Homer et al. 2015; Doherty et al. 2022). Populations have been extirpated from Nebraska and British Columbia, and the species is now absent from almost half of its estimated historic distribution (Connelly et al. 2004; Schroeder et al. 2004; Knick and Connelly 2011; Hanser et al. 2018).

Population abundance has declined significantly over the last six decades, with rangewide declines of approximately 80% since 1965 and nearly 41% since 2004 (Prochazka et al. 2024). Although continued population declines over the entire species range are the overall trend, rates of change vary regionally (Coates et al. 2021). Declines in GRSG numbers and distribution are attributed primarily to the loss and degradation of sagebrush habitats (Connelly et al. 2000b; Schroeder et al. 2004; Knick and Connelly 2011; Hanser et al. 2018). The recent trends and condition of GRSG populations and habitat are further described below in **Section 3.2.2**, Conditions and Trends within the Planning Area.

Life History and Habitat Characteristics

GRSG persistence is linked to functioning sagebrush ecosystems containing minimal levels of human land use (Knick et al. 2013). Areas of occupation can range in size from 640 to over 64,000 acres to provide all seasonal life requirements (Beever and Aldridge 2011; Connelly et al. 2011a; Connelly et al. 2011b; Leu and Hanser 2011; Stiver et al. 2015). Sagebrush ecosystems are comprised of sagebrush–steppe and Great Basin sagebrush and contain various plant species composition (shrubs, perennial grasses, and forbs), essential for food, cover, and nesting habitat (Connelly et al. 2000). General habitat characteristics for rangelands supporting GRSG were reported by Braun et al. (1976) and later updated by Connelly et al. (2000) and others. These include local consideration of sagebrush shrub cover, annual precipitation (e.g., arid, mesic), herbaceous understory and soils (Connelly et al. 2000). GRSG distribution is strongly correlated with the distribution of sagebrush habitats (Schroeder et al. 2004; Connelly et al. 2011b; Doherty et al. 2016), especially with big sagebrush (e.g., Wyoming big sagebrush, mountain big sagebrush, and basin big sagebrush) (Braun et al. 1976; Connelly et al. 2000; Connelly et al. 2004; Miller et al. 2011). The behavioral complexity of the species (e.g., migratory or resident population), local variability of ecological sites, and quality and quantity of sagebrush and herbaceous understory influence population structure, which is thought to be highly clustered (Doherty et al. 2016; Coates et al. 2021). Landscape cover of sagebrush was identified as an important predictor of GRSG habitat, whereas conifer canopy cover and anthropogenic development were correlated with reductions in habitat selection across the GRSG range (Doherty et al. 2016). Additionally, GRSG within fragmented habitats (e.g., agricultural conversion, conifer encroachment) had lower tolerance to disturbances, suggesting effects vary across the range.

As a landscape-scale species, GRSG move between habitats seasonally, requiring large, interconnected winter, breeding, nesting, and summering areas to sustain a population (Connelly et al. 2011b; Doherty et al. 2016; 2022; Cross et al. 2018; Oyler-McCance et al. 2022). These habitat requirements increase their vulnerability to habitat loss, fragmentation and degradation from development, infrastructure, improper grazing management, and other disturbances (Connelly et al. 2011b; Doherty et al. 2016). GRSG populations have been found to be both non-migratory and migratory in their spatial and temporal distribution. Non-migratory populations often move 5 to 6 miles between seasonal habitats and use home ranges no more than 25,600 acres in size while annual movements of migratory populations may be 9 to 60 miles and have home ranges that cover hundreds of square miles. Seasonal population movements also vary by the amount of GRSG habitat available and year-to-year conditions. Populations in areas with a large amount of contiguous habitat move longer distances than those in isolated habitats (Dahlgren et al. 2015). There was significant variation it movement distances within and among sites across Wyoming (Fedy et al. 2012).

GRSG have a strong site fidelity to established nesting habitat and other seasonal habitats, suggesting resistance of individuals to adjust to changing habitat conditions (Holloran and Anderson 2005; Doherty et al. 2010; Holloran et al. 2010). Individuals may use currently unsuitable seasonal habitats, reflecting their fidelity to previous conditions in that area (Connelly et al. 2004; Knick and Connelly 2011; Dahlgren et al. 2015, 2016; Fregmen et al. 2016; Caudill et al. 2016).

During the spring breeding season males congregate at leks, traditional strutting grounds, to perform courtship displays to attract females. GRSG leks are generally found in areas with low, sparse vegetation with higher amounts of bare ground, surrounded by adjacent sagebrush habitat (Scott 1942; Patterson 1952, Klebenow 1985; Bradbury et al. 1989). Leks also include old fire scars, sparse hillsides, roads or pipeline scars. Lekking sites remain fairly consistent year-to-year and there is evidence that some leks have been in use for up to 130 years.

Productive nesting areas are typically characterized by sagebrush with an understory of native grasses and forbs, with horizontal and vertical structural diversity that provides an insect prey base, herbaceous forage, and cover for the hen while incubating eggs (Gregg et al. 1994; Connelly et al. 2000; Connelly et al. 2004; Connelly et al. 2011a). These areas also provide GRSG chicks with insects and forbs, essential nutritional components for chick survival and development (Klebenow and Gray 1968; Johnson and Boyce 1990; Connelly et al. 2004; Thompson et al. 2006). Some recent studies have shown mixed support for relationship between grass height and GRSG nest survival (Smith et al. 2018). After correcting for plant phenology (i.e., the timing of vegetation surveys), successful nests had high horizontal cover and total shrub cover during nesting and late brood rearing (Gibson et al. 2016). Taller perennial grasses (>12.1 centimeters) were associated with successful nests in xeric but not mesic sites because grasses were less available in xeric sites (Coates et al. 2017). Shrub canopy and grass cover provide concealment for GRSG chicks (Barnett and Crawford 1994; Gregg et al. 1994; Connelly et al. 2004).

Summer use areas include sagebrush habitats as well as riparian areas and wet meadows that provide an abundance of forbs and insects for both hens and chicks (Schroeder et al. 1999). GRSG gradually move from sagebrush uplands to more mesic areas (moist areas, such as streambeds or wet meadows) during the late brood-rearing period in response to summer desiccation of herbaceous vegetation in the sagebrush uplands (Connelly et al. 2000; Knick and Connelly 2011; Donnelly et al. 2016). Late brood-rearing habitats are often associated with sagebrush, and selection is based on shrub cover as well as the availability of forbs, correlated to a shift in the diet of chicks as they mature (Connelly et al. 1988 and references therein; Connelly et al. 2011a; Coates et al. 2017).

In the fall, GRSG transition to winter habitats. The timing of this transition depends largely on the weather. GRSG generally remain in summer habitat until plant phenology or frost eliminates the succulent vegetation. At this time, they move to their winter habitat and transition their diet to mostly sagebrush (Knick and Connelly 2011). These movements may include migrations of less than 37 miles (60 km), with the longest known migration occurring is approximately 75 miles (120 km) (Smith 2012). GRSG select winter-use sites based on sagebrush availability above the snow, which is influenced by snow depth, topographic factors (e.g., slope, aspect, elevation), environmental factors (e.g., wind speed, snow hardness), and vegetation characteristics (e.g., canopy cover, shrub height) (Smith et al. 2016).

Threats

Proximate reasons for population declines differ across the GRSG distribution, but ultimate underlying cause is loss, fragmentation, and/or degradation of suitable sagebrush habitat. The quality and quantity of sagebrush habitat has declined over the last 50 years to the extent that expanses of unfragmented sagebrush are rare across the landscape (Connelly et al. 2000; Miller and Eddleman 2001; Aldridge and Brigham 2003; Pedersen et al. 2003; Connelly et al. 2004; Schroeder et al. 2004; Leu and Hanser 2011; Homer et al. 2015). Habitat loss is attributed to large-scale conversions to cultivated croplands or pastures, increasing wildfire frequencies facilitating annual nonnative grass and noxious weed dominance at lower elevations, conifer encroachment, improper livestock grazing, herbicide use and chaining to reduce sagebrush, crested wheatgrass seedings, mineral and energy development, wild horse grazing, and recreational activities related to urban growth and increased human populations (Manier et al. 2013; USFWS 2013). Pinyon-juniper expansion and infill occurs from low to high elevations, especially in Nevada's Basin and Range GRSG habitats (Miller et al. 2011). Currently, sagebrush communities and GRSG continue to be at risk from multiple stressors acting across multiple scales (Manier et al. 2013; Hanser et al. 2018; Connelly et al. 2011b; Doherty et al. 2022).

Parts of the planning area have experienced severe habitat degradation from undesirable annual invasive species, including cheatgrass (*Bromus tectorum*), medusahead wildrye (*Taeniatherum caput-medusae*), and ventenata (*Ventenata dubia*). Invasive plants, including cheatgrass, alter plant community structure and composition, productivity, nutrient cycling, and hydrology and may competitively exclude native plant populations. The presence of invasive annual grasses can also change wildfire cycles, creating a positive feedback loop between wildfire frequency and invasive annual grass persistence, precluding reestablishment of sagebrush and reduce or eliminate vegetation that GRSG use for food and cover (Manier et al. 2013; Hanser et al. 2018). Warming trends may further exacerbate this cycle, preventing natural recovery in those areas and requiring active management approaches (Hanser et al. 2018; Pyke 2011). While wildfire is a primary factor facilitating annual grass invasion, annual grasses are also able to invade in landscapes that have not been burned for decades (Smith et al. 2023).

The expansion of native juniper (*Juniperus* spp.) and pinyon (*Pinus* spp.) woodlands (pinyon-juniper) can also contribute to GRSG habitat loss. Pinyon-juniper expansion intensifies avian predation threats by providing perch sites and nesting substrate for raptors and corvids (Prochazka et al. 2017), as well as changing vegetative understories. Studies have shown that GRSG incur population-level impacts as low as 4 percent of conifer encroachment (Baruch-Mordo et al. 2013). In addition, Douglas-fir (*Pseudotsuga menziesii*) expansion into GRSG habitat has occured in Montana (USGS 2011).

Wild horse and burro grazing disturbances have negatively influenced sage-grouse lekking activities (Muñoz et al. 2021), at times restricting GRSG breeding activities to areas that have not been disrupted by free-roaming horses. Sage-grouse population growth is sensitive to breeding success and can be impacted by wild horse and burro disturbances that degrade sagebrush ecosystems (Coates et al. 2021).

Predation is a common cause of mortality for GRSG (Connelly et al. 2011b; USFWS 2013; Conover and Roberts 2016), but it is not considered a threat to the persistence of the species (USFWS 2010a). Predators of GRSG include golden eagles (*Aquila chrysaetos*), great horned owls (*Bufo virginianus*), coyotes (*Canis latrans*), and common ravens (*Corvus corax*). Populations of golden eagles, great horned owls, and coyotes have not increased during the last century, so they likely have not contributed to GRSG population declines (Conover and Roberts 2016). However, populations of ravens in the West have increased due to anthropogenic causes (Conover and Roberts 2016; Boarman 2003; Boarman et al. 2006; USFWS 2023). This increase has caused an elevated predation rate on GRSG, which may be a contributing factor to the decrease in GRSG populations, particularly where sagebrush habitat conditions are poor (Conover and Roberts 2016; Coates et a. 2016; USFWS 2023).

3.2.2 Conditions and Trends within the Planning Area

Population, Abundance, and Trends

Lek count data have been widely used to monitor GRSG population trends and are considered a reasonable index to relative abundance (Reese and Bowyer 2007; Doherty et al. 2010, 2016). Because demographic properties, such as rates of population change, are affected by environmental and intrinsic factors that operate on different spatial and temporal scales (Gurevitch et al. 2016), clustering leks into hierarchical levels can help detect changes in abundance that are more likely driven by demographic rates. Pronounced clustering has been documented in GRSG populations within each management zone (i.e., Southern Great Basin, Snake River Plain, Northern Great Basin, Wyoming Basin, and Northern Great Plains; Doherty et al. 2016; see **Map 3.1** in **Appendix 1**). This suggests the species is vulnerable to those landscape-level risks that occur in high-density areas because they could negatively affect large proportions of the populations (Doherty et al. 2016).

New research has incorporated lek count variation and habitat selection into population estimates to more accurately reflect abundance and changes across different spatial and temporal scales (Baumgardt et al. 2017; Fremgen et al. 2016; Fremgen et al. 2017; McCaffery et al. 2016; Monroe et al. 2016). Coates et al. (2021) clustered GRSG leks to develop a multi-scale hierarchical population structure that can be used to assess population trends. Estimated trends show 37.0, 65.2, and 80.7-percent declines in abundance rangewide during short (17 years), medium (33 years), and long (53 years) temporal scales, respectively (see **Map 3.2** in **Appendix 1**). However, trends varied spatially and some areas exhibited evidence of increasing trends in recent decades. In general, population clusters at the periphery of the species range showed higher probabilities of extirpation relative to interior clusters (see **Map 3.3** in **Appendix 1**).

The use of statistical models applied to time series lek count data have also improved the understanding of GRSG population fluctuation. There is substantial variation in how GRSG populations fluctuate across space and through time. Populations in core range (Great Basin and Wyoming Basin) exhibited the most consistent fluctuation but with smaller differences between population highs and lows (Row and Fedy 2017). Trends for marginal populations did not follow expected fluctuations, and large-scale spatial synchrony among populations weakened as fluctuations weakened. Length between fluctuation for most populations also decreased with time.

Genetic Structure and Connectivity

Genetic variation and the dispersal of individuals are necessary to maintain GRSG resilience to current and future environmental and demographic stochasticity and anthropogenic effects. Several studies have used genetic network models to delineate subpopulations, which theoretically represent the core of each distinct genetic group and identify areas of increased importance to GRSG genetic connectivity (Cross et al. 2023; Cross et al. 2018; Oyler-McCance et al. 2022; see **Map 3.4** in **Appendix 1**). Areas outside of subpopulation centers are likely important for maintaining overall connectivity by allowing different genetic groups to converge (Cross et al. 2018; Oyler-McCance et al. 2022). However, subpopulation centers help maintain genetic diversity, as well as other "hubs" important for connectivity (Cross et al. 2018; Oyler-McCance et al. 2022) were identified as high priority for targeted conservation efforts. Areas outside subpopulation centers are also priorities for conservation to protect areas where different genetic groups converge maintain overall connectivity. Translocations have been recommended to reestablish and sustain genetic diversity in declining GRSG populations. Low genetic diversity has been shown to be coupled with declining population trends, suggesting relatively high conservation concern.

Gene flow is greater, and genetic differentiation less in areas of contiguous habitat in eastern Montana, most of Wyoming, much of Oregon, Nevada, and parts of Idaho. In contrast, areas of fragmented habitat such as in Utah exhibited the greatest genetic differentiation and lowest effective migration (Oyler-McCance et al. 2022). Migration rates were lower than expected and functional connectivity was constrained in central Wyoming east of the Continental Divide (Row et al. 2018; Oyler-McCance et al. 2022; see **Map 3.6** in **Appendix 1**).

Empirical evidence on the mechanisms governing the exchange of genetic information among populations shows that affinity to breeding leks can inherently restrict gene flow and provide a mechanism for maintaining localized genetic structure (Cross et al. 2016, 2017; Jahner et al. 2016). Additionally, landscape and habitat features, such as terrain ruggedness, may cause dispersing GRSG to avoid certain areas and affect connectivity between populations (Row et al. 2018). However, increased habitat suitability, especially during nesting and winter periods, decreased anthropogenic effects on the landscapes, and increased landscape connectivity can facilitate higher rates of gene flow that are important for population persistence (Cross et al. 2017; Jahner et al. 2016; Knick et al. 2013; Row et al. 2015, 2016). Research suggests minimum thresholds for sagebrush land cover across the landscape for GRSG persistence. One study showed 90% of active leks occurred on landscapes that were at least 40% dominated by sagebrush, while others have shown 25% to 30% sagebrush within 18- and 30-km scales (Aldridge et al. 2008; Wisdom et al. 2011). The rangewide map of habitat and genetic connectivity indicates areas that are important to genetic exchange and population persistence (see **Map 3.5** in **Appendix 1**).

Habitat Conditions and Trends

The distribution of GRSG is closely aligned with the distribution of sagebrush-dominated landscapes (Schroeder et al. 2004), and occupancy is associated with measures of sagebrush abundance and distribution. Sagebrush area (percentage of 18-km radius composed of sagebrush cover types) was the single best discriminator between occupied and extirpated ranges among 22 variables evaluated by Wisdom et al. (2011). Across the planning area, sagebrush vegetation communities still occur on approximately 109,131,000 acres across the planning area (**Table 3-1**, Comparative Summary of Greater Sage-Grouse Habitat Management Areas by State by Alternative, in **Appendix 9**).

Existing Habitat Management Areas

Currently, the BLM delineates GRSG habitat into management areas to help prioritize habitat and conservation activities while providing management flexibility. GRSG habitat management areas (HMAs) were identified during previous land use plan amendments based on considerations of GRSG occupancy, landscape, habitat and land use/adaptive management opportunities as described below. HMAs have been revised in some instances through plan maintenance actions.

PHMAs are considered those areas with the highest value for maintaining sustainable GRSG populations. Management within PHMAs is the most restrictive, designed to promote GRSG conservation. Sagebrush Focal Areas (SFAs), a subset of PHMA, are areas identified as "strongholds" with the highest densities of GRSG and habitat connectivity and persistence. Remaining suitable habitat is designated as GHMAs, which are either occupied seasonally or provide year-round habitat where some special management would apply. The GHMA designation is the least restrictive due to generally lower occupancy of GRSG and more marginal habitat conditions.

The RMP Amendments in Idaho and Nevada include additional habitat management area categories. Important Habitat Management Areas (IHMA) in Idaho are closely aligned with PHMA, but management is somewhat less restrictive, providing additional management flexibility. Other Habitat Management Areas (OHMA) in Nevada and Northeastern California are lands identified as previously unmapped habitat that are within the planning area and contain seasonal or connectivity habitat areas. The corresponding management for these other HMA categories is discussed in the previous RMPAs.

The acres of each HMA in the planning area are shown in **Table 3-1 (Appendix 9)**.

Habitat Assessment Framework

The Habitat Assessment Framework (HAF) fills the need for a multiple-scale, Sage-Grouse habitat assessment tool that can be easily integrated into the BLM landscape monitoring approach. The HAF established indicators to determine the status of Sage-Grouse habitat needs at multiple scales and for seasonal habitats. The results of these assessments provide necessary information to evaluate whether the BLM managed lands are meeting the Sage-Grouse land health habitat standard.

GRSG occupy large geographic extents and experience a high degree of spatial heterogeneity in biotic and abiotic variables across their range (Doherty et al. 2016; Coates et al. 2021). The general condition and trend of habitats on BLM-administered lands varies by geographic area within the region and is a result of various threats that are currently occurring or have occurred historically. The HAF was established to account for this variation and describes habitat suitability at different spatial scales (Stiver et al. 2015). The orders of habitat selection are hierarchical, in which each higher order is dependent on the previous order (Johnson 1980; Stiver et al. 2015):

- First-order (broad-scale): The physical or geographical range of a species (Johnson 1980). GRSG range is defined by populations of GRSG associated with sagebrush landscapes (Connelly et al. 2003).
- Second-order (mid-scale): Population areas; dispersal between subpopulations. These may include as many as 39 discrete populations (USFWS 2013).
- Third-order (fine-scale): Home range of isolated populations, subpopulations, or an individual, which is determined in part by the quality and the comparison of resources within and between seasonal habitats. Relevant ecological processes are those that may affect movements between seasonal habitats within a home range.

- Fourth-order (site-scale): The use of a particular nesting, feeding, or roosting site within one particular seasonal habitat. Ecological processes consider seasonal habitat needs related to the life requisites of shelter, food, and breeding.

Space is a significant life requisite for GRSG at all scales – pathways for movement within and between populations are critical for maintaining population viability, while access to well-connected sagebrush patches that provide dispersal and movement among subpopulations is essential for GRSG population viability and long-term persistence. At the fine scale, habitat availability, security, and connectivity within home ranges are important for securing seasonal movements to shelter and food needs. Shelter and food availability at the site-scale directly affects individual fitness, survival, and reproductive potential (Stiver et al. 2015).

The GRSG mid-scale HAF areas are shown in **Map 3.7** in **Appendix 1**, and the fine-scale HAF areas are shown in **Map 3.8** in **Appendix 1**.

Sagebrush Ecological Integrity

Advances in research have built upon the emerging understanding of the importance of multiscale habitat selection (Johnson 1980) and how landscape context affects GRSG habitat selection, survival, and population persistence (Aldridge and Boyce 2007; Aldridge et al. 2008; Doherty et al. 2008; Connelly et al. 2011b; Wisdom et al. 2011; Knick et al. 2013; Doherty et al. 2016; Coates et al. 2021). This work has identified the need for large intact sagebrush landscapes with minimal disturbance that provide all seasonal components required to meet GRSG life history needs. Geographical patterns in sagebrush ecological integrity were positively linked to GRSG population performance (Doherty et al. 2022). Therefore, conservation actions in those areas identified as having high sagebrush ecological integrity may be most beneficial.

Probability of Breeding Habitat and Lek Persistence

Breeding habitat is highly condensed within GRSG occupied range, and comprises 26% of the current range (see **Map 3.9** in **Appendix 1**). General habitat variables and climatic gradient variables were more important than disturbance variables in predicting occupied breeding habitat across the species' range. However, the human disturbance resulted in the sharpest probability distribution declines once identified thresholds were crossed (Doherty et al. 2016). GRSG response to sagebrush varies across the range with strong selection for landscape-level sagebrush and a strong avoidance of tree cover. Thresholds of disturbance factors (i.e., tillage, conifer, human disturbance index) also varied across the range (Doherty et al. 2016).

Rangewide lek persistence was modeled as a function of environmental covariates, including sagebrush cover, pinyon-juniper cover, topography, precipitation, point and line disturbance densities, and landscape configuration metrics (Wann et al. 2023). Five of these covariates showed significant regionally varying responses: sagebrush clumpiness (a measure of habitat aggregation), pinyon-juniper cover, point disturbance of anthropogenic features such as energy infrastructure and communication towers, elevation, and a topographic index associated with mesic habitats. The highest quality habitat (capturing 50% of active leks) was estimated as covering 25.5% of the occupied range, while the combined lowest through highest quality habitats (capturing 95% of active leks) covered 65.0% (see **Map 3.10** in **Appendix 1**). These results suggest that habitat management planning should consider regional environmental differences in addition to broader-scale habitat requirements (Wann et al. 2023).

Persistent and Emerging Threats

Interactions Between Climate Change, Wildfire, and Invasive Species

Over the past century, changing trends in temperature, precipitation, and atmospheric CO_2 have altered vegetation community composition and species distributions across the western US (Polley et al. 2013; Lucht et al. 2006; USGCRP 2018), resulting in changes to the composition and availability of sagebrush (Schlaepfer et al. 2015; Still and Richardson 2015). Research predicting sagebrush responses to changing climate has helped identify areas where climate change poses the greatest threat to GRSG habitat. Projections suggest geographically divergent responses of big sagebrush to climate change with changes in biomass ranging from −20% to +27% (Palmquist et al. 2021; see **Map 3.11** in **Appendix 1**). Decreases in sagebrush cover were projected across much of its range, although some increases were projected in Wyoming, the Northern Great Basin, and eastern Montana (Rigge et al. 2021; see **Map 3.12** in **Appendix 1**). Warmer, drier sites are likely more susceptible to sagebrush reductions compared with cooler, wetter sites (Rigge et al. 2021; Adler et al. 2018; Flerchinger et al. 2019; Palmquist et al. 2021). GRSG may have the ability to move to areas that are currently cooler and wetter, as long as the new regions are suitable and available for sagebrush expansion (BLM 2013a; Knick et al. 2013).

Within the planning area, California, Nevada, and Utah have experienced particularly severe and prolonged drought (Belmecheri et al. 2015; Griffin and Anchukaitis 2014), which, based on climate models, are expected to become more intense rangewide (BLM 2020; NOAA 2022; see **Section 3.13.1**, Air Resources, *Climate Change and Greenhouse Gases*). This drought has caused changes to vegetation conditions, including lower sagebrush canopy cover, reduced perennial grass and forb production, and changes to food resource availability (See **Section 3.3**, Vegetation). Such changes could trigger mismatches in timing between resource availability and GRSG life-history needs. Because GRSG population abundance is positively related to mesic availability (Donnelly et al. 2016, 2018), weather-driven productivity has been identified as a key factor influencing GRSG survival (Blomberg et al. 2013; Guttery et al. 2013; Donnelly et al. 2018). A diversity of mesic resources (e.g., rangelands, riparian, and wet meadows) may help sustain GRSG populations over time, but regional drought sensitivity may influence demographic performance differently across the species range (Donnelly et al. 2018).

Sagebrush habitats with low resistance and resilience to invasion by exotic annual grasses are also more likely to be negatively affected by climate changes (Adler et al. 2018). Climate change may worsen the spread of invasive species, such as cheatgrass, medusahead, and ventenata, by increasing the severity of droughts, reducing precipitation, or altering wildfire cycles (BLM 2013a; USGCRP 2018). Climate change models indicate less precipitation may occur from July through August in lower elevation sites; this may favor cheatgrass, which becomes dormant in summer, over native perennials, which depend on summer moisture for growth. Elevated temperatures due to climate change may increase the competitive ability of cheatgrass at higher elevations, expanding its range into sites where it currently is not widespread. Climate change may increase the spread of woody plants such as juniper at higher elevations due to increased precipitation in winter and spring and warmer temperatures, which may increase wildfire risk (BLM 2013a).

Disease Relative to Climate Change

GRSG are highly susceptible to mortality from West Nile virus, the zoonotic disease transmitted by mosquitoes and other anthropods (Clark et al. 2006; Naugle et al. 2004; Clark et al. 2006). Climate change is expected to increase the risk of exposure to West Nile virus because warmer temperatures associated with climate change can lengthen the mosquito breeding season, biting rates, and the incubation of the disease within a mosquito. Climate change may also likely alter GRSG ecology and physiology, as well as the mosquitoes that play a role in disease transmission and maintenance. During periods of drought, which are expected to be more frequent and possibly more intense under climate change, GRSG may also move toward water earlier in the year and, subsequently, come into contact with mosquitoes for longer periods during the transmission season (Naugle et al. 2004). The combined impacts of predicted climate change on sagebrush habitat and West Nile virus transmission are likely to reduce suitable GRSG habitat in the northern Great Plains and northern Rockies (Schrag et al. 2011).

Renewable Energy Development

There has been increasing interest in renewable energy development and many areas that are promising for wind, solar, and geothermal energy development overlap with GRSG habitat (Hanser et al. 2018). Due to negative impacts to GRSG associated with non-renewable energy development, is concern that renewable energy development may also have negatively affect GRSG habitats and populations (NWCC 2017; Hanser et al. 2018). For example, disturbance associated with existing energy infrastructure and human activity has been linked to reproductive costs incurred by GRSG exposed to diverse energy development. Female GRSG avoided areas where discrete disturbance was high during nesting and brood-rearing, and survival of nests and broods were highest in areas that had the least amount of disturbance. This indicates the importance of minimizing disturbance to maintain viable GRSG populations (Kirol et al. 2020).

Impacts from renewable energy development generally include direct habitat loss and fragmentation due to facilities, access roads, and transmission lines as well as disturbance and habitat avoidance from noise and increased human presence. Solar facilities in particular require a large land area and high water consumption (Hanser et al. 2018). Geothermal power is expanding, and while little is known regarding impacts of geothermal energy on wildlife populations, recent research suggests GRSG are adversely affected. GRSG experienced decreased nest and adult survival near geothermal infrastructure (Coates et al. 2023). Ravens also increased in density around geothermal plants, potentially increasing predation risk to GRSG (Coates et al. 2023).

Research has suggested that the sensitivity of GRSG to wind energy development varies with the life history stage and distance from disturbance (NWCC 2017). Brood site selection and summer habitat selection were both negatively affected by surface disturbance, such as cleared ground related to roads and turbine pads. Females raised broods in habitats with lower densities of turbines and access roads out to 1.2 km from the facility. At a wind facility in Wyoming, lek counts declined more severely near wind infrastructure after a 3 or 5-year time lag and the relative probability of GRSG selecting brood-rearing and summer habitats was negatively correlated with the percentage of surface disturbance associated with the facility infrastructure (LeBeau et al. 2017a, 2017b). Effects of wind infrastructure on lek attendance were weakly evident within 1.5 km from a turbine. However, survival rates were higher on the wind facility site relative to the undisturbed site, possibly due to lower numbers of avian predators (LeBeau et al. 2017b). Further research is needed to increase the understanding of the relationship between wind energy development and GRSG populations.

Predation

Predation, including hunting, is a common cause of direct mortality for GRSG during all life stages (Connelly et al. 2011b; USFWS 2013; Conover and Roberts 2016), but it is not considered a threat to the persistence of the species in areas where habitat is not limited and of good quality (USFWS 2010a). However, predation may limit population growth in fragmented habitats or areas where predator populations have supplemental food sources, such as landfills (Coates 2007), or where electrical transmission or other human-made structures facilitate nesting and perching by avian predators such as ravens (Howe 2012; Hagen 2011).

In particular, increased common raven (*Corvus corax*) populations as a result of anthropogenic subsidies (Boarman 2003; Boarman et al. 2006, USFWS 2023) have caused elevated predation rates on GRSG, which may have contributed to the declining GRSG populations in some areas in recent decades (Conover and Roberts 2016; Coates et al. 2016). In one study the majority (64%) of projected GRSG breeding concentration areas across the Great Basin and adjoining ecoregions had raven densities associated with below average GRSG nest survival, suggesting predation as a result of elevated raven numbers is a more widespread and greater threat than wildfire (Coates et al. 2020). Anthropogenic factors that contribute to greater raven occurrence include livestock presence, increased road density, presence of transmission lines, agricultural activity, and presence of roadside rest areas (O'Neil et al. 2018; Coates et al. 2016).

Wild Horses

The Wild Free-Roaming Horses and Burros Act of 1971 was created to manage population levels of herds to facilitate and protect "a thriving natural ecological balance" (Coates et al. 2021). The BLM was tasked to establish appropriate management levels (AMLs) for each herd management area to balance the multiple use mandate (Coates et al. 2021; BLM 2010). In recent years, the population of wild horses on public land has greatly increased. In Nevada, the current population estimate is 46,974 wild horses, which exceeds the BLM's AML upper limit of 11, 987 by 367% (Munoz et al. 2021).

Recent research suggests wild horses can directly and indirectly disrupt native wildlife populations within sagebrush ecosystems (Munoz et al. 2021). Wild horse presence causes fragmented and reduced shrub cover, increase soil compaction and erosion, and may contribute to the spread of invasive grasses (Coates et al. 2021; Munoz et al. 2021; Henning et al. 2021). Wild horses may be a particular threat during the lekking season. Research suggests that male GRSG respond differently when native (pronghorn and mule deer) and non-native (wild horses and cattle) ungulates are on established leks (Munoz et al. 2021). GRSG continue to display at leks when native ungulates are present, but they are not usually detected when non-native ungulates are present (Munoz et al. 2021).

3.3 Vegetation

Vegetation provides many ecosystem services, including, but not limited to, stabilizing soils, preventing erosion, absorbing carbon dioxide, releasing oxygen, increasing species diversity, and providing habitat and food for animals and products for human use. Many land management policies are directed toward maintenance of healthy vegetation communities (Fattet et al. 2010; Yapp et al. 2010; Lawler et al. 2014).

Land Monitoring Frameworks (LMF) and field office collected Assessment, Inventory, and Monitoring (AIM) data provide estimates for consistent contextual information about habitat conditions (Herren et al. 2021). AIM data represent one of the largest available datasets to inform resource management decisions on BLM lands. The LMF is a component of the AIM strategy and is used to assess and monitor renewable resources on BLM-managed rangelands in 13 western states (Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming). LMF and AIM would be used to evaluate whether quantitative habitat objectives are met within seasonal habitats within HMAs.

GRSG rely on sagebrush ecosystems for all aspects of their life cycle. Typically, a range of sagebrush community composition within the landscape (including variations in sub-species composition, co-dominant vegetation, shrub cover, herbaceous cover, and stand age), along with the use of riparian and wet meadow areas, is needed to meet seasonal requirements for food, cover, nesting, and wintering habitats. Since GRSG require large landscapes, the ecology, management, and conservation of large, intact sagebrush ecosystems goes hand-in-hand with managing for the dynamics and behaviors of the populations themselves (Connelly et al. 2004; Crawford et al. 2004). Intact sagebrush does not imply uniform coverage of sagebrush across the ecosystem, but a mosaic of shrub, grassland, and riparian cover across the landscape that allows for migration of GRSG between seasonal habitats (Connelly et al. 2011). In addition, riparian and wetland areas provide important seasonal habitat, water, and forage for GRSG. See section 3.2.1 *Life History and Habitat Characteristics* for an in-depth discussion of GRSG habitat characteristics and requirements.

Historically, sagebrush-dominated vegetation was one of the most widespread habitat types in the US, but its expanse has been fragmented, lost, or altered by invasive plant species and anthropogenic disturbance (NTT 2011). Current protection of GRSG habitat involves restrictions and limitations on activities that contribute to the spread of invasive plant species, wildfire, and habitat fragmentation, reducing other surface disturbances, and management of vegetation to promote healthy sagebrush and understory vegetation to support GRSG. Some habitat loss associated with energy development, infrastructure, wildfire, and invasive plants will likely continue into the future.

There are two main sagebrush dominant vegetation communities: sagebrush steppe and sagebrush shrublands (Kuchler 1970). The sagebrush steppe resembles a semiarid grassland and is characterized by a mosaic of perennial bunchgrasses and forbs with sagebrush shrubs. Sagebrush shrubland resembles more of an arid, desert ecosystem with fewer grasses and forbs and sagebrush dominates (Arizona 2023). The open density, erosive soils, and low herbaceous cover of the sagebrush shrubland type contribute to the vulnerability of this sagebrush type to plant invasions (Barbour and Billings 2000).

Within both the sagebrush steppe and sagebrush shrubland types there are several different community types. The dominant community types are calculated and presented in acres by state within HMAs (**Table 3-1** [**Appendix 9**]), **Map 3.13** [**Appendix 1**]).

Table 3-1 (**Appendix 9**) and **Map 3.13** (**Appendix 1**) presents LANDFIRE EVT acres, which captures a number of different sagebrush, sagebrush-associated, and non-sagebrush communities. Several representative vegetation community types within each of those three categories are discussed below, but LANDFIRE EVT includes more communities included in the numbers above.

3.3.1 Representative Sagebrush Vegetation Communities

Wyoming Big Sagebrush/Grassland

The Wyoming big sagebrush (*Artemisia tridentata* spp. *wyomingensis*)/grassland occurs in shallow-to-moderately deep soil at lower elevations, giving way to basin big sagebrush (*Artemisia tridentata* spp. *tridentata*) in deeper soils and to mountain big sagebrush (*Artemisia tridentata* spp. *vaseyana*) above 6,500 feet in elevation and within the 9- to 16-inch annual precipitation zones (Knight 1994). Shrub height varies from as little as six inches on shallow sites to around 30 inches in deeper soils. Canopy cover is usually under 30% which generally lower than observed in either basin or mountain big sagebrush.

Wyoming big sagebrush often appears as the dominant plant in mosaic communities intermixed with Gardner saltbush (*Atriplex gardneri*) and open grasslands. In shallow, rocky-to-gravelly soils, Wyoming big sagebrush may co-dominate with black sagebrush (*Artemisia nova*), green rabbitbrush (*Chrysothamnus viscidiflorus*), and sometimes winterfat (*Krascheninnikovia lanata*). Grass and forb species vary depending on soil texture, aspect, and slope (Knight 1994). Common grass and grass-like species include bluebunch wheatgrass (*Pseudoroegneria spicata*) and thickspike wheatgrass (*Elymus lanceolatus*), Sandberg bluegrass (*Poa secunda sandbergii*) and mutton bluegrass (*Poa fendleriana*), Indian ricegrass (*Achnatherum hymenoides*), needle-and-thread (*Hesperostipa comata*), threadleaf sedge (*Carex filifolia*), and bottlebrush squirrel tail (*Elymus* *elymoides*). Common forbs include phlox (*Phlox spp.),* Hooker sandwort (*Arenaria hookeri*), onion (*Allium spp.)*, goldenweed (*Pyrrocoma spp.),* sego lily (*Calochortus nuttallii)*, buckwheat (*Eriogonum* spp.) penstemon (*Penstemon spp.)*, Indian paintbrush (*Castilleja spp.)*, globemallow (*Sphaeralcea spp.),* and prickly-pear cactus (*Opuntia spp.)*.

Basin Big Sagebrush Shrubland

Basin big sagebrush shrubland is found in moderately deep-to-deep soils of all soil textures, in zones of ten to 16 inches of annual precipitation (Beetle 1960). It occurs as pockets within Wyoming big sagebrush and Gardner saltbush communities, as the dominant plant type along valley bottoms and canyons, and along ephemeral washes. This subspecies of big sagebrush may reach 12 feet in height, with canopy cover reaching 70%.

Basin big sagebrush mixes with serviceberry *(Amelanchier spp.),* green and rubber rabbitbrush (*Ericameria nauseosa*), snowberry (*Symphoricarpos spp.),* bitterbrush (*Purshia tridentata*), silver sagebrush (*Artemisia cana*), and mountain mahogany (*Cercocarpus spp.),* depending on the soil depth, annual precipitation, and elevation. Grasses occurring in these communities include basin wildrye (*Leymus cinereus*), green needlegrass (*Nassella viridula*), Idaho fescue (*Festuca idahoensis*)*,* thickspike wheatgrass, Kentucky bluegrass (*Poa pratensis*) and mutton bluegrass, and bottlebrush squirrel tail. Common forbs include bluebell (*Mertensia spp.*), groundsel (*Senecio vulgaris*), onion, violet (*Viola spp.)*, buttercup (*Ranunculus spp.)*, sagebrush false dandelion (*Nothocalais troximoides*), buckwheat, penstemon, Indian paintbrush, lupine (*Lupinus spp.),* locoweed (*Oxytropis spp.)*, *Agoseris sp*., and prickly-pear cactus (Decker 2020).

Basin big sagebrush can provide important cover and habitat for wildlife species. In some areas it also provides critical winter habitat for GRSG when snow covers most other shrubs. Basin big sagebrush increases in density and cover as the dominant plant species, and to even a greater degree when associated with poor livestock management and/or interruptions in the wildfire cycle. The natural wildfire recurrence interval in the sagebrush type is approximately 30 to 75 years.

Mountain Big Sagebrush/Grassland

Mountain big sagebrush is located in shallow or moderately deep soils at elevations above 6,500 feet, in 9- to 20-inch annual precipitation zones (Innes 2018). This is one of the largest homogeneous communities of this sagebrush type in the United States. Mountain big sagebrush also occurs as smaller plant communities at the lower mountain elevations, intermixed with aspen (*Populus* spp.) and conifer woodlands. Shrub height will vary from eight to 60 inches, with canopy cover reaching 50% to 60%.

Mountain big sagebrush is usually the dominant shrub in foothill and mountain sage communities, with bitterbrush, serviceberry, snowberry, and mountain mahogany providing subdominant brush diversity. Grasses include Idaho fescue, king spike fescue (*Leucopoa kingii*)*,* needlegrass (*Achnatherum spp.)*, muttongrass, and Kentucky and big bluegrass; elk sedge (*Carex geyeri*), and Ross' sedge (*C. Rossii*). Common forbs found in these areas include Indian paintbrush, phlox, balsamroot (*Balsamorhiza spp.),* locoweed, lupine, larkspur (*Delphinium* spp.), penstemon, hawksbeard (*Crepis spp.)*, and Oregon grape (*Mahonia aquifolium*) (MTNHP 2023).

Mountain big sagebrush is limited as a food source for GRSG during the winter when these habitats become unavailable because of snow.

Silver Sagebrush/Grasslands

Silver sagebrush/grasslands have two subtypes with very different habitats. The most common is found in deep sandy soils and consists of silver sage as the dominant species. It is associated with basin big sagebrush, green rabbitbrush, serviceberry, chokecherry (*Prunus spp.),* and wood rose (*Rosa woodsii*). Herbaceous species include needle-and-thread, Indian ricegrass, poverty oatgrass (*Danthonia spicata*)*,* sand dropseed (*Sporobolus cryptandrus*)*,* scurfpea (*Pediomelum* spp.)*,* and prickly-pear cactus.

A second type of silver sagebrush is located in riparian habitat along streams above the wet sedge and willow riparian zone. This second riparian terrace is also habitat for basin wildrye, Kentucky bluegrass, streambank wheatgrass (*Elymus lanceolatus psammophilus*), redtop (*Agrostis gigantea*)*,* Baltic rush (*Juncus balticus*), clover (*Trifolium spp.),* checkermallow (*Sidalcea malviflora*), malva (*Malva sylvestris*), and, occasionally, cottonwood (*Populus spp.)* and willow (*Salix spp.)*.

Low Sages—Alkali, Birdsfoot, Black, and Wyoming Three-Tip Sagebrush/Grassland

Alkali sagebrush (*Artemisia arbuscula* ssp. *longiloba*) is found growing in clay soils and, as its name implies, can withstand soils of higher alkalinity than can other sagebrush species (Beetle and Johnson 1982; Knight 1994). It reaches six to 12 inches in height and occurs in relatively pure communities because of the high clay content and high cation exchange capacity in the soils in areas below 7,500 feet in elevation. Understory grasses include bluebunch wheatgrass, western wheatgrass (*Pascopyrum smithii*), mutton bluegrass, bottlebrush squirreltail, and Indian ricegrass. Forbs noted at this site include wild buckwheat (*Eriogonum ovalifolium*)*,* biscuit root (*Lomatium spp.)*, and wild onion.

Birdsfoot sagebrush (*Artemisia pedatifida*) is found in alkaline soils, where pH ranges from 8.5 to 11, and below 7,500 feet. It is a mat species, reaching only three to six inches in height. At lower pH levels, birdsfoot sage mixes with Gardner saltbush, and it appears with a mixture of grasses and forbs on windswept ridges and hills. At higher pH levels, birdsfoot sagebrush occurs as a monoculture.

Black sagebrush occurs on gravelly-to-rocky soils that have a "shallow effective" rooting depth (less than 15 inches) and various textures from sandy loams to clay loams. As a result, plant heights may vary between four and 12 inches. On the plains north of the Ferris and Seminoe Mountains, it is the principal shrub present, but it will often be intermixed with Wyoming big sagebrush. Above 7,400 feet, it gives way to Wyoming three-tip sagebrush. It also has been observed as an understory shrub in true mountain mahogany stands. On sandy sites, it is commonly found with needle-and-thread, threadleaf sedge, Junegrass (*Koeleria macrantha*)*,* sandwort, and buckwheat, whereas on loamy soils it will occur with wheatgrasses, bluegrasses, Indian ricegrass, phlox, onion, paintbrush, and penstemon.

Wyoming three-tip sagebrush (*Artemisia tripartita*) occurs above 7,000 feet in the foothills and at the higher elevations of the mountain ranges. It normally grows between four inches and 15 inches tall in moderately deep, well-drained soils (Beetle and Johnson 1982). It is often found intermixed with mountain big sagebrush and black sagebrush. Understory grasses and forbs include Idaho fescue, king spike fescue, Columbia needlegrass, elk sedge, Ross' sedge, Indian paintbrush, prairie clover (*Dalea spp.*), larkspur*,* balsamroot, phlox, and buckwheat. Wyoming three-tip sagebrush-dominated areas are often used as forage for wildlife.

3.3.2 Representative Sagebrush-Associated Vegetation Communities

Sagebrush-Associated Vegetation Communities are typically grasses and forbs species in shrub-dominated overstories and grass/forb-dominated understories that vary with geographic location, topography, soil, elevation, and climate throughout sagebrush ecosystems. Sagebrush steppe and shrublands vegetation follow a gradient of temperatures and moistures that may have perennial herbaceous species dominate or be co-dominant with sagebrush, depending on the last wildfire, insect outbreak, or climatic. (Arizona 2023).

Inter-Mountain Basins Mixed Salt Desert Scrub

Inter-mountain basins mixed salt desert scrub contains soils that are shallow to moderately deep, poorly developed, and often alkaline or saline. Salt desert shrubland is perhaps the most arid vegetation type in the intermountain West (Knight 1994). Gardner saltbush (*Atriplex gardneri*) dominates the salt desert shrub community type and in some instances occurs as up to 90 percent of the vegetation cover. Gardner saltbush normally grows no higher than 12 inches and may grow along the ground, forming a mat. These areas are characterized by accumulations of salt in poorly developed soils. Soils of these areas usually have a pH of 7.8 to 9, which restricts the uptake of water by all but the most salt-tolerant plants (halophytes). Soil textures can be sandy loam, sandy clay loam, or loam and clay. Salt desert shrublands occur at elevations between 5,000 and 7,600 feet within the lowest precipitation areas in the planning area (Arizona 2023). These areas are typically flat or rolling hills.

Rocky Mountain Gambel Oak-Mixed Montane Shrubland

The Rocky Mountain Gambel oak-mixed montane shrubland occurs in mountains, plateaus and foothills of the southern Rocky Mountains and Colorado Plateau, including the Uinta and Wasatch ranges and the Mogollon Rim. These shrublands are most commonly found along dry foothills, lower mountain slopes, and at the edge of the western Great Plains from approximately 6600 to 9500 ft in elevation and are often situated above pinyon-juniper woodlands (NatureServe 2022). Vegetation types in this system may occur as sparse to dense shrublands composed of moderate to tall shrubs. In many situations of this system, the canopy is dominated by the broad-leaved deciduous shrub Gambel oak (*Quercus gambelii*), which occasionally reaches small tree size. Climate is semi-arid and characterized by mostly hot-dry summers with mild to cold winters and annual precipitation of 10 to 25 inches (Reid 2022).

Northwestern Great Plains Mixed Grass Prairie

Mixed-grass prairie is characterized by needle-and-thread (*Hesperostipa comata*), western wheatgrass (*Pascopyrum smithii*), blue grama (*Bouteloua gracilis*), Sandberg bluegrass (*Poa secunda*), threadleaf sedge (*Carex filifolia*), needleleaf sedge (*Carex duriuscula*), prairie junegrass (*Koeleria macrantha*), Indian ricegrass (*Achnatherum hymenoides*), prickly-pear cactus (*Opuntia* spp.), globemallow (*Sphaeralcea* spp.), fringed sagebrush (*Artemisia frigida*), sand dropseed (*Sporobolus cryptandrus*), threeawn (*Aristida purpurea*), little bluestem (*Schizachyrium scoparium*), and various species of milkvetch (*Astragalus* spp.) and locoweed (*Oxytropis* spp.). Summers in this area are cool, reducing evapotranspiration. Frequent thunderstorms in July and August maintain this grassland.

3.3.3 Nonsagebrush Vegetation Communities

Nonsagebrush communities are typically grasses and forbs species in pinyon-juniper dominated overstories and grass/forb-dominated understories that vary with geographic location, topography, soil, elevation, and climate throughout sagebrush ecosystems.

Pinyon-Juniper

Pinyon-juniper woodlands occupy dry woodland sites and grow on foothills, low mountains, mesas, and plateaus, depending on precipitation and soil conditions. These areas typically include portions of black sagebrush and Wyoming big sagebrush communities occupying the cooler and moister end of their range. It also includes cool and moist mountain big sagebrush and low sagebrush (*Artemisia arbuscula*) communities with moderately deep soils (Miller et al. 2013).

Plant species present in these areas vary widely. Typically, juniper dominates at lower elevations, and pinyon dominates at higher elevations. Pinyon and juniper woodlands are similar to semiarid communities where water and soil retention or losses are governed by structure, amount and cover of vegetation, inherent soil and topographic attributes, and climate. These semiarid woodlands occupy precipitation zones between 8 and 20 inches, elevations of less than 1,000 to over 8,000 feet, and a wide variety of soils and parent materials (Miller et al. 2019). In general, pinyon-juniper communities do not provide suitable habitat for GRSG, and further, mature trees displace shrubs, grasses, and forbs through direct competition for resources that are important components of GRSG habitat (Manier et al. 2013).

Pinyon-juniper woodlands naturally spread into sagebrush and perennial grass communities and have expanded across the landscape over the last 120 years (Miller et al. 2008; Rowland et al. 2008). Expansion has been greatest in cooler and/or moister portions of the landscape (Miller et al. 2013, Johnson and Miller 2006; Weisberg et al. 2007). Expansion largely coincides with soil temperature and moisture regimes that are cool to warm and moist, to cool and moist. Three phases of juniper succession are identified by Miller (2005). In Phase I, juvenile trees are present on site, with an occasional mature, seed-producing tree present, but shrub and herbaceous vegetation still maintain dominance of ecological processes (hydraulic, nutrient, and energy cycles). As juniper saplings develop in Phase I, GRSG use declines rapidly. In Phase II, trees are established on site and contribute an equal influence on ecological processes along with shrub and herbaceous species. Trees are increased in size and density in this phase. In Phase III trees have established dominance on the site and are the primary plant group influencing ecological processes. The expansion of pinyon-juniper communities has been attributed to the reduced role of wildfire, introduction of livestock grazing, increases in global carbon dioxide concentrations, climate change, and natural recovery from past disturbance (USFWS 2010a).

Table 3-2 [**Appendix 9**] shows PHMA and GHMA acreage found within the percentage of the project area that is covered by conifer species in the states of California, Colorado, Idaho, Montana, Nevada, Oregon, Utah, and Wyoming., which is also depicted in **Map 3.14**[1] (**Appendix 1**).

Riparian and Wetlands

Riparian vegetation includes plants requiring higher amounts of available water than those found in adjacent upland areas and are generally associated with water courses and wet meadow areas (Decker et al. 2020). Riparian areas, wetlands, and wet meadows provide valuable GRSG late summer brood rearing habitat because these areas provide succulent forbs and insects later in the summer when most forbs in upland habitats have dried out and are senescent (Connelly et al. 2011). These communities make up a small percentage of the vegetation in relation to other types but are important in providing seasonal habitats.

Invasive Annual Grasses

All invasive plant species adversely affect GRSG habitat quality by competing with and displacing native species (Dardis et al. 2016). Invasive annual grasses are the most problematic due to the expense and low success rate in restoration and the dramatic shortening of wildfire frequencies where these grasses dominate. Invasive plants were present on nearly 70 percent of GRSG habitat in 2018 (Herren et al. 2021).

Cheatgrass and medusahead (*Taeniatherum caput-medusae*) are the two most aggressive non-native invasive species found in the planning area and comprise about 15% of vegetation on average (Herren 2021). These species are prolific seed producers and can out-compete native plants for valuable resources such as water and nutrients. These grasses germinate in the fall and early spring and are adapted to thrive in low moisture

[1] The Falkowski et al. 2017 data used to create **Map 3.14** does not cover the entire planning area.

conditions (Tilley 2023). Throughout the west, the number and size of infestations have increased in size and density over the last 20 years.

Cheatgrass is usually matured and cured by early to mid-June, while most native herbaceous species cure in late July and early August. In areas where cheatgrass has replaced native species, earlier and more frequent wildfire can occur, causing further damage to native plant species. With an increased wildfire frequency, conversion to annual grasslands is likely and an increase in other invasive species such as Russian-thistle (*Salsola* spp.) and rush skeletonweed (*Condrilla juncea*), can replace native plants in previously sagebrush dominated ecosystems.

The invasive annual grass ventenata, or North Africa grass (*Ventenata dubia*), is an emerging concern that is spreading quickly through the planning area. Ventenata differs from cheatgrass in that it prefers wetter conditions (Scheinost et al. 2008). Ventenata is beginning to replace perennial grasses and forbs along roadsides and in hay, pasture, rangeland, and fields in the western U.S. It has minimal forage value for wildlife and may cause the soil to be more prone to erosion. Over time, infestations of ventenata will cause a decline of productivity and land value (Scheinost et al. 2008).

3.3.4 Climate

As described in **Section 3.2.1**, Species Background, *Threats*, changing trends in temperature, precipitation, and atmospheric CO_2 over the past century have resulted in changes in the composition and availability of sagebrush. Climate change scenarios for the sagebrush region predict a decline in sagebrush communities across most of its range, although some increases were projected in Wyoming, the Northern Great Basin, and eastern Montana (Rigge et al. 2021). Changing environmental conditions may also favor invasive species (e.g., cheatgrass) expansions and result in increased wildfire sizes and frequencies. In addition, climate change may exacerbate the expansion of woody vegetation (e.g., pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.)) into sagebrush communities (Shriver et al. 2022).

3.4 Wildland Fire Ecology and Management

Wildfires played an important role historically in creating a mosaic of areas of herbaceous species and mature sagebrush. However, human influences have changed wildfire return intervals, altering their historical ranges of variability. Human factors include wildfire ignitions, wildfire suppression, grazing management, and invasive annual grass expansion, which alters the fuel composition. Sagebrush ecosystems have among the most altered wildfire regimes due to these factors (Shinneman et al. 2018).

3.4.1 Role of Wildfire in Sagebrush Vegetation Communities

Wildfire is an important component of all sagebrush-dominated plant communities. Depending on the nature of the site, the wildfire return interval can be between 33 and 130 years (Innes 2019). Historic wildfire seasons in sagebrush communities usually occur between July and September, with the most extreme wildfire conditions being in August (Bunting et al. 1994). Wildfire can be particularly damaging to sagebrush ecosystems. Big sagebrush does not resprout after a wildfire 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 within five years of a burn, but a return to a full pre-burn community cover can take 15 to 30 years or longer (Manier et al. 2013).

Following wildfire, mountain big sagebrush reestablishes as the dominant species more quickly than do other sagebrush types, often resuming dense canopy cover after approximately 40 years. Immediately after wildfire, perennial grasses, forbs, and sprouting shrub species dominate for up to 20 years (Innes and Zouhar 2018). The natural wildfire recurrence interval in this sagebrush type is approximately 25 to 75 years. Reduced wildfire frequency in mountain big sagebrush types has allowed for the encroachment of conifer species such as lodgepole pine (*Pinus contorta*) and Douglas-fir (*Pseudotsuga menziesii*).

In contrast to big sagebrush, silver sagebrush readily resprouts following wildfire, which facilitates post-fire recovery and potential use of prescribed fire as a management tool under favorable spring moisture conditions (White and Currie 1983; Howard 2002). However, any disturbance in the silver sagebrush community may result in less desirable species increasing in prevalence due to the transition of soil types or low-moisture regime. Black sagebrush sites rarely burn, probably because of the low production and shrub cover these sites support. Wyoming three-tip sagebrush (*Artemisia tripartita*) does burn, but because of a lack of fuel continuity, large, resource-damaging wildfires are rare.

3.4.2 Invasive Annual Grasses

Increasing exotic annual grasses, primarily cheatgrass, are resulting in sagebrush loss and degradation (USFWS 2010). Cheatgrass can more easily invade and create its own feedback loop in areas that are dry with understory vegetation cover that is not substantial or that are experiencing surface disturbance, such as road construction. Cheatgrass facilitates short wildfire 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). By providing a dry, fine fuel source during the peak of wildfire season, cheatgrass increases the likelihood of wildfire and thus increases the likelihood of further cheatgrass spread (Pellant 1990). Without wildfire, cheatgrass dominance can exclude sagebrush seedlings from establishing. With wildfire, areas can be converted to annual grasslands.

Wyoming big sagebrush communities are one of the most susceptible to cheatgrass invasion (Bunting et al. 1987; Miller and Eddleman 2000; Schlatterer 1972), and tend to be most susceptible to wildfire compared to the other big sagebrush subspecies (Tisdale 1994). Cheatgrass introduction to the big sagebrush ecosystem has increased wildfire frequency about 12 to 22 times (Whisenant 1990). Recent research found that invasive annual grasses are also capable of substantial spreading in the absence of wildfire (Smith et al. 2023).

Another invasive annual grass, ventenata, tends to dry out earlier than associated perennial grasses and remains highly flammable throughout the wildfire season. Ventenata invasion can increase fine fuel loads and continuity by establishing in typically bare interspaces between shrubs and perennial grasses, increasing the risk of wildfire spread in areas that historically had discontinuous fuels. Models suggest that ventenata invasion can increase wildfire severity, annual area burned, wildfire intensity, and burn probability. Similar to cheatgrass, a grass/wildfire cycle may establish in some communities invaded by ventenata, such as sagebrush steppe (Innes 2022).

3.4.3 Climate

Changing climatic conditions have resulted in higher temperatures and more severe droughts, which have led to longer wildfire seasons and larger, more frequent wildfires in the western US (Jolly et al. 2015; Dennison et al. 2014). More wildfires facilitate the spread of invasive annuals, which results in a positive feedback cycle between wildfire and grasses (D'Antonio and Vitousek 1992). Further, potential climatic shifts may enhance the spread of invasive annuals such as cheatgrass into resistant ecosystems (Bradley et al. 2016). The combined interactions of invasive plant species, uncharacteristic wildfire events, and climate change will likely continue to change sagebrush communities (USGCRP 2018).

3.4.4 Resistance and Resilience

The condition of sagebrush vegetation within HMAs can be assessed on the concepts of resistance and resilience (Chambers et al. 2014a, b; see **Table 3-3** [**Appendix 9**]). Resistance relates to a vegetation community's ability to retain its structure, processes, and function when exposed to stresses, disturbances, or invasive species. Resilience relates to a vegetation community's capacity to regain its structure, processes, and functioning after disturbance, such as wildfire (Chambers et al. 2014a, 2014b). At sites in higher elevations with higher precipitation levels and soil moisture content, sagebrush steppe vegetation is more resistant to cheatgrass invasions and wildfires and more resilient to disturbances (Chambers et al. 2014b). Sagebrush shrublands occur at lower elevations and are more arid, resembling deserts with open shrub density, erosive soils, and low herbaceous cover, contributing to the vulnerability for annual plant invasions.

Vegetation types were analyzed by state in **Table 3-3** (**Appendix 9**) to determine the acres of HMAs consisting of sagebrush steppe and sagebrush shrubland and their levels of resistance to disturbances. These levels of resistance to disturbances range from high and medium-high, medium, medium-low, and low, with additional acreage for areas not analyzed in the HMA. Not all acres within HMAs were analyzed by Chambers et al. (2023) and they are noted in a column as such.

3.4.5 Wildfire Occurrence and Risk

Susceptibility to wildfire occurrence, which results from fuel loading, vegetation characteristics, or as a natural condition of the environment (for example, drought). The introduction of invasive grasses such as cheatgrass and the expansion of pinyon-juniper into sagebrush systems have resulted in changes in the frequency, size, and severity of wildfires in some communities. Low-elevation Wyoming sagebrush communities in sagebrush shrublands have been especially susceptible to such changes due to their low resistance to disturbances. Acres burned in areas with low resistance and resilience may not recover after larger wildfires and could be dominated by invasive annuals, resulting in a loss of habitat functions for GRSG. **Figure 3.1** (**Appendix 9**) and **Map 3.15** (**Appendix 1**) show the acres of mapped occupied GRSG habitat between PHMA and GHMA that have burned since 2012 (regardless of land ownership) and between 2012 to 2021 throughout the states of Wyoming, Montana, North and South Dakota, Idaho, California, Nevada, Colorado, Oregon, and Utah.

The data for **Figure 3.2** (**Appendix 9**) were sourced from the National Interagency Fire Center (NIFC) 2023 GIS data regarding acres burned in HMA boundaries. In **Figure 3.2** (**Appendix 9**) acres burned were analyzed by year of total acres burned in PHMA and GHMA boundaries between all states. In both PHMAs and GHMAs, 2012 experienced the most significant impact with 1,500,500 acres burned for PHMA and 949,900 acres for GHMA. In 2013, there was a sharp drop in acres burned with 90,400 acres in PHMA and 304,900 acres in GHMA impacted by wildfire.

3.5 Fish and Wildlife

A wide variety of fish and wildlife occur within the planning area. Species' distributions are influenced by vegetation, cover, elevation, soil, and other factors. Some species have similar habitat requirements as GRSG while others overlap in distribution but require different habitats. A high-level summary of the types of species that may occur in the planning area is presented below but should not be considered a complete list.

3.5.1 Big Game

Primary big game species found in the planning area include elk (*Cervus canadensis*), mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), and pronghorn (*Antilocapra americana*). Moose (*Alces*

alces), bighorn sheep (*Ovis canadensis*), and bison (*Bison bison*), occur in limited numbers throughout the planning area. These big game species are supported by the diversity of habitat and availability of essential resources throughout the planning area. For most big game species in the planning area, habitat management challenges include habitat degradation (particularly browse forage), habitat fragmentation, and loss, invasive annual grasses, impairment of migratory and other seasonal movements by incompatible fences (e.g., excessive wire heights, spacings, wire type, net wire, etc.), incompatible land use practices (land conversion, industrial activities, and intensive recreational activities), incompatible stock management (domestic sheep grazing in or near bighorn sheep habitat that can spread disease to bighorn sheep), and impacts from human disturbance during sensitive periods and barriers to animal movement.

The BLM's Instruction Memorandum 2023-005, Habitat Connectivity on Public Lands, ensure habitat connectivity, permeability and resilience is restored, maintained, improved, and/or conserved on public lands, particularly for big game animals. The BLM is working with state and Tribal wildlife managers as well as other stakeholders to assess data regarding connectivity, permeability, and resilience and, based on that assessment, identify where to focus management that best supports priority species.

3.5.2 Small Mammals

Terrestrial mammals, such as ground squirrels, cottontails, bats, and mice, are common throughout much of the sagebrush range in the planning area. Sagebrush range in good condition supports an abundant understory of protein rich bunchgrasses and forbs providing habitat for by small mammals. Examples of species are associated with sagebrush vegetation communities include black-tailed jackrabbits (*Lepus californicus*), white tailed jackrabbits (*L. townsendii*), desert cottontails (*Sylvilagus audubonii*), mountain cottontails (*S. nuttallii*), deer mice (*Peromyscus* spp.), sagebrush voles (*Lemmiscus curtatus*), Merriam's shrew (*Sorex merriami*), and kangaroo rats (*Dipodomys* spp.) (McAdoo et al. 2003). Bats include the little brown myotis (*Myotis lucifugus*), fringed myotis (*M. thysanodes*), long-eared myotis (*M. evotis*), pallid bat (*Antrozous pallidus*), spotted bat (*Euderma maculatum*), and Towsend's big-eared bat (*Corynorhinus townsendii*). Many of these bat species use aquatic and riparian habitats for foraging opportunities (McAdoo et al. 2003).

Some small mammals that rely on pinyon-juniper woodlands within the sagebrush planning area include mountain cottontail, cliff chipmunks (*Tamisas dorsalis*), rock squirrels (*Spermophilus variegatus*), brush mice (*Peromyscus boylii*), pinyon mice (*P. truei*), rock mice (*P. difficilis*), deer mice, white-throated woodrats (*Neotoma albigula*), desert woodrats (*N. lepeda*) and Mexican woodrats (*N. mexicana*) (Findley et al. 1975, in Gottfried et al. 1995). Bat species commonly found in pinyon-juniper habitats include eight species of myotis, big brown bats (*Eptesicus fuscus*), spotted bats, western pipistrelles canyon bats (*Pipistrellus hesperus*), and pallid bats (Findley et al. 1975, in Gottfried et al. 1995). Native mammalian predators in the project area include red fox (*Vulpes vulpes*), striped skunk (*Mephitis mephitis*), racoons (*Procyon lotor*), American badger (*Taxidea taxus*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), and long-tailed weasel (*M. frenata*) (Conover and Roberts 2016; Hagen 2011).

3.5.3 Raptors

Raptors are important indicators of overall ecosystem health because they are keystone species at the top of the food web. Raptors are found throughout the planning area and include bald eagles (*Haliaeetus leucocephalus*), golden eagles (*Aquila chrysaetos*), peregrine falcons (*Falco peregrinus*), prairie falcons (*F. mexicanus*), red-tailed hawks (*Buteo jamaicensis*), Swainson's hawks (*B. swainsoni*), rough legged hawks (*Buteo lagopus*), ferruginous hawks (*B. regalis*), Cooper's hawks (*Accipiter cooperii*), sharp-shinned hawks (*A. striatus*), American kestrels (*F. sparverius*), northern harriers (*Circus cyaneus*), great-horned owls (*Bubo virginianus*), and burrowing owls (*Athene cunicularia*). Nests of all raptors are protected under the Migratory Bird Treaty Act

(16 U.S.C. §§ 703–712). Bald and golden eagles are also protected under the Bald and Golden Eagle Protection Act.

3.5.4 Migratory Birds

Migratory birds cross international borders to meet seasonal habitat requirements and are protected under the Migratory Bird Treaty Act. Examples include passerine songbirds, flycatchers, vireos, swallows, thrushes, warblers, and hummingbirds. In addition to GRSG, sagebrush-obligate migratory birds include the sagebrush sparrow (*Artemisiospiza nevadensis*), and sage thrasher (*Oreoscoptes montanus*). Other migratory birds associated with sagebrush habitats include Brewer's sparrow (*Spizella breweri*), loggerhead shrikes (*Lanius ludovicianus*), and Cassin's sparrows (*Aimophila cassinii*). Pinyon/juniper expansion into sagebrush alters range structure negatively impacting migratory birds reliant on sagebrush (e.g., GRSG, sagebrush sparrow). However, several species of migratory birds depend on pinyon/juniper habitats, including the pinyon jay (*Gymnorhinus cyanochephalus*) which is being reviewed by the USFWS for potential listing under the Endangered Species Act.

Common ravens (*Corvus corax*) populations have nearly doubled in the past 50 years (USFWS 2023) and extremely adaptable to human-altered environments and disturbance (Howe et al. 2014). Ravens are known to predate GRSG nests and chicks and in some areas they have been documented to influence lek behavior at a similar magnitude as golden eagles, and other predators (Kobilinsky 2021). Raven densities are higher in areas associated with livestock production (Coates et al. 2016) and will readily use anthropogenic structures for nesting (Howe et al. 2014), particularly in areas like sagebrush habitats where features such as power poles were historically uncommon. The continued expansion human-related structures in sagebrush will likely drive increases in common ravens (USFWS 2023).

Waterfowl and Shorebirds

The numerous streams, rivers, reservoirs, ponds, associated riparian areas, and wetlands vegetation provide habitat for a wide variety of waterfowl and shorebirds. Canada geese (*Branta canadensis*), mallards (*Anas platyrhynchos*), pintail (*Anas acuta*), gadwall (*Anas strepera*), green-winged teal (*Anas crecca carolinensis*), American wigeon (*Anas americana*), and other waterfowl species winter along many of the major rivers within the planning area. Waterfowl production also occurs throughout the planning area. Important foraging areas include primarily lakes and ponds found on public or private lands in agricultural areas and within the river corridors.

Wading birds such as great blue heron (*Ardea herodias*), cattle egret (*Bubulcus ibis*), snowy egret (*Egretta thula),* and white-faced ibis (*Plegadis chihi*) are found throughout the planning area. Great blue heron foraging and breeding areas are primarily along rivers, streams, and ponds throughout the planning area. Killdeer (*Charadrius vociferus*), American avocet (*Recurvirostra americana*), willet (*Tringa semipalmata*), and Wilson's phalarope (*Phalaropus tricolor*) are also commonly found within the planning area.

3.5.5 Upland Game Birds

Upland game birds are common within the planning area, but few share the same sagebrush habitats with GRSG. For example, dusky grouse (*Dendragapus obscuru*) are widely distributed throughout higher elevation woodlands, and Merriam's turkeys (*Meleagris gallopavo merriami*) can be found in riparian areas, mixed mountain shrub, and pinyon-juniper woodlands. California quail (*Callipepla californica*) occur in foothill woodlands, chaparral, and sagebrush along the western side of the planning area. Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*) while native to GRSG habitat occur primarily in grasslands and shrub-dominated slopes. Small flocks of the non-native chukar (*Alectoris chukar*) can also be found in the western portion of the planning area.

3.5.6 Reptiles and Amphibians

Reptiles in the planning area mostly occur in lower elevations and in dryer habitats, such as semi-desert shrub, sagebrush, greasewood, and pinyon-juniper. The sagebrush lizard (*Sceloporus graciosus),* and short-horned lizard (*Phrynosoma hernandesi*), are two of the most common species associated with sagebrush habitats. Other species found in the planning area include Great basin gopher snake (*Pituophis catenifer),* western terrestrial garter snake (*Thamnophis elegans*), collared lizard (*Crotaphytus collaris*), and the side blotched lizard (*Uta stansburiana*). Predatory snakes, such as gopher snakes, are unable consume GRSG eggs but have been observed constricting and consuming a 19-day juvenile GRSG chick (McIntire 2020).

Amphibians, specifically frogs and toads, are important indicators of ecosystem health because they are highly sensitive to environmental changes. Widespread population declines in the western United States are be attributed to disease, pollution, exposure to toxins from energy development, habitat loss and degradation, and the effects from climate change. Examples of amphibians that may occur in GRSG habitat include Columbia spotted frogs (*Rana luteiventris*) and Great Basin spadefoot (*Spea intermontana*).

3.5.7 Invertebrates

Insects provide important food sources for many species of wildlife, including adult and juvenile GRSG. Although there are thousands of species of insects in sagebrush, and riparian and wetland habitats, species in the Scarabaeidae and Tenebrionidae (beetle) families, Formicidae (ants) family, Tettigoniidae family (including Mormon crickets), and Orthoptera (grasshopper) family are a high protein food source of many wildlife species, including GRSG (Klebenow and Gray 1968; Peterson 1970; Johnson and Boyce 1990; Pyle 1993; Fischer 1994; Drut et al. 1994).

Invertebrates are the primary pollinators of forbs, thus helping to proliferate important components of the GRSG diet. GRSG brood-rearing and chick survival are highly dependent on diverse and abundant forbs and insects necessary for early GRSG development. Insect diversity can be attributed to large, diverse, and relatively undisturbed areas of sagebrush habitat.

3.5.8 Fish

The condition of aquatic habitats and fisheries is related to hydrologic conditions of the upland and riparian areas associated with, or contributing to, a specific stream or water body, and to stream channel characteristics. Riparian vegetation reduces solar radiation by providing shade and thereby moderates water temperatures, adds structure to the banks to reduce erosion, provides overhead cover for fish, and provides organic material, a food source for macroinvertebrates. Intact vegetated floodplains dissipate stream energy, store water for later release, and provide rearing areas for juvenile fish. Water quality (especially factors such as temperature, sediment, and dissolved oxygen) also greatly affects fisheries and aquatic habitat.

Higher elevation waters support cold water fishes, consisting primarily of brook trout (*Salvelinus fontinalis),* rainbow trout (*Oncorhynchus mykiss*)*,* brown trout (*Salmo trutta*), and cutthroat trout (*Oncorhynchus clarkii* spp.). Lower elevation waters support primarily cool water and warm water fishes including such species as nonnative northern pike (*Esox lucius*), yellow perch (*Perca flavescens*), smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*), black crappie (*Pomoxis nigromaculatus*), bluegill (*Lepomis macrochirus*), common carp (*Cyprinus carpio*), and walleye (*Sander vitreus*).

Native warm water fish within the planning area include but are not limited to black bullhead (*Ameiurus melas*), channel catfish (*Ictalurus punctatus*), green sunfish (*Lepomis cyanellus*), Johnny darter (*Etheostoma nigrum*), long-nose dace (*Rhinichthys cataractae*), bluehead sucker (*Catostomus discobolus*), flannelmouth sucker (*Catostomus latipinnis*), roundtail chub (*Gila robusta*), razorback sucker (*Xyrauchen texanus*), creek chub (*Semotilus atromaculatus*), Colorado pikeminnow (*Ptychocheilus lucius*), plains killifish (*Fundulus zebrinus*), bonytail chub (*Gila elegans*), and humpback chub (*Gila cypha*).

3.5.9 Pollinators

Pollinators in the planning area include invertebrates and some bird and bat species. Because of the large diversity of species may serve as pollinators, habitat use by these species is also diverse and are generally described above. A diversity of pollinators is a direct indicator of plant diversity and overall ecosystem health. Declines in native and managed pollinator populations have been linked to habitat loss, fragmentation, invasive species, disease, and pesticides (Xerces Society 2021). North American bumble bee species are generally threatened by habitat loss, pesticides, and climate change. Some species are additionally threatened by pathogens and parasites they may acquire from managed bees.

3.6 Special Status Species

Special status species include both animals and plants requiring specific management due to population or habitat concerns. BLM management obligations are described in the BLM 6840 Manual, Special Status Species Management. Categories of special status species are the following:

- Federally listed threatened and endangered species and designated critical habitats
- Federally proposed species and proposed critical habitats
- Federal candidate species
- BLM sensitive species

The BLM will be consulting per Section 7 of the ESA for any listed or proposed species or designated or proposed critical habitat that may be affected by the RMPA. A summary of consultation is included in **Chapter 4**.

3.6.1 Federally Listed Species

Threatened and Endangered Species

Species are listed as either threatened or endangered under the ESA. Some listed species have critical habitat designated as essential to species conservation, or requiring special management consideration or protection. Under the ESA, all federal agencies must participate in the conservation and recovery of listed threatened and endangered species (USFWS and NMFS 1998). The ESA also states that federal agencies shall ensure any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat.

The mission of the USFWS is to work with other federal, state, and local agencies to conserve, protect, and enhance fish, wildlife, and plant species and their habitats. USFWS manages threatened and endangered species and designated critical habitat, in cooperation with other federal agencies to support recovery. The BLM cooperates with USFWS identify and properly manage recovery habitats.

ESA-listed species that have been documented to occur in the planning area are included in **Appendix 11**, Special Status Species.

Proposed and Candidate Species

Proposed species are plant and animal taxa proposed in the Federal Register to be listed under the ESA. These are species that USFWS has sufficient data on biological vulnerability or threats to support a potential to list but issuance of a proposed rule is precluded by higher priority listing actions. Proposed and candidate species that have been documented to occur in the planning area are in **Appendix 11**, Special Status Species.

BLM Sensitive Species

The BLM's objectives for special status species are to conserve and recover ESA-listed species and the ecosystems on which they depend so that ESA protections are no longer necessary, and to initiate proactive conservation measures that reduce or eliminate threats to minimize the need for listing these species under the ESA. The BLM 6840 manual directs the BLM to "work cooperatively with other agencies, organizations, governments, and interested parties for the conservation of sensitive species and their habitats to meet agreed on species and habitat management goals." The 6840 Manual also requires managers to determine to the extent practicable, the distribution, abundance, population condition, current threats, and habitat needs for sensitive species, and evaluate the significance of actions in conserving those species.

All Federal candidate species, proposed species, and delisted species in the 5 years following delisting will be conserved as Bureau sensitive species. State lists of BLM sensitive species for states in the planning area are available in **Appendix 11**.

Current Conditions

The BLM continues to implement actions that further the conservation, protection, and recovery of ESA-listed threatened and endangered species. Consultation with USFWS under the ESA is a key part of these activities. Habitat for proposed, candidate, and BLM sensitive plant and animal species continue to be managed in such a manner that actions authorized, funded, or carried out by the BLM reduce the likelihood for special status species to become listed under the ESA.

The BLM maintains some spatial data on special status species but mostly relies on state agencies for data stewardship and data are also available from NatureServe for wide ranging species that cross jurisdictional boundaries. State natural heritage programs provide location and natural history information on special status plants, animals, and natural communities. These data help drive conservation decisions, aid in the environmental review of projects and land use changes and provide baseline data helpful in recovering listed species.

Species Accounts

Activities within the decision area will primarily affect sagebrush habitat. Areas of conifer encroachment targeted for sagebrush restoration to benefit GRSG may also be affected. Therefore, special status species dependent on sagebrush habitat or strongly associated with pinyon-juniper woodlands may be directly or indirectly affected by proposed management actions to protect and enhance GRSG habitat. An expanded discussion of several key special status species follows. For other special status species accounts, please see **Appendix 11**.

Mammals

<u>Black-footed ferret</u>

In 1967, the black-footed ferret (*Mustela nigripes*) was listed as endangered in early legislation prior to the ESA; the ferret was officially listed as endangered under the ESA in 1973 (USFWS 2013c). The black-footed ferret is intimately tied to prairie dogs (*Cynomys* spp.) and is only found in association with prairie dog colonies. Historically, the black-footed ferret range overlapped with prairie dog habitat throughout the

North American Great Plains, mountain basins, and grasslands. Declines in occupied prairie dog habitat in the early twentieth century coincided with the rapid decline of the ferret (USFWS 2013c). Black-footed ferrets currently occur in both captive and wild populations. Captive ferrets have been reintroduced at 29 reintroduction sites in the western United States, Canada, and Mexico, including at multiple locations in the planning area (see Table 3 in USFWS 2019). Four primary stressors to black-footed ferrets are disease, drought, declining genetic fitness including increased inbreeding and a reduction in genetic diversity, and prairie dog poisoning and shooting (USFWS 2019). The main disease concern for wild and captive populations is non-native sylvatic plague. The white-tailed prairie dog (*C. leucurus*) is the primary diet for black-footed ferrets in the planning area (USFWS 2017). White-tailed prairie dogs generally inhabit dry landscapes with shrub land vegetation, such as the high desert scrub community of Utah and sagebrush steppe of western Wyoming. Sagebrush management that negatively impacts white-tailed prairie dogs could affect black-footed ferrets.

Pygmy rabbit

On January 25, 2024 the USFWS announced they will conduct a status review of the pygmy rabbit (*Brachylagus idahoensis*) in consideration of listing under the ESA. This BLM sensitive species is patchily distributed throughout sagebrush habitat and alluvial fans in the planning area where plants occur in tall dense clumps (Smith et al. 2019). Deep, crumbly, loamy-type soils are required for burrow excavation (the only native rabbit species in North America to excavate their own burrows) although pygmy rabbits may occasionally use burrows excavated by other species and, therefore, may occur in areas that support shallower, more compact soils (Janson 1946; Weiss and Verts 1984; USFWS 2010c).

Big sagebrush is the primary food and may comprise up to 99 percent of food in winter and 51 percent in summer. Grasses and forbs make up the remaining diet during the summer (Shipley et al. 2009, Schmalz et al. 2014). Pygmy rabbits likely select for percent cover and composition of grasses and forbs at different habitat scales (i.e., patch vs. burrow). Cover and height of woody vegetation appear to be critical habitat features (Green and Flinders 1980) and Larrucea and Brussard (2008) found 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).

Pygmy rabbits avoid edge habitats and open areas such as ROWs, roads, and other areas cleared of sagebrush (Crowell et al. 2016, Carr et al. 2016, Edgel et all 2018.) The size of pygmy rabbit home ranges fluctuates seasonally with smaller home ranges during winter and larger home ranges during spring and summer. 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. Juvenile dispersal in Nevada and Oregon was greater than 0.3 mile, with a maximum long-distance movement of 5.3 miles recorded for a juvenile female (Weiss and Verts 1984).

Utah prairie dog

The Utah prairie dog (*Cynomys parvidens*) was listed as an endangered species under the ESA in 1973 and reclassified to threatened status in 1984 (49 FR 22330–22334). Historically, the Utah prairie dog was found in portions of Beaver, Garfield, Iron, Juab, Millard, Piute, Sanpete, Sevier, Washington, and Wayne Counties in Utah (USFWS 2012b). Current dog distribution is now limited to the southwestern quarter of Utah (USFWS 2012b). Significant concentrations of Utah prairie dogs occur in three areas that are identified as recovery units in the Recovery Plan (USFWS 2012b), including the Awapa Plateau, Paunsaugunt, and West Desert recovery units. There are nearly 60,000 acres of Utah prairie dog habitat among the three Recovery Units, and over 48 percent of these acres are BLM-administered or National Forest System lands.

The Utah prairie dog inhabits elevations from 6,200 feet on valley floors up to 9,180 feet (USFWS 2012b) in mountain mesa habitats. Preferred habitats include grasslands and semiarid shrub-steppe. Open habitats are important for foraging and avoiding predators. Livestock grazing practices that reduce shrub height and density or vegetation treatments that remove encroaching conifers may enhance prairie dog habitat.

Since 1976, the Utah Division of Wildlife Resources has performed annual counts of Utah prairie dogs (spring counts) designed to monitor population trends over time. Based on the spring counts, rangewide population trends for the Utah prairie dog are stable to increasing since the time of listing, though populations vary annually and the numbers across the range have decreased in recent years. The rangewide count in 2020 (6,217 dogs) is approximately 54 percent of the count in 2016 (11,478 dogs; USFWS 2021). Population numbers have declined from historic highs primarily due to habitat loss and fragmentation, sylvatic plague, drought, poisoning, and other factors.

Migratory Birds and Raptors

Brewer's sparrow

Brewer's sparrow is a BLM sensitive species strongly associated with sagebrush over most of its range, in areas with scattered shrubs and short grass, though it can also be found in mountain mahogany, rabbit brush, bunchgrass grasslands with shrubs, bitterbrush, and openings in pinyon-juniper (Knopf et al. 1990; Sedgwick 1987). Brewer's sparrow places nests in sagebrush, and may also use other shrubs, from a few inches to about three feet from the ground, though higher nests in taller sagebrush have been documented (Rich 1980). In migration and winter, Brewer's sparrow uses low, arid vegetation, desert scrub, sagebrush, and creosote bush (NatureServe 2023d). Brewer's sparrow is vulnerable to loss and fragmentation of sagebrush habitats, and even though it is typically one of the most abundant songbirds in sagebrush habitats, it is declining across its range (NatureServe 2023d).

Ferruginous hawk

The ferruginous hawk (*Buteo regalis*), a BLM sensitive species, occurs in grassland and shrublands year-round throughout the planning area. Ferruginous hawks often nest on the ground, lone trees, topographic high points, or cliffs. Ferruginous hawks occur in areas with abundant prey, typically small mammals such as rabbits, prairie dogs, and ground squirrels. Ferruginous hawk density and productivity are closely associated with cycles of prey abundance (NatureServe 2023e). Ferruginous hawks are easily disturbed during the breeding season; nest abandonment from disturbance is most likely during early nesting stage (Tesky 1994).

Golden eagle

The golden eagle (*Aquila chrysaetos*) is a BLM sensitive species and is protected under the Bald and Golden Eagle Protection Act of 1940, as amended (16 USC 668-668d), which prohibits unpermitted "taking" of bald or golden eagles, including their parts, nests, or eggs. Golden eagles generally inhabit open and semi-open country such as prairies, sagebrush, savannah or sparse woodland, and barren areas, and in areas with sufficient mammalian prey base and suitable nesting sites. Nests are most often on rock ledges of cliffs but sometimes in large trees, on steep hillsides, on electrical transmission towers, or on the ground. While a pair may have multiple alternate nests they may use the same nest in consecutive years (NatureServe 2023f). Diet consists primarily of small mammals (e.g., rabbits, marmots, ground squirrels) but sometimes also includes large insects, snakes, sage-grouse, other bird species, juvenile ungulates, and carrion.

Golden eagle declines in the early 1900s were due to eradication campaigns, frequently encouraged by the use of bounties (eagle was believed to be a major predator on livestock). Golden eagles are also susceptible to powerline electrocution given their large wingspan. Other threats include ingestion of poison intended for coyotes; ingestion of toxic water from mining activities; occasional shootings; habitat loss to agriculture, suburban land uses, and energy development and loss of potential food resources as a result of habitat degradation. Human disturbance or activity may cause nest abandonment, render a nest site less productive, or prevent a suitable nest site from being utilized, but direct disturbance of nests appears to be infrequent (GBBO 2010).

Pinyon Jay

Pinyon jay, a BLM sensitive species, is a resident of the foothills and lower mountain slopes of western and southwestern U.S. and Mexico in pinyon juniper woodland habitats (AOU 1983). Pinyon jays do not migrate but may forage long distances to find food during years with a low pinyon pine seed crop. Flocks may also migrate altitudinally – up or down in elevation – to find food (NatureServe 2023g). Pinyon jay flocks have complex social organization. Flocks are made of multiple breeding pairs and offspring. While flocks tend to have established home ranges, they move in search of food as described above.

Pinyon jays prefer a mixed-age mosaic of woodland interspersed with sagebrush shrubland. Although they roost and nest within relatively dense groves of older trees, they typically locate their nests usually within half a mile of the habitat edge (NatureServe 2023g). Pinyon jays nest when and where enough food is available – food is seeds from pinyon pines. Large expanses of homogenous closed-canopy pinyon-juniper woodland that have become more common over the past century are largely unsuitable for the birds. A GBBO radio-telemetry study found that foraging pinyon jays appeared to favor transitional areas where pinyon/juniper woodland is interspersed with sagebrush, have relatively small flock home ranges (2,500 to 3,700 acres), and make more use of the sagebrush understory than expected. Thinning activities typically done on behalf of greater sage-grouse, fuels reduction, and to increase livestock forage in the pinyon-juniper ecotone between woodlands and sagebrush habitat may be negatively impacting pinyon jay populations.

This species has undergone significant declines over the last 50 years and faces ongoing threats from habitat alteration due to climate change and wildfire suppression (NatureServe 2023g). Pinyon-juniper habitats in the southwest have been impacted by climate change, including widespread pinyon mortality and probable reduction in pinyon seed crops, the primary food source for pinyon jays (Defenders of Wildlife 2022). Further loss and distributional shifts of pinyon juniper woodland habitats in response to climate change are likely (Gaylord et al. 2013, Meddens et al. 2015). Habitat has also been altered through thinning of pinyon-juniper for fuels reduction, and perceived wildlife management benefits, including habitat improvements for GRSG. Breeding Bird Survey data show a decline of 2.1 percent per year from 1966-2021 (Ziolkowski et al. 2023). The pinyon jay status is currently being reviewed by the USFWS for potential listing under the Endangered Species Act.

Sagebrush Sparrow

Sagebrush sparrow habitat is dry brushy foothills, chaparral, and sagebrush and in winter deserts (Audubon 2023). In the northern and eastern part of the range, sagebrush sparrows mainly inhabit stands of big sagebrush, whereas farther southwest, they mainly use saltbush and other low shrubs of arid flats. Nests are either on the ground or in shrubs. In the Great Basin, the species usually nests in living sagebrush, where cover is sparse, but shrubs are clumped (Petersen and Best 1985). Placement may be related to density of vegetative cover over the nest, as sagebrush 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 (Audubon 2023; Meents et al. 1982; Repasky and Schluter 1994).

Sagebrush sparrows are negatively affected by factors that fragment sagebrush habitat or alter its basic structure, including wildfire, 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.

Sage Thrasher

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

Fish

Lahontan Cutthroat Trout (LCT)

LCT (*Oncorhynchus clarkii henshawi*) is an inland subspecies of cutthroat trout (Salmonidae). The species may be either riverine or lacustrine and is endemic to the Lahontan Basin of northeast California, southeast Oregon, and northern Nevada. As with all cutthroat trout, LCT is an obligate riverine spawner. This species spawns in riffles over gravel substrate when water temperatures are between 41 and 60°F. Intermittent tributaries are sometimes used as spawning sites during high-water years. Fry may develop in the tributary stream until flushed into the mainstream during high runoff.

The decline of LCT has been primarily attributed to the loss and degradation of habitat. Agricultural and municipal uses of water from streams and lakes have reduced or altered the stream discharge in this species' range. Grazing has altered the physical characteristics of stream channels and increased the sediment loads in many LCT habitats. Mining, urban development, logging, road construction, and dam building have also been associated with changes in stream channel morphology and water quality (USFWS 1995). LCT competes with nonnative trout species that were historically stocked for recreational fishing opportunities. Updated recovery goals include removing threats from nonnative trout, ensuring ecological functions in habitats, including carrying out restoration and management changes where needed, and maintaining existing isolated populations (LCTCC 2019).

Bull Trout

Bull trout (*Salvelinus confluentus*) occur in the Columbia River and Snake River basins in Washington, Oregon, Montana, Idaho, and Nevada. Other populations outside the planning area include Puget Sound and Olympic Peninsula watersheds in Washington, Saint Mary basin in Montana, and Klamath River basin of south-central Oregon. Historical habitat loss and fragmentation (including from climate change), interaction with nonnative species, and fish passage issues are widely regarded as the most significant primary threat factors affecting bull trout (USFWS 2015).

Of all the native salmonids in the Pacific Northwest of the United States, bull trout generally have the most specific habitat requirements, including cold water temperatures (often less than 54 degrees Fahrenheit), clean water quality conditions, complex stream habitat including deep pools, overhanging banks and large woody debris, and connectivity between spawning and rearing areas and downstream foraging, migration, and overwintering habitats (USFWS 2015).

Invertebrates

Monarch butterfly

The monarch butterfly was identified as a candidate species for listing under the ESA in 2020 (USFWS 2020). Based on past annual censuses, the western North American population has been declining over the last 23 years, despite an increasing number of sites being counted. Primary drivers affecting North American migratory populations are loss or degradation of breeding, migratory, and overwintering habitat, continued exposure to insecticides, and effects of climate change. Milkweed availability is essential to monarch reproduction and survival and reductions in milkweed due to habitat loss and conversion are also a key driver in monarch declines (USFWS 2020).

During the breeding season, monarch butterflies (*Danaus plexippus*) lay their eggs on milkweed host plants (primarily *Asclepias* spp.). In western North America, nectar and milkweed resources are often associated with riparian corridors, and milkweed may function as the principal nectar source for monarch butterflies in more arid regions. Additionally, monarchs rely on mostly native forb species within GRSG habitat that are also GRSG preferred forbs (Dumroese et al. 2015).

Most adult butterflies live approximately 2 to 5 weeks, but overwintering adults enter into reproductive diapause (suspended reproduction) and live 6 to 9 months. In the fall, monarch butterflies west of the Rocky Mountains fly south and west to overwintering groves along the California coast into northern Baja California (USFWS 2020). During breeding and migration, adult monarch butterflies require a diversity of blooming nectar resources, which they feed on throughout their migration routes and breeding grounds.

3.7 Wild Horses and Burros

The Wild Free-Roaming Horses and Burros Act of 1971, as amended by FLPMA and the Public Rangeland Improvement Act of 1978, directs the protection and management of wild horse and burro populations on BLM-administered lands. Responsibility for wild horse and burro management is governed by 43 CFR Part 4700. One of the BLM's top priorities is to ensure the health of the public lands so that the species depending on them, including the nation's wild horse and burro, can thrive. The BLM policies and regulations also direct that wild horses and burros are to be managed as self-sustaining populations of healthy animals.

The 53.8 million acres where wild horses or burros were found when the 1971 Wild Free-Roaming Horses and Burros Act was passed are known as herd areas (HAs). A subset of these areas (approximately 31.6 million acres nationwide) have been determined suitable for long-term management of wild horses and burros and are known as herd management areas (WHB HMAs). Wild horse and burro populations within WHB HMAs are managed with the goal of maintaining sustainable ecological conditions and multiple-use relationships on federal lands. Both HAs and WHB HMAs can include private or state lands, but the BLM has management authority only over public lands.

The BLM periodically evaluates each HA to determine if it has adequate food, water, cover, and space to sustain healthy and diverse wild horse and burro populations over the long-term. The BLM may designate an appropriate management level (AML) and specifies an allowable range in horse numbers for each WHB HMA based upon available forage and other resources necessary to sustain the horse or burro populations, as well as resource objectives and other designated uses of the BLM-administered lands.

The estimated population size of wild horses and burros within each WHB HMA is based on helicopter, fixed-wing, or by ground-based inventories, which occur every 2 to 3 years. These population inventories provide information pertaining to population numbers, foaling rates, distribution, and herd health. When the AML is exceeded, populations of wild horses and burros are examined to determine if population control methods are required. Historically, it has been a challenge for BLM to maintain AML in all herd management areas.

Wild horses and burros are a long-lived species with annual survival or other time period rates estimated between 80 and 97 percent (Wolfe 1980; Eberhardt et al. 1982; Garrott and Taylor 1990). In addition, 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). Wild horse and burro numbers appear to be limited principally by water availability and winter forage, as predation and disease have not substantially regulated wild horse and burro population levels. This has resulted in the BLM shifting program emphasis beyond just establishing an AML and conducting wild horse and burro gathers to including 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" (Public Law 92-195). Methods of herd population control include periodic gathers and removal to short-term holding and adoption or long-term holding, as well as methods of population growth suppression, including treatment with fertility control drugs where approved. Gathering or other population growth suppression activities are based on inventory data, herd health, rangeland health, climatic conditions, and occurrence of catastrophic events such as wildfire and drought.

3.7.1 Current Conditions

In the planning area, there are approximately 15 million acres of WHB HMAs. The BLM administers 168 WHB HMAs within California, Colorado, Idaho, Montana, Nevada, Oregon, Utah, and Wyoming. Current herd area, herd management areas, and estimated population of wild horse and burro within the project area are listed in **Table 3-4** (**Appendix 9**). Wild horse and burro populations within the planning area continue to grow, often exceeding AMLs. Wild horses and burros can be causal factors for failing to meet applicable Land Health standards. Due to a lack of predators, in the absence of management action, wild horse and burro populations will continue to increase in size. As a result, the agency will continue to remove animals from the range each year and will continue to administer various methods of fertility control.

Currently, the AMLs are being exceeded by an average of 3.6 times greater than the "high" AML value across the planning area (**Table 3-4** [**Appendix 9**]). The total number of AML acres which overlap with GRSG Habitat Management Areas is displayed in **Table 3-5** (**Appendix 9**). Wild horses and burros can be found outside of WHB HMAs as they are not fenced and horses and burros may leave in search of water and forage and enter onto BLM-administered or other lands.

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

3.8 LIVESTOCK GRAZING

The BLM administers public land grazing primarily in accordance with the 1934 Taylor Grazing Act, 1976 Federal Land Policy and Management Act, and 1978 Public Rangelands Improvement Act. Grazing use on public land is administered through grazing authorizations issued by field offices to qualified applicants, who are assigned grazing preference. Forage use is identified in allotments, which are areas of land designated and managed for livestock grazing. The amount and length of use is described in the terms and conditions of the grazing authorization, which is usually a permit or lease, normally issued for 10 years. More prescriptive management and flexibility may be used to achieve resource and operational goals and objectives through Allotment Management Plans (AMP) or their functional equivalents. When grazing permits/leases expire, they may be renewed based on continued availability of the grazing area, grazing preference, and satisfactory record of performance.

3.8.1 Current Conditions

The species (kind) and age (class) of livestock that graze across the planning area varies across field offices, but are primarily cow-calf pairs or yearling cattle. Some allotments graze other kinds of livestock, including sheep, goats, bison, and horses. Livestock grazing allotments across the planning area range in size, with some less than 1,000 acres, and others exceeding 100,000. Allotments may be completely fenced but are often located along geographic features such as canyons, streams, and rivers that can restrict the movement of livestock in lieu of fencing.

The BLM grazing administration regulations were revised in 1995 to include Fundamentals of Rangeland Health and Standards and Guidelines for Grazing Administration (43 CFR Part 4180). Standards provide for the conformance with the Fundamentals of Land Health at 43 CFR Part 4180.1 BLM State Directors are responsible for developing or modifying Standards and Guidelines specific to areas under their jurisdiction. This is done in consultation with affected Resource Advisory Councils and in coordination with applicable Indian Tribes, other State/Federal land management agencies, and the public. Standards (of Land Health) are expressions of levels of physical and biological condition or degree of function required for healthy lands and sustainable uses and define minimum resource conditions that must be achieved and maintained. Guidelines are a practice, method or technique determined to be appropriate to ensure that standards can be met or that significant progress can be made toward meeting the standard. Guidelines are tools such as grazing systems, vegetative treatments, or improvement projects that help managers and permittees achieve standards.

In BLM policy, Standards (i.e. Land Health Standards) are applicable to all ecosystems and management actions. They are expressed as goals in the Land Use Plan. Public lands are managed to achieve or make significant progress toward achieving Land Health Standards developed for an area unless specified otherwise in the Land Use Plan. Practices and activities subject to standards and guidelines by regulation include the development of grazing-related portions of activity plans, establishment of terms and conditions of permits, leases and other grazing authorizations, and range improvement activities such as vegetation manipulation, fence construction and development of water.

In accordance with 43 CFR Part 4180, the BLM must take appropriate action as soon as practicable but not later than the start of the next grazing year upon determining that existing grazing management practices or levels of grazing use on public lands are significant factors in failing to achieve the standards and conform with the guidelines. Appropriate action means implementing management that will result in significant progress toward fulfillment of the standards and toward conformance with the guidelines.

The number of allotments with at least 15% PHMA by Land Health Standard Category is shown in **Table 3-6** (**Appendix 9**). Across the planning area, grazing management has been improved by a variety of actions. One example is changing the terms and conditions in grazing permits/leases to improve riparian areas and wetlands through utilization, herding requirements, and strategic placement of salt and supplemental feed.

Furthermore, improvements through additional water developments and pasture fencing, along with following compliance inspections to ensure assigned range improvement maintenance is completed for grazing authorizations. Livestock have also been observed to not impact nest success of GRSG at current grazing levels (Bartholdt 2023).

3.9 LANDS AND REALTY (INCLUDING RENEWABLE ENERGY)

The lands and realty program consists of (1) land use authorizations, including ROWs; (2) land tenure adjustments, including disposals and acquisitions of lands; (3) Official Surveys of Federal Interest Lands, Management of Land Boundary (MLB) Plans, Standards for Boundary Evidence (SBE), Public Lands Survey System Data Set (PLSSDS), Surface Management Agency (SMA), and Land Status Records System; and (4) withdrawals. Changes to land tenure and the cadastral survey are not being considered in this effort and will not be discussed further. The lands and realty program also processes renewable energy applications related to wind, solar, and geothermal energy. Geothermal energy is managed as a fluid leasable mineral (see **Section 3.10.1**, Fluid Minerals [Including Geothermal]). Utility-scale wind and solar resource facilities are permitted with ROW authorizations through the lands and realty program. As a result, management actions related to the lands and realty program and leasable minerals could affect renewable energy resources. Special management designation areas, such as ACECs and WSAs, could also affect the use of renewable energy resources by limiting the location of these facilities.

3.9.1 Conditions within the Planning Area

Land use authorizations include granting ROWs, permits, leases, and temporary use permits (TUPs). A ROW is most often authorized by a grant or lease under 43 CFR Part 2800 and 2880 and are appropriate for facilities constructed for long-term use, generally 30 years. Short-term ROWs are typically used during construction, maintenance, and other seasonal or short duration uses involving minimal improvement and investment. Additional land use authorizations are issued as leases, permits, and easements under 43 CFR Part 2920. Leases are usually long-term authorizations that use public lands for a fixed term involving considerable capital investments. TUPs are authorized under the Mineral Leasing Act (see 43 CFR Part 2881.5(a)) and short-term ROWs may be issued under FLMPA. TUPs can be reauthorized at the discretion of the authorized officer. Easements are authorizations for a non-exclusive interest in lands that specifies the right to the holder the obligation of the BLM to use and manage the lands in a manner consistent with the terms of the easement. A lease grants less than the interest given by an easement and provides for more direct control by the authorized officer. ROW grants are used for wind and solar development and testing.

Granting ROWs

ROW grants are used for oil and gas pipelines, electric transmission and distribution lines, roads, wind and solar development, and communication sites such as telephone and fiber optic. Generally, ROWs are granted for the term of a project. A ROW authorizes the holder to construct, operate, maintain, and/or terminate a new or existing facility over, under, upon, or through BLM-administered lands. The majority of ROWs are authorized under Title V of the FLPMA (90 Stat. 2743; 43 USC 1715, 1761-1771) and the Mineral Leasing Act (Section 28 of the Mineral Leasing Act of 1920, as amended, 43 USC 185). The BLM will authorize ROW applications at the discretion of the authorized officer in a responsible, efficient, and economically feasible manner.

Acres of existing pipelines and transmission lines on BLM-administered lands within the planning area are listed in **Table 3-7** (**Appendix 9**) and **Map 3.16** (**Appendix 1**) shows disturbance associated with roads. Of the approximately 679,300 acres of transmission lines on BLM-administered lands in the planning area, approximately 33 percent are within mapped occupied habitat (**Table 3-7** [**Appendix 9**]).

ROW Avoidance and Exclusion Areas

Areas identified as unsuitable for surface disturbance or occupancy are generally identified as avoidance or exclusion areas for ROWs. Restrictions and mitigation measures could be modified on a case-by-case basis for avoidance areas, depending on impacts on resources, while exclusion areas are prohibited from ROW development with limited exceptions.

Communication Sites

The BLM typically issues communication site ROWs or leases for communication facilities. Communication towers, transmission lines, and other vertical structures that provide additional perching opportunities for ravens and other birds of prey can result in habitat fragmentation, habitat avoidance, and increased vehicle traffic during maintenance operations (USFWS 2013).

Roads and Railroads

Roads and railroads can fragment GRSG habitat (Knick and Rotenberry 1995). Within the BLM-administered lands in the planning area there are 46,600 acres of railroad and 2,197,200 acres of road ROWs, of these 24 percent and 42 percent respectively are located in occupied habitat (**Table 3-8** and **Table 3-9** [**Appendix 9**]).

Solar Energy

Acres of solar facilities and ROWs in the planning area are presented in **Table 3-10** (**Appendix 9**). For ROW applications to support non-utility-scale solar facilities (i.e., less than 5 MWs), the BLM will consider requests on a case-by-case basis, and may require a land use plan amendment to analyze an otherwise nonconforming proposal.

Wind Energy

Based on 2023 U.S. Energy Information Agency data, sites with an average annual wind speed greater than 5.8 meters per second are candidates for utility-scale generation (EIA 2023a). Acres of wind turbines and wind ROWs in the planning area are listed in **Table 3-11** (**Appendix 9**). Acres of wind potential in mapped occupied habitat within the planning area are listed in **Table 3-12** (**Appendix 9**). See **Map 3.17** (**Appendix 1**) for an overview of existing wind potential within the planning area.

3.9.2 Trends within the Planning Area

Land Use Authorizations

Land use authorization requests are customer driven. Within the planning area most authorizations processed are primarily for roads, electric distribution lines, and communication sites. Renewable energy land use authorization requests including wind and solar development have increased and are expected to continue to increase due to the growing demand for renewable energy.

3.10 MINERAL RESOURCES

3.10.1 Fluid Minerals (Including Geothermal)

Fluid leasable minerals include oil, gas, coalbed natural gas, and geothermal resources. Oil and gas are most often found in the porous spaces of sedimentary rocks (e.g., sandstone and limestone), having migrated there from source rocks (e.g., marine shales) rich in organic material. Coalbed natural gas is methane gas that can be extracted from coal seams. Since most coalbed natural gas is associated with coals at shallow depth, exploration, well drilling, completion, and production costs are considerably lower than for conventional deep gas production. Geothermal resources are a source of energy that uses the natural heat of the Earth's interior, carried to the surface by steam or hot water.

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. Leases are issued through a competitive process and are offered through a bid in areas nominated by interested parties. The BLM issues competitive leases for oil and gas exploration and development on lands owned or controlled by the Federal government. Currently, the BLM holds quarterly competitive sales but not in every state. Leases are issued for a term of ten years and expire unless they are extended, suspended, or held by production. If the lessee establishes hydrocarbon production, leases are held as long as oil or gas is produced.

During the leasing process, the BLM may apply lease stipulations to leases in order to protect other resource values or land uses (e.g., cultural resources, boundary line markers and corners and wildlife) by establishing authority for timing delays or the denial of operations in the terms of the standard lease contract. There are four types of additional stipulations 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.
- 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 and that less stringent, project-specific mitigation measures would be insufficient.
- Protection of Survey Corner and Boundary Line Markers. Under the boundary marker protection stipulation, the responsible party will identify and protect evidence of Federal interest land boundary markers.

Most but not all stipulations attached to leases at the time of sale have a provision, specified in the individual Land Use Plans, 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.

The issuance of a lease does not, in and of itself, authorize any surface-disturbing activities. If a lessee wishes to conduct exploratory drilling, an application for permit (APD) to drill must be submitted to the BLM for approval. These protections are accomplished through the attachment of Conditions of Approval (COA) to each project in conjunction with the NEPA process and during review. For geothermal resources, some exploratory drilling can be done under a Notice of Intent and does not require an APD.

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. Similarly, the BLM may not apply COAs and other post-leasing restrictions that result in a de facto application of a new lease stipulation.

Existing Conditions in the Planning Area

Oil and Gas

Major oil and gas producing basins in the planning area are located primarily in Colorado, Utah, Wyoming, Montana, and the Dakotas. The most prolific oil and gas producing basins include the Powder River, Greater Green River, Unita-Piceance, North Park, and Williston, and are described further below.

The Powder River Basin, with an area of 43.5 thousand square miles, covers northeastern Wyoming and southeastern Montana (EIA 2023b). The Powder River Basin is a deep, northerly trending, asymmetric, mildly deformed trough, approximately 250 miles long and 100 miles wide. The thickness of the sedimentary section exceeds 17,000 feet along the basin axis (Lawrence 2010). The Eastern Powder River Basin in northeast Wyoming is one of the most prolific oil producing basins the Rocky Mountains. Coalbed natural gas is one of the largest contributors to total natural gas production in Wyoming, and coals of the Powder River Basin are the largest source of coalbed natural gas (WOGCC 2023).

The Greater Green River Basin, with an area of 25.9 thousand square miles and the largest oil shale deposits, covers areas in southwest Wyoming, northwest Colorado, and northeast Utah (EIA 2023b). Oil and gas exploration of the Overthrust Belt dates back to the 1890s. This area has been the focus of intense exploration, including seismic and drilling programs, since the mid-1970s (BLM 2003).

Uinta-Piceance Basin, which encompasses an area of 29.2 thousand square miles, extends from eastern Utah into northwestern Colorado and currently has production in conventional gas, tight sands, shale gas and oil (EIA 2023b). The Piceance Basin within the greater Unita-Piceance Basin is an elongated structural depression trending northwest - southeast located in western Colorado. The basin is more than 100 miles long and has an average width of over 60 miles, encompassing an area of approximately 8.6 thousand square miles (EIA 2023b). The Piceance Basin contains six of the top one hundred natural gas reserves in the US one of the top one hundred oil reserves (Colorado Geological Survey – online).

The North Park Basin occupies approximately 1.3 in thousand miles in north-central Colorado (EIA 2023b) and includes oil and natural gas resources primarily in the form of coalbed natural gas, carbon dioxide, and recent interest in the resource potential of the Niobrara shale formation.

The Williston Basin, with an area of 69.8 thousand square miles extending from northwest South Dakota to western North Dakota and eastern Montana (EIA 2023b), has a long history of oil and gas production. Conventional oil production from the Williston Basin became significant during the 1970s, peaking in the mid-1980s, and then declining in the 1990s. Technological advances in horizontal drilling and hydraulic fracturing in the early 2000s have allowed development of unconventional zones (methane-bearing coal zones, oil or gas bearing shale zones, gas hydrates or "tight gas" in low porosity or low permeability traditional zones), that were once considered as uneconomic. As a result, oil and gas production in the region increased beginning in early 2000 and peaking in 2008. While production has slowed, interest and potential continue to exist in the region.

In addition to the above regions, Railroad Valley and Pine Valley in Nevada have areas of high and moderate potential for petroleum. Railroad Valley 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). Pine Valley 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.

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 application for permit to drill (APD). As demand rises, more interest in oil and gas development is expected (BLM 2009). In areas with moderate to high potential in several areas in the planning area, drilling is expected to increase.

Geothermal

Geothermal resources are a source of energy that uses the natural heat of the Earth's interior, carried to the surface by steam or hot water. Most of the geothermal power plants in the US are in western states, where there are large areas with medium to high potential for geothermal resources. More than 90 percent of the US geothermal power generation is from California and Nevada, with additional contributions from plants in Idaho, New Mexico, Oregon, and Utah (as well as Alaska and Hawaii; NREL 2021).

In Nevada, geothermal resources are significant in portions of the planning area. Based on US Geological Survey (USGS) data, there is particularly high potential in northeastern Nevada (Williams et al. 2008). Nevada currently has 26 operating geothermal power plants in 17 locations (State of Nevada Commission on Mineral Resources 2023). Between 2015 and 2019, geothermal project development growth in Nevada surpassed all other states with 5 new geothermal plants (NREL 2021). Nevada's geothermal electricity generation is the second highest in the US, after California. In 2021, geothermal power plants in Nevada collectively produced 825 megawatts of electricity (State of Nevada Commission on Mineral Resources 2021).

Geothermal resources in Utah are plentiful in the middle and northwest portions of the state, although a lack of transmission capacity may hinder development. Geothermal resources in Utah have the potential to supply 15,000 MW of electricity. As of 2019, there were four geothermal power plants in Utah with capacity of 90 MW (NREL 2019). Currently, there are no geothermal energy production facilities within GRSG habitat in the planning area in Utah. Future development of geothermal resources within GRSG habitat in the planning area is also highly unlikely.

In 2019, Oregon and Idaho had 4 and 1 operating geothermal power plants with a total capacity of 38 MW and 18 MW, respectively (NREL 2021). Between 2016 and 2019, Oregon had 4 developing projects and Idaho had 5 (NREL 2021).

3.10.2 Nonenergy Leasable Minerals

Nonenergy solid leasable minerals may include sodium, phosphate, potassium, sulfur, and gilsonite. 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. A prospecting permit provides the exclusive right to prospect and explore for leasable mineral deposits. There are three ways to obtain a mineral lease for nonenergy solid leasable minerals:

- Competitive lease: A competitive lease can be issued where there is an existence of a valuable mineral deposit. The BLM can designate such lands as Known Leasing Areas.
- Preference Right Lease: This is a noncompetitive lease. A prospecting permit is applied for and an exploration plan is approved. The plan must show how the existence and workability of a valuable

deposit will be determined. If a valuable mineral deposit has been discovered, and other mineral-specific determinations are made in the positive, the BLM may issue a Preference Right Lease.

- Fringe Acreage Lease: This is a noncompetitive lease. A Fringe Acreage Lease can be applied for if the applicant has control over adjacent lands. The leased area must meet certain requirements, including demonstration that the deposit continues from the lands controlled by the applicant and that the mineral deposit is not in an area of competitive interest.

Existing Conditions in the Planning Area

The discussion of nonenergy leasable mineral resources in the planning area focuses on gilsonite, phosphate, and sodium. Although the discussion for these minerals is planning area wide, each of these resources exists primarily in limited areas, described in detail below.

Sodium

The world's largest known trona deposit, a hydrous sodium carbonate mineral refined into soda ash, sodium bicarbonate, sodium sulfite, sodium tripolyphosphate, and chemical caustic soda (Gregory 2014) is located in southwestern Wyoming. Soda ash is the trade name for sodium carbonate, a chemical obtained from trona and sodium-carbonate-bearing brines. Primary uses are by the glass and chemical industries (USGS 2023a). The trona is found in the Green River Formation of Eocene age. The Wilkins Peak Member of the Green River Formation includes at least 42 trona beds, occurring from 400 to 3,500 feet below the surface. Trona is Wyoming's top export and in the US, 90 percent of trona production comes from southwestern Wyoming. At current production rates of approximately 18 million tons per year Wyoming's estimated recoverable reserves would last over 2,000 years (Wyoming Mining Association 2023). A federally designated Known Sodium Leasing Area covering a 1,085 square mile area almost entirely in Sweetwater County, Wyoming overlaps part of the planning area.

The Piceance Basin of northwestern Colorado and adjacent states contains the world's largest and most economically significant deposit of a nahcolite, an evaporite mineral consisting of naturally occurring sodium bicarbonate. Within the planning area in Colorado, all of the sodium resources are found in the Parachute Creek Member of the Green River Formation. The sodium resource in the basin was estimated at 32 billion short tons (Dyni 1974) and 29 billion tons by Beard et al. (1974; Brownfield et al. 2010).

In Utah, there are approximately 175,200 acres of federal mineral estate in the population areas on which sodium occurs. All sodium deposits in the population areas are within the Rich and Box Elder population areas. The Rich Population Area has 158,900 acres with sodium deposits, all of which is within the decision area. The Box Elder Population Area has 16,300 acres of federal mineral estate on which sodium occurs, of which 2,500 acres (16 percent) is within the decision area. In Utah, there are no federal sodium leases in the planning area (BLM 2015).

Phosphate

Phosphate is primarily contained in phosphate rich sedimentary rock deposits, typically deposited in shallow marine or low energy environments (Delaney 1998). Phosphate is primarily used in ammonium phosphate fertilizers and animal feed supplements (USGS 2023b). The BLM manages phosphate leasing and development on most public land.

Phosphate is currently mined in North Carolina, Florida, Idaho, and Utah. Production from Idaho and Utah has been steady while eastern production has been decreasing, leading to an increasing reliance on western deposits for domestic production. In the west, the richest phosphorite accumulations are found in southern Idaho and northern Utah. A deposit does exist in Wyoming but is currently unavailable due to existing withdrawals. Mining for phosphate occurs using surface mining methods where large quantities of waste rock are typically moved to extract the ore. Lands known to have a valuable phosphate resource have been designated as Known Phosphate Leasing Areas and are leased through a competitive leasing process. Lands outside a Known Phosphate Leasing Area may also be leased, but the existence of a valuable phosphate resource must first be demonstrated, through prospecting. Leasing is a discretionary action; however, when issued, a federal phosphate lease conveys to the lessee the exclusive rights to explore for and extract the phosphate resources contained in the lease, subject to existing laws and regulations.

Idaho has 8 known phosphate leasing areas, totaling 80,168 acres and approximately 86 federal leases covering approximately 43,000 acres. Approximately half of the leases have been mined. There are currently 3 active producing phosphate mines; 2 permitted mines under construction that will replace producing mines as they are depleted; and 1 mine being permitted. The phosphate industry has been an important industry in southern Idaho since about 1907. As a result average wages in Caribou County are among the highest in the State of Idaho. The ore produced from the federal leases is an important source of phosphate fertilizer and elemental phosphorus produced at industrial plants in Pocatello and Soda Springs, Idaho. Currently, 10 unmined leases and one mine in permitting, encompassing 4 of the unmined leases, are located in GRSG HMA.

Gilsonite

Gilsonite is a solid hydrocarbon formed in veins or dikes that is mined primarily underground. Gilsonite is a unique industrial mineral found only in the Uinta Basin in eastern Utah. The main markets for gilsonite are the oilfield and printing ink industries. In the oilfield industry, gilsonite is used as a fluid loss control agent and shale stabilizer for oil-based drilling fluids and water-based drilling fluids. It is also used as a loss circulation material and slurry density reducer for cementing fluids (Boden and Tripp 2012).

3.10.3 Coal

Leasing and developing federal coal resources is described in the federal regulations at 43 CFR Part 3400. Coal leases are made available for sale through a competitive bidding process in each BLM state office. Provisions of the lease documents in relation to surface and subsurface resources and resource uses are dictated by the current RMPs for each field office within which leases are offered. In general, these RMPs specify types of restrictions on coal leasing within each field office boundary based on identification of lands with potentially developable coal resources and determination of lands found suitable for coal leasing using the 20 criteria listed in Section 522 of the Surface Mining Control and Reclamation Act

Coal leases are subject to readjustment of their stipulations. The first readjustment could occur 20 years after the initial date of issuance and then every 10 years thereafter. For lands found suitable for leasing, analysis of acceptability for leasing would consider protective measures identified in the then-current RMP. Depending on the field office, these protections may include design, reclamation, and mitigation of proposed measures.

Most but not all protections are attached to leases at the time of sale, and the protections may identify exception criteria for granting temporary or permanent relief from a specific measure. In addition, federal regulations give the BLM the authority to ensure coal is developed in a manner that minimizes impacts on other resources and uses and is protective of human health and safety. These protections are accomplished through the attachment of COAs to each project in conjunction with the NEPA process and during review of individual permit application.

BLM-administered lands are acceptable for coal leasing only after the lands have been evaluated through the BLM's multiple-use planning process (43 CFR Part 3420.1-4). In areas where development of coal resources may conflict with protection and management of other resources or land uses, the BLM may identify mitigating measures as either lease stipulations or operational restrictions.

Existing Conditions in the Planning Area

Coal resources within the planning area are primarily found in eastern Utah, northwestern Colorado, southwestern and northeastern Wyoming, and many parts of Montana.

Wyoming has the largest federal coal program in the BLM and is the nation's largest producer of coal at 34% of national production. Most Wyoming coal is used for steam generation in the electrical utility industry. The planning area contains bituminous and sub-bituminous deposits. The Powder River Basin, which extends into northern Converse County, contains some of the largest low-sulfur coal deposits in the world. In 2022, Wyoming produced a total of 244 million short tons of coal with 237 million short tons produced from the Powder River Basin on federal and non-federal Lands (Mine Safety Health Administration 2023).

Other coal formations and fields in Wyoming with significant historic and projected coal production include Adaville, Evanston, and Frontier formations in southwest Wyoming, and the Hanna Field in southcentral Wyoming. Reserves in the Adaville Formation are estimated at 1 billion tons, and currently is being mined at Chevron Mining, Inc.'s surface mine near Kemmerer. Within the Rawlins Field Office, there are six significant coalfields containing coal resources of sub-bituminous to bituminous rank: Hanna Basin, Carbon Basin, Great Divide Basin, Rock Creek, Kindt Basin, and Little Snake River (Berryhill et al. 1950).

Colorado coal has the second highest quality (low impurity content) in the nation. Most Colorado coals are bituminous and subbituminous. The Green River Coal Region, which occupies most of Moffat County and the western portion of Routt County, is the largest coal-producing region in Colorado (Carroll 2005).

A recent USGS report determined that more than 162 billion short tons of available coal resources are within the Montana portion of the Powder River Basin with about 35 billion short tons recoverable by surface mining methods. An additional 42 billion short tons of underground coal resources are within the Montana portion of the Powder River Basin and 80 percent (34 billion short tons) are within 500 to 1,000 feet of the surface, (Haacke et al. 2012). Four mines (Absaloka, Decker, Rosebud, and Spring Creek) mine sub-bituminous coal beds within the Tongue River member of the Fort Union formation in the Montana portion of the Powder River Basin. Most of the coal mined in the planning area is shipped out of state and the remainder of the coal is burned at local power plants. A small amount of coal is trucked in state to power plants and manufacturing facilities.

Coal resources occur throughout Utah, with an estimated 15 billion tons of recoverable coal. The most important coal-bearing formation in the planning area is the Blackhawk Formation in central and eastern Utah, a lower middle unit of the Mesaverde Group. Coal beds in this formation are up to 25 feet thick, with most mined seams in the 6- to 13-foot range. The high quality coal in this formation is bituminous with a relatively high heat content and low sulfur content. The Ferron Sandstone member of the Mancos Shale in central and eastern Utah also contains coal beds. Coal in the Ferron Sandstone member is bituminous but has higher sulfur and ash contents and slightly lower heat content than coal in the Blackhawk Formation. There are significant reserves of sub-bituminous C to high-volatile A bituminous coal in the Kiaparowits Plateau Late Cretaceous Straight Cliffs Formation (USGS 2002). Much of the coal in central Utah has been extracted, and the remaining coal resources in this area are difficult to access or extract and some is of lower quality. The Dakota Formation in southern Utah contains coal beds up to 27 feet thick with subbituminous coal. These coal beds are higher in sulfur and ash contents and lower in heat content than coal mined in the Blackhawk Formation. The Carbon Population Area contains most of the coal operations in the planning area. Most mines in that area are deep underground mines, primarily in the Wasatch Plateau and Book Cliffs region.

3.10.4 Locatable Minerals

Locatable minerals are minerals for which the right to explore or develop the mineral resource on federal land is established by the location (or staking) of lode or placer mining claims and is authorized under the General Mining Law of 1872, as amended. Locatable minerals include metallic minerals such as gold, silver, copper, lead, zinc, molybdenum, uranium, and non-metallic minerals such as fluorspar, asbestos, talc, mica and lithium.

Acquisition of locatable minerals is done by staking a claim over the deposit and acquiring the necessary permits to explore or mine, or the mineral rights can be acquired by purchase. For operations other than casual use, the claimant is required to submit a Notice or a Plan of Operations. Regulations require the claimant to prevent unnecessary or undue degradation of the land. The BLM may petition the Secretary of the Interior to withdraw areas from further location of mining claims or sites. Mining claims located after the Surface Resources Act of July 23, 1955, remain open to the public for other multiple uses which do not materially interfere with exploration, mining, and reasonably incident activities.

Existing Conditions in the Planning Area

Locatable mineral exploration and production occurs throughout the planning area. Locatable minerals found in the planning area are listed in **Table 3-13** (**Appendix 9**). Because locatable minerals are governed under the requirements of the Mining Law of 1872, as amended the BLM has limited information regarding the existing conditions of locatable mineral development. Many locatable mineral prospecting and exploration activities fall under the definition of casual use and thus can occur without notifying the BLM, Required filings of claims, notices of intent or plans of operations do not require the identification of the particular locatable minerals being sought or developed. There is also no requirement to report the locatable mineral commodities produced or amounts produced each year. As a result, information regarding the existing conditions of locatable minerals in the planning area is not available.

3.10.5 Mineral (Salable) Materials

Salable minerals, also referred to as mineral materials, include common construction materials and aggregates, such as, sand, gravel, limestone aggregate, building stone, cinders, moss-covered rock (moss rock), roadbed, decorative rock, clay, and ballast material. The Materials Act of 1947, as amended (61 Stat. 681) authorizes disposal of mineral materials on BLM-administered lands through a sales system, and provides for free use of material by government agencies, municipalities or nonprofit organizations, if the material is not used for commercial purposes. Permitting removal or extraction (i.e., disposal) of mineral materials on BLM-administered lands is a discretionary activity. An operator and permittee may request use of mineral materials, but the BLM has no obligation to provide mineral materials for commercial and free use operations. The BLM will not authorize the disposal of mineral materials if it is determined that the damage to BLM-administered lands and resources would exceed the public benefits expected from the proposed disposal; nor will the BLM dispose of mineral materials from areas identified in Land Use Plans as not appropriate for mineral materials disposal (43 CFR Parts 3601.11 and 3601.12).

Sand and gravel is an extremely important resource and its extraction varies directly with the amount of development nearby – road building and maintenance, and urban development. The proximity of both transportation and markets are key elements in the development of a deposit. Future demand for mineral materials will vary depending upon market conditions, which differ according to economic conditions and construction activity. One major driver of construction activity is road and well pad construction for oil and gas exploration and development and residential and commercial construction projects. As new oil and gas development continues to occur, it is expected that mineral materials activity will continue.

Community pits are sites established by governmental agencies for the public to acquire mineral materials through sales contracts. Local government agencies and nonprofit organizations may obtain these materials free of cost for community purposes. County and State Road construction divisions are the significant users of gravel and sand resources through free use permits. A negotiated sale is an exclusive site proposed by a single party, often commercial, and the party must pay for the BLM to process the permit.

The number of sales out of a community pit varies by site, from less than one to more than 50 per year. Most of these sales are for less than one ton. Free Use Permit sites are used sporadically and may be scattered throughout a field office or district office, to reduce hauling costs. A pit may be inactive for several years before it is needed for a road project in the area.

A gravel pit is initially developed by scraping off the vegetation and topsoil, which is then stockpiled for future reclamation. Most gravel pits are 5 to 15 acres in size. No infrastructure other than an access road is generally needed for mineral materials disposals. Most mineral material removal activity occurs during the summer months and during daylight hours.

Existing Conditions in the Planning Area

Mineral materials are the largest single mineral resource present across all the states with the largest potential for development. The volume of material sold and used varies by state. Specific closures of areas to salable mineral materials, such as ACECs or crucial or essential wildlife habitat, exist throughout much of the planning area. Some Land Use Plans apply use and development restrictions in terms of seasonal timing limitations to protect GRSG habitat and leks, similar to oil and gas leasing; however, this is not consistent across the planning area. Many of the LUPs in the planning area encourage the use of existing disposal sites until the material is depleted.

3.10.6 Oil Shale and Tar Sands

Oil shale is an organic-rich sedimentary rock consisting of calcareous shale with a large amount of organic material consisting of shale with a large amount of mixed organic compounds known as kerogen. Kerogen may be converted to oil through destructive distillation and exposure to heat. The US holds more than half the world's oil shale, with the largest deposits located in the Green River Formation in Colorado, Utah, and Wyoming. The Mineral Leasing Act of 1920, as amended, authorizes the leasing of federal lands for the development of oil shale and tar sands and the Energy Policy Act of 2005 authorizes the BLM to accelerate development of oil shale and tar sands in those states. Pursuant to Section 369 of that Act, the BLM issued a Final PEIS in 2008 amending 10 RMPs in Utah, Colorado, and Wyoming to make approximately 2 million acres of public lands potentially available for commercial oil shale leasing and development and 430,000 acres potentially available for tar sands leasing and development. Because of litigation, the BLM released another Final PEIS/Proposed RMP Amendment in November 2012 and accompanying ROD in March 2013. The ROD reduced the areas available in Utah, Colorado, and Wyoming for potential development of federal oil shale and tar sands to approximately 800,000 acres. Areas open to oil shale leasing are for research, development, and demonstration leases only. The BLM would issue a commercial lease when the lessee satisfies the conditions of its research, development, and demonstration leases and applicable regulations. Preference right acreage in addition to the research, development, and demonstration lease acreage may be included in the commercial lease if specified. The Oil Shale and Tar Sands ROD removed federal mineral estate within all GRSG HMAs in Utah from potential oil shale and tar sands leasing, subject to valid existing rights.

Existing Conditions in the Planning Area

The most prospective oil shale deposits in the US are within the Green River Formation in the greater Green River Basin (including Fossil Basin and Washakie Basin) in southwestern Wyoming and northwestern Colorado, the Piceance Basin in northwestern Colorado, and the Uinta Basin in northeastern Utah (BLM 2013a). The resource potential of these shales is estimated to be the equivalent of 1.5 to 1.8 trillion barrels of oil in place (Bartis et al. 2005). Although resource potential within the Piceance Basin totals approximately 1.2 trillion barrels of oil in place, only part of it can be recovered depending accessibility of the oil shale for development and method of mining used (Taylor 1987). The Green River Basin, which covers a large area in southwest Wyoming, northwest Colorado, and northeast Utah, contains an estimated 244 billion barrels of shale oil in the Tipton Shale Member, Wilkins Peak Member, and Laney Member of the Green River Formation. Oil shale occurs throughout most of the Green River Basin and in thin beds (less than 4 feet thick) in Fossil basin. The beds in the upper part of the Tipton Shale are up to 75 feet thick and yield up to 24 gallons of oil per ton. Other important oil shale beds in the Wilkins Peak Member and the Laney Member are slightly to the east of the southeast border of the Kemmerer Field Office.

Oil shale areas of interest in southwestern Wyoming lie within the Green River and Washakie Basins. These areas are presently withdrawn from locatable mineral entry to protect the oil shale resource. Although the oil shales within these basins are of lesser quality than Colorado oil shales some of these contain several trillion barrels of oil per square mile (Trudell et al. 1973). The Green River and Washakie Basins contain approximately 476 billion barrels of in-place oil within the shale. These oil shale deposits have not been leased, nor have they received major attention from industry, primarily due to high development costs of underground and surface mining methods. Several in-situ research projects and tests conducted west of Rock Springs more than 30 years ago suggested marginal results for extraction of this mineral resource. Final federal regulations governing oil shale leasing and development were published in the Federal Register on November 18, 2008 (43 CFR Parts 3900, 3910, 3920, and 3930). There are currently no federal oil shale leases in the Green River and the Washakie Basins. There are no expressions of industry interest to explore for or to develop oil shale resources in this area.

3.11 ACECs and RNAs

Areas managed under Special Designations are regulatory or congressionally mandated and are designed to protect or preserve certain resource qualities or uses. Only ACECs and RNAs are included for analyses in this effort - other designated areas were not carried forward. FLPMA mandates prioritizing designation and protection of ACECs in the development and revision of land use plans (43 USC 1712(c)(3)). Specific regulations governing this process are outlined in 43 CFR Part 1610.7-2(b). These regulations ensure careful consideration and prioritization of environmental concerns during land use planning and management. Regulatory mandates for ACECs do not necessarily correspond to special designations imposed by the President or Congress. The Special Designations within the planning area include ACEC and Resource Natural Areas (RNAs) and are specific to GRSG.

3.11.1 Greater Sage-Grouse ACECs

An ACEC is defined in the FLPMA, Section 103(a), as an area on BLM-administered lands where special management attention is required to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes, or to protect life and ensure safety from natural hazards. BLM regulations for implementing the ACEC provisions of the FLPMA are found in 43 CFR Part 1610.7-2(b). In addition, ACEC Interim Guidance (*Clarification and Interim Guidance for Consideration of Areas of Critical Environmental Concern Designations in Resource Management Plans and Amendments, IM-2023-013*) highlights the need for evaluation of relevant values contributing to landscape intactness, climate resiliency, habitat connectivity, and opportunities for conservation or restoration within ACECs.

ACECs differ from some other special management designations as the designation does not automatically prohibit or restrict other uses in the area. The special management attention is designed specifically for the relevant and important values and, therefore, varies from area to area. Restrictions of an ACEC designation are determined at the time of designation is made and are designed to protect the values or serve the purposes for which the designation was made. The BLM identifies goals, standards, and objectives for each proposed ACEC and general management practices and uses, including necessary constraints and mitigation measures (ACEC Interim Guidance, IM-2023-013). In addition, ACECs are protected by the provisions of 43 CFR Part 3809.11(c), which requires an approved plan of operations for activities resulting in more than five acres of disturbance under the mining laws. However, regulations and requirements may vary based on specific locations and jurisdictions. While a plan of operations is generally required for mining activities, certain activities, such as casual use or small-scale exploration, may have different regulations and thresholds.

For this planning effort the assumption is managing to protect GRSG would be compatible with other designated and overlapping ACECs managed to protect other relevant and important values. Guidance in BLM Manual 1613, Areas of Critical Environmental Concern, informs the public has an opportunity to submit nominations or recommendations for areas to be considered for designation. Nominations may be made at any time and must receive a preliminary evaluation to determine whether they meet relevance and importance criteria to warrant further consideration. Within a planning process, the BLM solicits requests for nominations with the Notice of Intent and then analyzes any nomination for relevance and importance. Any ACECs that meet at least one relevance criteria and at least one importance criteria must be brought forward for consideration in at least one alternative.

Existing Conditions

Within the planning area, several portions of both existing ACECs and nominated ACECs overlap mapped occupied GRSG habitat. The BLM also called for and received nominations for ACECs to protect GRSG. A BLM interdisciplinary team reviewed nominations during scoping to determine which areas met the relevance and importance criteria, as defined by 43 CFR Part 1610.7-2(a)(1) and 43 CFR Part 1610.7-2(a)(2), and guidance in BLM Manual 1613, Areas of Critical Environmental Concern. This process identified potential candidates for designation to protect GRSG habitat. Detailed information on each state's ACEC review process and determinations can be found in the respective state's 2015 GRSG EIS process.

None of the existing ACECs were identified as potential candidates for designation solely for the purpose of protecting GRSG habitat. In Oregon, however, there are two ACECs, High Lakes ACEC and Red Knoll ACEC, in GRSG habitat where the relevant and important values specifically identified GRSG and GRSG plant communities. Together, these cover over 50,000 acres of GRSG habitat. GRSG and GRSG plant communities are commonly considered in relevant and important values screenings.

3.11.2 Research Natural Areas (Oregon Only)

RNAs are a unique type of ACEC created to preserve examples of all significant natural ecosystems for comparison with those influenced by humans, provide educational and nondestructive research for ecological and environmental studies, and preserve gene pools of typical and endangered plants and animals. RNAs are areas that are part of a national network of reserved areas under various ownerships that contain important ecological and scientific values and are managed for minimum human disturbance. RNAs are intended to represent the full array of North American ecosystems with their biological communities, habitats, natural phenomena, and geological and hydrological formations, and provide an essential network of diverse habitat types that will be preserved in their natural state for future generations. Under certain circumstances, deliberate manipulation may be used to maintain the unique features for which the RNA was established. RNAs in the planning area have important biological or physical attributes that are identified and designated in cooperation with the Pacific Northwest RNA Committee (Forest Service, BLM, and Washington and Oregon) following the Oregon Natural Areas plan (Oregon Natural Heritage Advisory Council 2010). Under current BLM policy, research natural areas must meet the relevance and importance criteria of ACECs and are therefore designated as ACECs. Under current guidelines, ACEC procedures also are used to designate outstanding natural areas.

One of the guiding principles in managing RNAs is to prevent unnatural encroachments or activities that directly or indirectly modify ecological processes or conditions. Permitted activities that could impair scientific or education values of the RNAs (e.g., energy development, logging, road building, livestock grazing, and recreation) are generally limited, restricted, or not allowed. These areas can be used for long-term baseline plant community monitoring; they are areas where few management activities have influenced the plant community for which the RNA was established. While management practices necessary to maintain or restore ecosystems may be allowed and perhaps are necessary to sustain values, such as invasive plant control, it is crucial to align these practices with the overall goals and considerations outlined in the alternatives. Notably, certain alternatives may incorporate specific language allowing juniper treatment, and any allowance or necessity for such practices should be consistent with the chosen alternative and its objectives.

Existing Conditions

In Oregon, there are thirteen RNAs with important GRSG conservation values. All thirteen RNAs were designated in the underlying district RMPs and were labeled as key RNAs in the 2015 GRSG ARMPA. Five of the existing RNAs included GRSG and GRSG habitat relevance and importance values prior to the 2015 GRSG ARMPA. Two of the RNAs (Foster Flats and Guano Creek-Sink Lakes) were closed to livestock grazing prior to the 2015 GRSG ARMPA. Neither the 2015 nor 2019 GRSG plan amendments changed management or decisions on these RNAs. See **Table 3-14** (**Appendix 9**). The 2015 GRSG ARMPA made all or portions of the other key RNAs unavailable to livestock grazing. BLM Oregon districts with key RNAs have closed some portions of them through the required grazing regulations and NEPA processes, as indicated in **Table 2-26**. The 2015 GRSG Final Environmental Impact Statement estimated that approximately 21,957 acres in these key RNAs would be unavailable to livestock grazing. During the 2019 GRSG amendment process that number was corrected to 21, 959 acres. **Tables 3-15 and 3-16** (**Appendix 9**) show the vegetation types by the key RNAs.

3.12 SOCIAL AND ECONOMIC CONDITIONS (INCLUDING ENVIRONMENTAL JUSTICE)

This section includes a summary of social and economic conditions, including identified environmental justice communities, and provides a discussion on updates and changes to key social and economic factors for the relevant states and counties, including population, employment, and income data and trends. Detailed information is included in **Appendix 13**, Socioeconomic Baseline Report. Updated information is also provided for BLM resources, including an overview of nonmarket values pulling from the 2015 discussion with updates from more recent literature. In addition, screening of environmental justice populations at the county level throughout the planning area has been updated based on 2022 BLM guidance (BLM 2022a). The economic data presented in this discussion include annual averages for the most recent reporting periods. These include the widespread economic effects of the recession brought about by the 2020 global COVID-19 pandemic, which might have impacted local and regional economies through short-term reductions in employment and industry output. Effects may be ongoing and may not be evenly distributed across industries.

The planning area includes portions of California, Colorado, Idaho, Montana, Nevada, North Dakota, Oregon, South Dakota, Utah, and Wyoming, regardless of jurisdiction. Due to the nature of social, economic, and environmental justice conditions, the analyses use a different study area than is used for other resources. Socioeconomic analysis areas and environmental justice analysis areas have been determined for each state to include counties that contain GRSG habitat on BLM-administered lands or minerals and within which social and economic conditions might reasonably be expected to change based on alternative management actions. An overview of counties included in each state analysis area is included in **Appendix 13**.

3.12.1 Baseline Demographic and Economic Conditions

Historical and projected population growth are important socioeconomic indicators because they aid in estimating future demand for public lands and potential shifts in demand for various land uses. They also provide context for how land use planning changes could affect the local population, further informing associated economic analyses. Appendix 13 provides an overview of population changes since 2010 and provides a summary of economic data, including trends and current conditions for per capita income and unemployment. The unemployment rate is a key indicator measuring the percentage of unemployed people to the number of people in the labor force, and is often used as an indicator of economic health and conditions. A high unemployment rate is a concern for the general economy and likely indicates that many individuals in the labor force are unable to find employment, which could lead to economic distress (Bondarenko 2024). Changes in the unemployment rate from year to year provide a good picture of the relative health of the economy over time. Appendix 13 also identifies and describes major economic sectors in the socioeconomic study area that can be affected by public land management actions. Economic activities that rely on or could rely on BLM-administered lands, such as livestock grazing or energy development, are the most likely affected. Differences in major sectors since the publication of the 2015 Sage-Grouse Plan Amendment EISs are highlighted below; for all other sectors, please refer to the respective 2015 Sage-Grouse Plan Amendment EIS.

3.12.2 BLM Land and Resource Use Revenue

Details are provided below for revenue and economic contributions associated with BLM lands and resources in the analysis area. Additional details for current and historic levels of resource use are included in the respective resource sections of this document.

Leasable Minerals

Fluid Minerals (Oil and Gas)

Oil and gas extraction is important for supporting the local economies in many communities in the analysis area, especially where a large percentage of employment comes from the fluid mineral industry on federal lands. These areas include northwestern Colorado, southeastern Idaho, southeastern Montana, northeastern Nevada, southwestern North Dakota, central to eastern Utah, and northeastern and southwestern Wyoming. Oil and gas extraction provides funding outside these areas for public services through royalties and taxes distributed to the states where the extraction occurred. The government collects revenues from leasable mineral extraction on public lands through bonuses, royalties, and rents paid by producers which are subsequently distributed to the federal and state government. The Department of the Interior, through the Office of Natural Resources Revenue (ONRR), collects a set percentage of the sales value of federal leasable minerals; this is known as a royalty.

Wyoming had the highest disbursement from oil and gas extractions, in 2022, with about $615 million. From 2018 to 2019, oil and gas disbursements made to the states increased in California, Colorado, Montana, North Dakota, and Wyoming, but decreased in Idaho, Nevada, South Dakota, and Utah. From 2019 to 2021, oil and gas disbursements declined for all states in the planning area. In 2022, disbursements increased and returned to 2019 levels or higher; however, disbursements in 2022 were lower than 2018 levels in Idaho, Nevada, and South Dakota.

Over the 5-year time period, Wyoming and North Dakota saw the largest magnitude increase in oil and gas disbursements, with an increase of about $260 million and $117 million, respectively. Nevada and South Dakota saw the largest magnitude decrease in disbursements of about $123,000 and $98,000, respectively. These decreases in disbursements could impact the local economies and public services such as education. If oil and gas disbursements continue to decline in Nevada and South Dakota, public services that are funded through oil and gas disbursements could be impacted.

See **Appendix 13**, Socioeconomic Baseline Report, and **Section 3.10**, Mineral Resources, for more information on current conditions of fluid mineral extraction and disbursements.

Coal Mines and Production

Although coal accounts for a small percentage of total economic contributions and employment in local communities, jobs associated with coal mining tend to be high paying compared with other types of employment in rural communities. All states, except North Dakota, saw a decline in coal production from 2018 to 2022, with the largest percentage decline occurring in Colorado (with a reduction in production of about 77.9 percent over the 5-year period). This reduction of coal production was observed globally and was largely driven by the reduction in natural gas prices that increased the demand for natural gas and reduced the demand for coal (EIA 2021).[2]

Due to the reduction in demand for coal-fired generation, many economies throughout the socioeconomic analysis area could face significant financial impacts from loss of the associated coal mining jobs and tax revenue in the next decade. For example, Moffatt County, Colorado, received over $12 million in ad valorem taxes in 2018 from coal power plants and mines in the county (Mesa University, undated). In Wyoming, continued revenue decreases from coal production have spurred the review of funding mechanisms for state school systems and education services (Wyoming Legislative Service Office 2022; Wyoming Consensus Revenue Estimating Group 2023).

All states in the planning area, except Montana and Utah, had stagnant disbursements from coal extraction over the last 5 years. Utah experienced a decline in disbursements of about 48 percent. Montana had a decline in disbursements from 2018 to 2021, but then disbursements increased from 2021 to 2022. See **Appendix 13**, Socioeconomic Baseline Report, and **Section 3.10**, Mineral Resources, for more information on current conditions of coal extraction and disbursements.

[2] Coal and natural gas are substitute goods and compete for the same demand for energy (Abraham 2018). This means that when the demand for one energy source increases (due to factors such as a decrease in price), the demand for the other energy source decreases.

Nonenergy Mineral Extraction

Similar to oil, gas, and coal, the government collects revenue from nonenergy minerals. The BLM determines and discloses the royalty rate for nonenergy minerals before the lease is offered; the minimum royalty rates are 5 percent of gross value of output for phosphate and sulfur and 2 percent of quantity or gross value of output for sodium and potassium, and 25 cents per ton for asphalt. Gilsonite and hard-rock minerals have no minimum royalty rate. A portion of the revenues collected by the government are disbursed to the states, and the states allocate a portion of the disbursements to counties, local governments, municipalities, and school districts. Wyoming had the highest disbursement from nonenergy mineral extractions, in 2022, with about $8.4 million (all of which came from sodium-based minerals such as trona). However, these disbursements in Wyoming declined from 2019 to 2022 by over $7.7 million, which was the largest decline in magnitude across the planning area. All states, except Idaho and Utah, had either a decline in disbursements or stagnation in disbursements over the 2019–2022 period. Idaho has large deposits of phosphate, and disbursements to Idaho over the last five years ranged from about $3.5 million in 2019 to $5.1 million in 2022. Disbursements to Idaho decreased from 2018 to 2019 but increased from 2019 to 2022, which raised the disbursements above 2018 levels by $863,000. Utah disbursements, which are largely from potassium and gilsonite, fluctuated between a low of about $739,000 in 2018 and a high of about $1.4 million in 2019. In addition to the public services that nonenergy leasable minerals help support, nonenergy leasable mining jobs tend to be some of the highest paying jobs in rural communities, especially in Idaho.

California receives disbursements for nonenergy minerals produced in the state. However, minerals are extracted outside the California socioeconomic analysis area so changes in BLM management decision on GRSG HMAs would likely not impact disbursements for nonenergy minerals in California.

See **Appendix 13**, Socioeconomic Baseline Report, and **Section 3.10**, Mineral Resources, for more information on current conditions of nonenergy mineral extraction and disbursements.

Locatable Minerals

The value of minerals and their contribution to local and regional economies vary based on market conditions and volume extracted. Within the planning area, all the states, except South Dakota and North Dakota, impose taxes on locatable hard-rock mining activities. The taxes in most states are collected regardless of landownership. The type of taxes and amount collected vary across states; however, the distributions of the taxes are important in supporting public services and infrastructure by providing funds for schools; local counties, cities, and towns; highways and road construction; and water infrastructure (State of Wyoming Legislature 2021). In addition to the public services supported by locatable minerals, hard-rock mining jobs tend to be some of the highest paying jobs in rural communities, especially in Nevada.

See **Appendix 13**, Socioeconomic Baseline Report, and **Section 3.10**, Mineral Resources, for more information on current conditions of locatable minerals on federal land.

Mineral Materials

Because mineral materials generally do not represent scare commodities, they can be found throughout the analysis areas, on and off GRSG HMAs. Sand and gravel, used often as construction aggregate, are an extremely important resource and extraction directly with the amount of development—road building and maintenance, and urban development—nearby. The proximity of both transportation and markets are key elements in the potential for deposits to be developed, even more so than for other types of mineral deposits (Burgex Mining Consultants 2023).

Future demand for mineral materials will vary depending on market conditions, which differ according to economic conditions and construction activity. One major driver of construction activity is road and well pad construction for oil and gas exploration and development and residential and commercial construction projects. As new oil and gas development continues to occur, it is expected that mineral materials activity will continue. Another driver is to improve road access for wildfire suppression activities. The construction, maintenance, and effectiveness of fuel breaks can be impacted by availability of mineral material pits.

Community pits are sites established by governmental agencies for the public to acquire mineral materials through sales contracts. Local government agencies and nonprofit organizations may obtain these materials free of cost for community purposes. County and state road construction divisions are the significant users of gravel and sand resources. A negotiated sale is an exclusive site proposed by a single party, often commercial, as the party must pay for the BLM to process the permit. The number of sales out of a community pit varies by site, from less than one to more than 50 per year. Most sales are for less than 1 ton. Free-use permit sites are used sporadically and may be scattered throughout a field office (FO) or district office. A pit may be inactive for several years before it is needed for a road project in the area.

See **Appendix 13**, Socioeconomic Baseline Report, and **Section 3.10**, Mineral Resources, for more information on current conditions of mineral materials on federal land.

Renewable Energy

Geothermal Energy

Industry surveys show geothermal power plants employ about 0.74–1.17 people per MW to maintain and operate a facility; an additional 0.96 secondary jobs per MW are generated for every power plant built. Additionally, there are temporary jobs in the manufacturing and construction sectors created by the construction of new power plants. Over the 17–33 months in which an average plant is constructed, about 3.1 people per MW of full-time employment are needed to construct the plant, and 3.3 people per MW are needed to manufacture the plant equipment (Geothermal Energy Association 2015).

See **Appendix 13**, Socioeconomic Baseline Report, and **Section 3.10**, Mineral Resources, for more information on current conditions of geothermal production and disbursements.

Wind and Solar

As of 2021, five wind projects were operating on public lands in the analysis area (in Nevada, Oregon, Utah, and Wyoming), and one project (in Wyoming) was pending construction (BLM 2021). As of 2022, there were only two solar projects operating on public lands in the analysis area (in Nevada and Wyoming), and one project (in Utah) was pending construction (BLM 2022).

See **Appendix 13**, Socioeconomic Baseline Report, and **Section 3.8**, Lands and Realty (Including Renewable Energy), for more information on current conditions of wind and solar on federal land.

Livestock Grazing

The BLM-administered lands and other public and private lands support values to the local economies across the socioeconomic study area by providing forage to permitted ranchers at a price below that of private land forage or purchased feed. Seasonal use of public land forage can offset higher feed cost incurred at other times of the year and lower overall input costs associated with producing livestock for market. These animals can make up a significant portion of farm sales and provide food to the ranchers, their families, and the surrounding communities. Grazing fees paid by ranchers under their federal grazing permits also generate revenue which is returned to the states or counties where the fees were generated. Under the Taylor

Grazing Act, a portion of BLM grazing revenue is returned to the county of origin; 50 percent of Section 15[3] fees collected are returned to counties, and 12.5 percent of Section 3[4] fees are returned to counties. Grazing revenue and the disbursement that is returned to the county vary by county and may have a higher level of importance at the local level for some communities. In addition, the lands provide value through the social and cultural connections between public land grazing and ranching lifestyles in the analysis areas.

For the purposes of examining how the BLM-management decisions in this effort will affect different ranches in the analysis area, a discussion on the different types of ranches in the analysis area is provided. The USDA Economic Research Service developed a classification, or "typology", of farms and ranches based on annual gross cash farm income (the farm's revenue prior to deducting expenses), primary occupation of the operator, and ownership of the farm or ranch. Ranches are broadly categorized into family and non-family ranches based on whether the majority of the ranch business is owned by the primary operator and relatives of the primary operator (non-family ranches are those where the operator and individuals who are related to the operator do not own a majority of the business). Family ranches are further categorized by size and primary occupation of the operator as described below (USDA Economic Research Service 2024):

- Small family ranches are those that have gross cash farm income of less than $350,000 per year. These ranches are broken into four types based on the primary occupation of the operator and size of the farm: retirement ranches (where the operators are retired but continue to ranch on a small scale), off-ranch primary occupation (where the operators report a primary occupation other than farming or ranching), ranch primary occupation with low sales (where the operators report that farming or ranching is their primary occupation and the gross cash farm income of their ranch is less than $150,000), and ranch primary occupation with moderate sales (where the operators report that farming or ranching is their primary occupation and the gross cash farm income of their ranch is at least $150,000 but less than $350,000).
- Midsize family ranches are those that have gross cash farm income of at least $350,000 but less than $1 million.
- Large family ranches are those that have gross cash farm income of at least $1 million but less than $5 million.
- Very large family ranches are those that have gross cash farm income of at least $5 million.

The BLM-management decisions that impact livestock grazing would likely have a greater effect on small family ranches where ranching is the primary occupation than other types of ranches. This is because small family ranches where ranching is the primary occupation rely more heavily on income from their livestock than small family ranches with other sources of income and they tend to have less flexibility and resources to operate on smaller margins or modify business practices based on the BLM-management decisions than ranches with higher sales or supplemental forms of income (for example, they have less ability to absorb higher costs, if ranching costs were to increase). See **Appendix 13**, Socioeconomic Baseline Report, and **Section 3.8**, Livestock Grazing, for more information on current conditions of livestock grazing on BLM land.

[3] Section 15 lands are public lands that lie outside a grazing district administered by the BLM under Section 15 of the Taylor Grazing Act. The BLM authorizes livestock grazing on these lands by issuing leases to private parties.
[4] Section 3 of the Taylor Grazing Act concerns grazing permits issued on BLM-administered lands within the grazing districts established under the act. It gave leasing preference to landowners and homesteaders in or adjacent to the grazing district lands.

Wild Horse and Burros

In the planning area, there are approximately 15 million acres of wild horse and burro WHB HMAs. The BLM administers 168 WHB HMAs within California, Colorado, Idaho, Montana, Nevada, Oregon, Utah, and Wyoming. Current conditions within the planning area show that wild horse populations continue to grow, often exceeding AMLs. As wild horse and burro populations exceed AMLs, wild horses and burros can be causal factors for failing to meet applicable standards.

Wild horses are often termed "living symbols of the historic and pioneer spirit of the West." (16 U.S.C. § 1331). As such, some stakeholders place a social value on horses related to this symbolism. Wild horses may also hold value for some due to an emotional connection related to the long history of human-horse interactions throughout civilization (Scasta et al. 2018)

Concerns over increasing wild horse and burro populations and program costs have prompted discussions, studies, and proposals. The BLM uses wild horse and burro funding for a variety of activities, including off-range holding activities, gathers, and other activities. For fiscal year 2021, expenditures totaled an estimated $122.2 million (CRS 2022).

See **Appendix 13**, Socioeconomic Baseline Report, and **Section 3.7**, Wild Horses and Burros, for more information on current conditions of wild horses and burros management and social values associated with wild horses and burros on BLM land.

Public Finances

State and local governments collect a variety of revenues related to the use of natural resources. Many western states and local governments are heavily dependent upon these mineral revenues for a significant portion of their annual budgets and rely on dollars generated from mineral development to fund schools, roads, and other public services. These revenues could be indirectly impacted by BLM management decisions on GRSG HMAs, if the decisions affect the level of use of natural resources. The following is a description of major sources of revenue and the potential link to BLM resources and resource uses.

Tax revenue at the state level is collected from various sources, including the following:

- State business income taxes and personal income taxes on employee earnings are collected for earnings on employment and industries in certain states (there is no state income tax in Wyoming).
- Severance tax is imposed on nonrenewable natural resources that are removed from the earth. Natural resources that are subject to severance taxation include metallic minerals, molybdenum, oil and gas, oil shale, and coal. Rates of taxation vary by mineral resource and state (see **Appendix 13**, Socioeconomic Baseline Report, for more information on the severance tax, including severance tax rates on oil and gas production for each state in the planning area).
- State sales tax is imposed on purchases directly or indirectly associated with BLM-administered lands and resource uses (for example, purchases of household goods by livestock operators on BLM-administered lands).
- Other state revenue sources include sources such as State Conservation Fees or Wyoming's Impact Assistance Tax Program, which require developers on public lands to pay impact assistance payments as warranted by the application/plan of development approval (State of Wyoming 2021).

Tax rates can vary widely across local taxing entities within a state, and a county often includes many different taxing entities (e.g., counties, school districts, municipalities, special districts). At the local level, taxes that can be impacted by BLM-administered land uses include the following:

- Local sales tax is imposed at a variable rate based on jurisdiction. It is imposed on purchases directly or indirectly associated with BLM-administered lands and resource uses.
- Ad valorem and other property taxes, which are determined based on local mill levy rates, property valuations, and the gross value of minerals produced within their jurisdiction (including federal minerals located within their jurisdiction).

PILTs are federal payments to local governments that help offset losses in property taxes due to nontaxable federal lands within their boundaries.[5] PILTs are not guaranteed and are subject to annual congressional budget appropriations. PILTs are transferred to county or local governments, as applicable, and are in addition to other federal payments, including those from grazing fees. Counties in the Utah analysis area received about $38.2 million in PILTs in 2023 for nearly 27.9 million acres of federal lands. About 70.5 percent of the federal land in the Utah analysis area was BLM-administered land. After applying the calculated payment per acre of federal land for each county to the BLM acres, the estimated BLM-related portion of PILT revenue in the Utah analysis area was about $24.7 million. This was the highest BLM-related portion of PILT revenue to counties across all states in the analysis areas.

3.12.3 Social Setting and Nonmarket Values

Social Conditions and Community Interests

The 10-state planning area encompasses a diverse landscape of social conditions, including both rural and urban populations. The socioeconomic analysis areas for each state where GRSG HMAs are located tend to be more rural; however, attitudes, beliefs, values, opinions, and perceptions about BLM-managed public resources and effects of policies and actions can vary substantially across social and geographic groups around and associated with the socioeconomic analysis area. These views and beliefs of residents, visitors, commercial users, traditional or subsistence users, Tribes, and interest-based or place-based groups reflect different cultural and economic linkages people have with BLM-administered lands. Those with common interests can typically be defined by communities of place or communities of interest, or both. Discussion of communities of place and communities of interest is included in **Appendix 13**.[6]

Nonmarket Values

BLM-administered lands provide a range of goods and services that benefit society in a variety of ways. Some of these goods and services, such as solid and fluid minerals, are bought and sold in markets and have a readily observed market value. Others have a less clear connection to market activity, even though they provide society benefits. In some cases, goods and services have both market and nonmarket values. This section provides an overview of several nonmarket values associated with GRSG management.

For the purposes of this effort, the BLM defines "value" as the combination of all benefits that people receive from BLM-managed lands and resources. Total value is the sum of market value from economic activities

[5] Public Law 94-565, dated October 20, 1976, was rewritten and amended by Public Law 97-258 on September 13, 1982, and was codified at 31 US Code 69. The law recognizes that local governments' inability to collect property taxes on federally owned land can create a financial impact. PILTs are in place to help mitigate the financial impact. See Public Law 94-565 and Public Law 97-258 for more details on limits and appropriations.

[6] Additional information on social characteristics of counties in Nevada can be found in the county-level socioeconomic baseline reports published by the Nevada Economic Assessment Project, accessed here: https://extension.unr.edu/neap/about-neap-program.aspx.

and nonmarket value. However, nonmarket values, in the discussion below, are not directly comparable to the previous sections that describe various resource uses and revenue on BLM-administered lands. The market indicators discussed above describe the effects on economic (market) activity in the region, and the market values of many of the activities are monetized. However, nonmarket values tend to differ across groups and individuals based on preferences, creating challenges with monetizing nonmarket values. Therefore, nonmarket values are discussed qualitatively.

The nonmarket values associated with GRSG management on BLM-administered lands include both use (direct and indirect) and nonuse values (such as existence values and bequest values held by the general public from self-sustaining populations of GRSG; BLM 2013b). Nonmarket values associated with GRSG and GRSG habitat can also be viewed through the lenses of ecosystem services. Ecosystem services, or the benefits that people receive from nature, are commonly classified within four major categories: regulating, provisioning, cultural, and supporting (Millennium Ecosystem Assessment 2005). Sagebrush environments, which support GRSG populations, provide numerous ecosystem services, such as providing services associated with food products from livestock production; hunting; other recreational opportunities; and the provision of water for municipal, industrial, and irrigation uses. In addition, intact sagebrush ecosystems reduce wildfire return intervals and host many species of wildlife, including game animals and other sensitive, threatened, and endangered species. Healthy sagebrush ecosystems sequester carbon, which can be enhanced through conservation efforts on public lands (Bennett and Pierce 2020). Additional details are included in **Appendix 13**.

People also receive intrinsic benefits from nature that are diverse in inspiration but consistently highly valued. These include benefits from seeing or knowing a flourishing, biodiverse sagebrush ecosystem exists; benefits from feeling secure such habitats will exist for the enjoyment and health of future friends and family members; or benefits from preserving ancestral/heritage/cultural connections established through sagebrush ecosystems and the GRSG species. Comparatively, there are others whose non-market values associated with public lands, including intrinsic and bequest values, are threatened by land use restrictions associated with GRSG HMAs.

3.12.4 Environmental Justice

Environmental justice embodies the principle of fair treatment and meaningful involvement for all individuals, regardless of their race, color, national origin, or income, in relation to the formulation, execution, and enforcement of environmental laws, regulations, and policies. It underscores the essential concept that no specific group, whether defined by race, ethnicity, or socioeconomic status, should disproportionately bear the adverse environmental impacts arising from industrial, municipal, or commercial activities, or the implementation of federal, state, local, and tribal programs and policies (BLM 2005).

Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (1994), mandates federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations in the United States. The EO mandates that each federal agency "make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations" (59 *Federal Register* 7629 [1994]). EO 14096, Revitalizing Our Nation's Commitment to Environmental Justice for All, enacted on April 21, 2023, complements EO 12898.

Furthermore, the BLM Land Use Planning Handbook (BLM 2005) and Instruction Memorandum 2022-059, reinforces the BLM's dedication to environmental justice. This commitment is evident in providing substantial opportunities for low-income, minority, and American Indian and Alaska Native populations to meaningfully participate and considering these populations when developing mitigation measures. Details of the Environmental Justice Screening Criteria and results, including maps and tables of identified communities are included in **Appendix 13**.

Identified populations that met the criteria for further consideration as environmental justice communities are:

- Both counties included in the California analysis area
- Seven of the eight counties in the Colorado analysis area
- In the Idaho analysis area, 25 of the 27 counties
- In the Montana analysis area, 18 of the 26 counties
- The entire Nevada analysis area
- No county in the North Dakota analysis area
- Seven of the eight counties in the Oregon analysis area
- In South Dakota's analysis area, Butte County
- Across the Utah analysis area, 18 of the 23 counties
- In the Wyoming analysis area, 15 of the 21 counties

The findings of areas containing environmental justice populations in the analysis areas for each state were instrumental in evaluating potential disparities in the impacts of various alternatives on minority, low-income, and American Indian and Alaska Native populations. Because counties were identified as containing environmental justice populations, as discussed above, the BLM management decisions on GRSG HMAs could impact environmental justice populations disproportionately.

Environmental Justice Issues of Concern

In 2012, the BLM and the Forest Service conducted an economic strategies workshop to identify public concerns related to potential social, economic, and environmental justice impacts resulting from management alternatives. Additionally, the BLM reviewed the scoping report for the current EIS to identify comments related to environmental justice issues. The BLM also had government-to-government consultation and outreach with Native American Tribes (BLM and Forest Service 2012; BLM 2013d; see Section 5.2.1 of the 2024 Greater Sage-Grouse Draft Resource Management Plan Amendment and Final Environmental Impact Statement for more details on tribal consultation for this effort).

A key issue relating to environmental justice populations for many states, including California, Nevada, Colorado, Idaho, Montana, Oregon, South Dakota, and Utah, pertained to the interests of those who identify as American Indian, the cultural significance of the GRSG to American Indian populations, and the importance of hunting and subsistence. Some concerns revolved around the viability of GRSG populations. Historical records highlight the importance of GRSG to individuals who identify as American Indian across the planning area who traditionally relied on GRSG as a vital food source. GRSG has played a vital role in traditions and customs, and it has served as inspiration for ceremonial dances.

The preservation of GRSG habitat would have beneficial effects for those who identify as American Indian who hold cultural value for the bird (BLM and Forest Service 2012). American Indian populations across the planning area engage in hunting and subsistence activities on federal lands outside the boundaries of their reservations. Access to hunting and subsistence resources is a concern for many environmental justice populations within the state analysis areas, especially for tribal members. The profound connection between the GRSG habitat and American Indian populations underscores the importance of considering these aspects in the planning and decision-making processes. On the other hand, some comments expressed concern that habitat conservation in some alternatives could negatively impact road realignment projects near their reservation and plans to expand their reservation boundaries where reservations are surrounded by PHMAs.

Another issue are the economic impacts on environmental justice populations from greater restrictions on livestock grazing and mineral, oil, and gas development. This issue was especially of concern in counties with high poverty rates and declining economic opportunities (BLM 2013b). However, there is a lack of evidence that individuals employed in sectors most likely to be impacted by BLM management decisions (such as the farming, ranching, and mining sectors) have a higher percentage of people who identify as a minority, low-income, or American Indian and Alaska Native. Therefore, economic impacts on environmental justice populations will not be carried forward in the impacts analysis on environmental justice populations, but will be included in the impacts analysis on social and economic conditions. The loss of economic activity stemming from the closure of GRSG PHMA or making PHMA unavailable for authorized uses, in terms of affected jobs and labor income, may result in some additional communities meeting low-income criteria for consideration as potential future environmental justice communities. Additional screening and consideration of environmental justice populations and disproportionate impacts will occur at the implementation stage at a scale commensurate with the scope and scale of management actions being considered to provide additional protections for local GRSG populations.

Concerns were identified about impacts on food prices and availability due to restrictions on grazing and mineral development (especially trona mining) in Wyoming and Idaho. These comments were in the context of economic conditions, however, increases in food prices and decreases in food availability tend to disproportionately impact low-income individuals who have more limited means for finding alternatives. This issue will be carried forward and examined in the impacts analysis on environmental justice populations.

The 2015 EISs identified issues that were not brought up in public comments but were considered important issues for analyzing impacts on environmental justice populations. One was the impact on environmental justice populations from changes in availability for firewood permits. The current BLM management decisions, however, will not change the availability for firewood permits; therefore, this concern will not be carried forward in the impacts analysis.

Visual and auditory impacts on environmental justice populations from mining development and operations and travel management decisions were other issues considered in the 2015 EISs. The 2015 plans included specific management decisions that could impact areas used for spiritual and religious practices, but these types of site-specific decisions are not included in the current effort. Therefore, impacts on environmental justice populations from visual and auditory disruptions will not be carried forward in the impacts analysis. Impacts on visual and auditory resources will be considered for potential inclusion in the implementation-level NEPA analysis.

In addition to issues raised by the public, as discussed above, the BLM will consider and analyze other concerns for environmental justice populations. These issues include impacts from potential changes in water quality, air quality, and climate change from mineral development under alternatives with less restrictions. These issues were not analyzed in the 2015 EISs but are considered important to the analysis in the current efforts.

3.13 AIR RESOURCES AND CLIMATE

This planning effort is limited to making land use planning decisions specific to the conservation of GRSG habitats. No decisions related to the management of air quality will be made. Impacts on air quality and climate from the alternatives being analyzed are presented in **Section 4.3**.

3.13.1 Air Resources

Air resources involve ambient air quality (measured by the concentration of air pollutants) and air quality-related values such as visibility and atmospheric deposition. Air quality indicators include concentration of criteria air pollutants, hazardous air pollutants (HAPs), and sulfur and nitrogen compounds, which could contribute to visibility impairment and atmospheric deposition.

Regulatory Framework

Clean, breathable air, expansive vistas, and minimal acidification of the lands, streams, and lakes are goals pursued by the BLM air resources program. The Clean Air Act and FLPMA require the BLM to comply with local, state, Native American tribal, and other federal agency air quality standards and regulations. FLPMA further directs the Secretary of the Interior to take any action necessary to prevent unnecessary or undue degradation of the lands (Section 302 (b)), and to manage the public lands "in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values" (Section 102 (a)(8)). Air resources management is accomplished by establishing desired outcomes (goals and objectives) and allocations for allowable resource uses (management direction) that, at a minimum, must ensure authorized activities are in compliance with regulatory standards.

The US Environmental Protection Agency (EPA) which has the primary responsibility for regulating air quality, has established national ambient air quality standards (NAAQS) under the Clean Air Act for six criteria air pollutants which include: carbon monoxide, lead, nitrogen dioxide, ozone, two classes of particulate matter (particulate matter with an aerodynamic diameter less than or equal to 10 microns [PM_{10}] and particulate matter with an aerodynamic diameter less than or equal to 2.5 microns [$PM_{2.5}$]), and sulfur dioxide. NAAQS include primary standards established to protect public health, including the sensitive populations (e.g., children, the elderly, or asthmatics), and secondary standards to provide public welfare protection, including protection against decreased visibility and damage to the environment (e.g., crops, vegetation, animals, buildings).

The Clean Air Act requires federal, state, tribal, and local agencies to work in partnership to manage and regulate air quality. Local governments are responsible to comply with NAAQS but also may establish local air quality standards that are no less restrictive than the NAAQS. The Clean Air Act has established permitting programs, generally implemented by states and local agencies, to carry out the goals of the Act. States are responsible for development of a state implementation plan to ensure standards are met.

In addition to criteria pollutants, the EPA and state air quality management agencies are responsible for controlling air toxics, or hazardous air pollutants, at all major sources and some area sources in specific source categories (40 Code of Federal Regulation 51). Hazardous air pollutants are those known or suspected to cause cancer or other serious health problems (e.g., respiratory problems, birth defects, or reduced fertility) or environmental effects (e.g., mercury deposition).

In addition to improving air quality, the Clean Air Act addresses maintaining clean air. This program, known as the Prevention of Significant Deterioration program, maintains clean air by limiting emissions of air pollutants so that significant deterioration of air quality will not occur. The program protects air quality within Class I areas by allowing only slight incremental increases in pollutant concentrations. Class I air quality areas include National Parks larger than 6,000 acres and wilderness areas larger than 5,000 acres that existed or were authorized as of August 7, 1977. They receive the highest degree of air quality protection under the Clean Air Act.

Current Conditions and Trends

The Clean Air Act requires each state to identify areas with ambient air quality in violation of the NAAQS using monitoring data collected through state monitoring networks. Areas that violate the NAAQS are designated as nonattainment areas for the relevant criteria air pollutants, while areas that comply with the NAAQS are designated as attainment areas for the relevant criteria air pollutants. Areas of uncertain status due to insufficient monitoring data are generally designated as unclassifiable but are treated as attainment areas for regulatory purposes. Most of the planning area is in attainment/unclassifiable for the NAAQS. As shown in **Table 3-17** (**Appendix 9**), portions of the planning area in California, Colorado, Idaho, Montana, Utah, and Wyoming are nonattainment for one or more of the NAAQS.

In conducting a thorough general conformity applicability review, the BLM has determined that conformity is not applicable. This conclusion is underpinned by the comparison of the RFD outlined in **Appendix 12**, which indicates that the projected development associated with the actions is either the same or less than the No Action alternative. As a result, net emissions are anticipated to remain unchanged.

Areas that have been redesignated from nonattainment to attainment are considered maintenance areas. **Table 3-18** (**Appendix 9**) shows the areas that were redesignated from nonattainment to maintenance areas and the dates of the redesignation. These areas have current attainment of the NAAQS, showing air quality in the planning area has improved over the last two decades.

Emission Inventory

The EPA, in collaboration with state, local, and Tribal agencies, compiles a National Emissions Inventory every 3 years. The total criteria pollutant emissions reported from the planning area counties in the most recent (2020) National Emissions Inventory[7] (EPA 2023b) is shown in **Table 3-19** (**Appendix 9**). Although there is no NAAQS for volatile organic compounds (VOCs), they contribute to ozone formation in the atmosphere. As shown in the table, in the planning area counties, wildfires were the primary emitter of carbon monoxide (72.7 percent) and $PM_{2.5}$ (62.1 percent) and the second highest emitter of VOCs (35.9), sulfur dioxide (35.5 percent), and PM_{10} (27.0 percent). Biogenics were the number of one source of VOCs (48.3 percent), while point sources were the number one source of sulfur dioxide (57.5 percent) and area sources were the number one source of PM_{10} emissions (70.2 percent). Nitrogen oxides' emissions were highest from point sources (23.1 percent), followed by on-road mobile sources (22.6 percent).

Air Quality Monitoring Data

The EPA compiles air monitoring data from state monitoring networks and presents annual air pollutant concentration values by county in its Air Quality Statistics Report (EPA 2023b). **Table 3-20** (**Appendix 9**) presents air pollutant concentration values, which are key indicators in assessing air quality and represent a calculated measure that reflects the highest long-term concentrations of pollutants. This information helps evaluate the overall air quality trends and compliance with standards for planning area counties in California, Colorado, Idaho, Montana, Nevada, Oregon, South Dakota, Utah, and Wyoming. There are no monitoring stations in the planning area counties in North Dakota. While monitoring data are available for the range of criteria pollutants, depending on location, **Table 3-20** (**Appendix 9**) focuses on the pollutants of most concern in the planning area, including ozone, PM_{10}, and $PM_{2.5}$, based on the county nonattainment status.

[7] First released version of the 2020 National Emissions Inventory.

Values in bold indicate a level above the NAAQS for that pollutant. However, these bolded values are not direct design values and serve as general indicators. The EPA determines attainment status, and this disclaimer is included for clarity.

All planning area states except Idaho have recorded concentrations for one or more pollutants above the NAAQS in some counties in some years (**Table 3-20** [**Appendix 9**]). In some areas, the elevated concentrations may reflect urban conditions where monitoring stations are located, potentially not accurately representing air quality conditions in more rural BLM-administered lands.

Ozone. Ozone is formed by photochemical reactions of precursor air pollutants, including volatile organic compounds and nitrogen oxides. These precursors are emitted by mobile sources, stationary combustion equipment, and other industrial sources. Ozone formation is enhanced by increased sunlight and higher air temperatures. Ozone exposure can lead to respiratory issues and aggravate pre-existing conditions such as asthma and chronic obstructive pulmonary disease. Elevated ozone concentrations may also occur during winter in snow-covered rural areas. Since 2000, ozone concentrations have decreased by 16 percent nationally (EPA 2023c). The West (including California and Nevada) has seen a decrease in ozone concentrations of 11 percent, while the Southwest (including Utah and Colorado) has seen a decrease of 2 percent. Conversely, ozone concentrations in the Northern Rockies and Plains have increased 14 percent since 2000, while the in the Northwest (including Oregon and Idaho) concentrations have increased by 2 percent (EPA 2023c).

Particulate Matter (PM_{10} and $PM_{2.5}$). Particulate matter is a complex mixture of small particles and liquid droplets found in the air. $PM_{2.5}$ consists of both primary particulate matter, generated mostly from combustion-related activities, and secondary particulate matter, which is formed from atmospheric chemical reactions of precursor emissions. Sources of particulate matter include agricultural activities, industrial processes, smoke from wildland fire, fossil fuel development, physically disturbed soils, and dust from unpaved roads. $PM_{2.5}$ emissions are primarily generated by internal combustion diesel engines, soils with high silt and clay content, and secondary aerosols formed by chemical reactions in the atmosphere. Particulate matter affects deposition on plants and surfaces (including on snow, which can contribute to climate change) and visibility. PM10, consisting of larger particles, can irritate the eyes, nose, and throat and may exacerbate respiratory conditions. PM2.5, comprising finer particles, poses health risks as it can penetrate deep into the lungs, potentially causing or worsening respiratory and cardiovascular problems.

PM_{10} concentrations have decreased by 36 percent nationally since 2000 (EPA 2023d). This decrease is observed in annual PM10 concentration averages. Over this same period, the West (including California and Nevada) saw a decrease of 66 percent and the Southwest (including Utah and Colorado) saw a decrease of 22 percent. Conversely, PM_{10} concentrations in the Northern Rockies and Plains increased 9 percent since 2000, while in the Northwest (including Oregon and Idaho) concentrations increased 21 percent (EPA 2023d). $PM_{2.5}$ concentrations have decreased by 37 percent nationally since 2000 (EPA 2023e). Concentrations decreased 28 percent in the West (including California and Nevada), 23 percent in the Northwest (including Oregon and Idaho), 16 percent in the Northern Rockies and Plains, and 13 percent in the Southwest (including Utah and Colorado) since 2000 (EPA 2023e).

Climate Change and Greenhouse Gases

The Intergovernmental Panel on Climate Change (IPCC) describes climate change as "a change in the state of the climate that can be identified (for example, by using statistical tests) by changes in the mean and/or the variability of its properties, and persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use" (IPCC 2013, 2021). Current ongoing global climate change is caused, in part, by the atmospheric buildup of greenhouse gases, which may persist for decades or even centuries. Although largely invisible to the short wavelength incoming solar radiation that heats the earth's surface, greenhouse gases absorb a portion of the outgoing long wavelength infrared heat radiated back from the surface, preventing it from escaping out into space. As a result, the buildup of greenhouse gases since the start of the industrial revolution has increased the global mean temperature and has altered the earth's climate in complex ways.

Greenhouse gasses exhibit different speciation characteristics, with each gas having unique properties. CO2, primarily released from fossil fuel combustion and deforestation, is a major contributor to global warming. Methane, emitted from livestock, agriculture, and energy production, is a potent but short-lived greenhouse gas. Nitrous oxide, originating from agricultural and industrial activities, has a longer atmospheric lifespan. While greenhouse gasses primarily influence climate patterns, they also have direct and indirect health impacts. Climate change resulting from greenhouse gas emissions contributes to extreme weather events, altered disease patterns, and impacts on air and water quality. Additionally, certain greenhouse gasses, like methane, can indirectly affect human health by contributing to ground-level ozone formation (IPCC 2013, 2021).

Warming of the earth's climate since the industrial revolution has been observed to coincide with widespread effects throughout the earth-atmosphere system, including reductions in the extent and duration of polar sea ice and mountain winter snowpack, rising sea levels, increases in mean nighttime minimum temperatures, shifts in historical rainfall patterns, and changes in the frequency, severity, and duration of weather events. These effects, in turn, have affected natural and human systems regardless of cause, implicating the sensitivity of natural and human systems to changing climate (IPCC 2013, 2021).

The IPCC (2021) has concluded that human activities such as the burning of fossil fuels have caused greenhouse gas concentrations to increase since the mid-18th century and that "it is unequivocal that human influence has warmed the atmosphere, ocean and land." The IPCC's (2021) best estimate of the human-caused increase in global surface temperatures between 1850-1900 to 2010-2019 is 1.93 degrees Fahrenheit (°F), and it is "very likely" that well-mixed greenhouse gases were the main driver of this warming since 1979. Evidence of the observed change and the human influence in extreme events such as heat waves, heavy precipitation, and droughts has strengthened since the IPCC Fifth Assessment Report (IPCC 2013). For example, it is "virtually certain" that the frequency and intensity of extreme heat events have increased across most regions since the 1950s, and cold extremes have become less extreme and less severe; there is "high confidence" that human-induced climate change is the main driver of these changes (IPCC 2021).

Across the United States, annual average temperatures have increased by 1.8 °F since the beginning of the 20th century and by 1.2°F over the last few decades (BLM 2020; US Global Change Research Program 2018). According to the National Climate Assessment (US Global Change Research Program 2018), the largest increases in annual average temperatures since the beginning of the 20th century were observed in the western United States, while the southeastern United States had the least warming. Annual precipitation has increased in the northern and eastern United States since the beginning of 20th century and decreased in most of the southern and western United States (US Global Change Research Program 2018). The frequency and intensity of heavy precipitation have increased in most parts of the United States since the 20th century (US Global Change Research Program 2018).

Over the contiguous United States, annual average temperature is expected to increase by 2.5°F over the next few decades compared to present-day, regardless of future emissions (US Global Change Research

Program 2018). By the end of the 21st century, the annual average temperature for the contiguous United States is expected to increase by 3 to 12°F depending on future emissions scenarios, and high temperature extremes are expected to increase accordingly (US Global Change Research Program 2018). The frequency and intensity of heavy precipitation are projected to continue increase over the coming century in the United States, and winter and spring precipitation are projected to increase significantly over the Northern Great Plains, the Upper Midwest, and the Northeast (US Global Change Research Program 2018).

The 2021 BLM Specialist Report on Greenhouse Gas Emissions and Climate Trends (BLMb 2022) presents climate trends for many of the western states. Information from that report is incorporated by reference and summarized in **Table 3-21** (**Appendix 9**). Climate trend information is further supplemented by the National Oceanic and Atmospheric Administration's State Climate Summaries (NOAA 2022), among other sources. In the Planning Area greenhouse gas emissions come primarily from the combustion of fossil fuels in energy use. Energy use is largely driven by economic growth, with short-term fluctuations in its growth rate created by weather patterns that affect heating and cooling needs and changes in the fuel used in electricity generation. In 2020, carbon dioxide emissions from combustion of fossil fuel for energy production in the US were equal to 73 percent of total United States anthropogenic greenhouse gas emissions (US Energy Information Administration 2022). Other major greenhouse gases that are caused by human activity include methane (11 percent) and nitrous oxide (7 percent; United States Energy Information Administration 2022). In 2021 oil- and gas-related greenhouse gas emissions from BLM-administered lands in Wyoming had the highest emissions (107.5 megatonnes of CO_2e) followed by Colorado (45.7 megatonnes of CO_2e) and North Dakota (36.3 megatonnes of CO_2e; **Table 3-22** [**Appendix 9**]). Estimates include direct emissions from extraction and indirect emission from transportation and processing along with end-use estimates. While processing, transport, and downstream combustion emissions may or may not occur in the state where oil and gas was extracted, for calculation purposes, indirect emissions are attributed to the state minerals originated. Different greenhouse gases have different impacts on Earth's warming based on their ability to absorb energy and how long they stay in the atmosphere; therefore, total greenhouse gas estimates use carbon dioxide equivalent (CO_2e) which takes the radiative power of each gas for a given timeframe.

Greenhouse gas emissions are offset to some degree by carbon that is sequestered in terrestrial ecosystems. Carbon sequestration is the process of capturing and storing atmospheric carbon dioxide (e.g., in vegetation and soils). Historically, natural carbon sequestration in plants and soils has been able to lock up about 29 percent of all human-caused emissions on a global scale (Merrill et al. 2018). Terrestrial ecosystems on federal lands were estimated to have sequestered an average of 195 megatonnes of CO_2e per year nationally between 2005 and 2014, which would offset emissions from extraction and end-use combustion of fossil fuels on federal lands by approximately 15 percent (BLM 2020).

3.14 Soil Resources

BLM's Rangeland Health Standards determine properly functioning physical conditions of soil resources in a planning area. This helps the BLM with soil management because determination on conditions will guide management adjustments and provide direction to make significant progress toward achieving the stated Standards. Since GRSG are dependent on sagebrush, and sagebrush viability is dependent on soil health, soils are a crucial element of GRSG habitat. Soil health is also integral to the BLM's mandate to sustain the health, diversity, and productivity of BLM-administered lands. Many resources and resource uses, including livestock grazing, wildlife habitat, riparian habitat, special status species, fisheries, recreation, water quality, and forestry, depend on suitable soils. Consequently, soil attributes and conditions are important to BLM management direction.

Soils are defined by the interaction of the processes that form them, including parent material (geology), climate, topography and biologic organisms. Through time, these processes form unique soil types and influence what plants may grow upon them. Soil surveys indicate that climate and topography are the primary influences on soil formation. Soil development processes, such as rock weathering, decomposition of plant materials, accumulation of organic matter, and nutrient cycling, are controlled largely by climate. Soil moisture and temperature strongly affect the rates of addition, removal, translocation, and transformation of material within the soil. Topography influences site conditions such as precipitation amounts and effectiveness, drainage, runoff, erosion potential, and temperature (Weltz et al. 2017).

Soils play an integral part in vegetation community development. Plants, including sagebrush, use soil as an anchor, a means to provide water for growth, and a storehouse for the nutrients needed for growth. Plant communities are most noticeably influenced where soil texture and thickness of soil horizons change, depth to restrictive layers including abrupt soil horizon boundaries exist, and by soil drainage, moisture holding capacity, or depth to the water table. Native plant communities require management considerations that include the ability of soil to produce a healthy ecosystem over the long term. Reducing the risk of erosion from water and air processes, limiting compaction from traffic source or grazing, and allowing water to infiltrate at a normal rate for the given soil texture will allow vegetative communities to thrive and further protects the soil resources (Weltz et al. 2017).

3.14.1 Existing Conditions

The discussion of existing conditions contains a description of soil resources for the planning area, regardless of landownership.

Conditions of the Planning Area

Soil Productivity

Soil productivity within the planning area varies widely due to the diversity of soils and site characteristics, including varying climatic, vegetative, topographic, and geologic conditions. The planning area landscape varies greatly from broad valleys to mountains. Average annual precipitation and temperature in the project area varies by elevation and aspect (NOAA 2022). Due to low soil temperatures in high elevations and rugged mountains, the chemical reactions that release plant nutrients from minerals take place slowly. The rate of biologic activity is also limited by temperature, resulting in a slow rate of biologic decomposition, seed germination, and root growth. These factors combine to give the soils low fertility (Weltz et al. 2017).

Some of the most productive soils in the planning area are found in well drained valley bottoms, toe-slopes, benches, and broad ridge tops. On uplands where rainfall is moderate to low, medium-textured soils may produce favorable conditions, depending on land uses such as livestock grazing. Favorable conditions arise because medium-textured soils have the capacity to retain moisture, supporting vegetation even in less rainy environments. Livestock grazing, as a land use, plays a role by influencing the composition and health of vegetation. The interaction between livestock grazing and vegetation affects soil stability and water retention, contributing to overall suitability of medium-textured soils in uplands with limited rainfall. Soils that feature shallow clay pans, hardpans, or salts pose substantial constraints to land use and land use management. Shallow clay pans and hardpans limit root penetration and water drainage. Additionally, the presence of salts can lead to soil salinity, affecting the suitability of the land for various land uses. Soils in the planning area vary from calcareous to alkaline and surface texture ranges from strongly alkaline loams, sandy loams, loams, to clay loams underlain by sandy loam to clay textures, and rock outcrop complexes. Permeability ranges from very slow to moderately rapid, and erosion hazard for most soils is moderate, with some ranked as severe. Some of these soils are highly saline. Due to the salt content in these soils, vegetative cover can be sparse, resulting in soil particles not being anchored in place; thus, the soil is easily eroded by wind and water (Weltz et al. 2017).

Biological soil crusts are an important component of a broad range of ecological sites in the planning area. They function as a living mulch by retaining soil moisture, increasing organic matter, and discouraging annual weed growth (Belnap et al. 2001). Biological soil crust communities are more prevalent at lower elevations, compared to higher elevations with greater precipitation, where vascular plant growth precludes biological crust development (Belnap et al. 2001). Biological crusts are well adapted to severe growing conditions, but are extremely susceptible to physical disturbances, domestic livestock grazing, and recreational activities. Wildfire can also damage the crust. Shrub presence and cheatgrass may increase wildfire intensity, thereby decreasing the likelihood of early vegetative or crust recovery after a burn (Brooks and Chambers 2011).

Management practices affect the ability of soils to maintain productivity because of displacement, compaction, erosion, and alteration of organic matter and soil organism levels. For instance, when vegetation is removed for specific management purposes, it alters organic matter levels, influencing productivity content of the soil. When soil degradation occurs in semiarid, high desert regions, natural processes are slow to return site productivity. This is because conditions in these areas, with limited water and harsh climates, slow down natural recovery of the soil. The lack of sufficient moisture and the challenging environment make it difficult for the soil to bounce back quickly after degradation. Prevention of soil degradation is far more cost-effective and time effective than remediation or waiting for natural processes. Management practices, such as proper stocking rates for livestock, rotation of grazing, periodic rest from grazing, improved site design, construction and maintenance of roads, selective logging, rehabilitation of unneeded surface disturbance, restricting vehicles to roads and trails, rehabilitating mined areas, and control of concentrated recreational activities, can reduce erosion effects and improve soil conditions. This encompasses efforts to create a more favorable environment for sustainable and productive soil.

Soil Erosion

Erosion is a continuing natural process that can be accelerated by human disturbances. Factors influencing soil erosion include soil 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, incohesive soil particles with slow infiltration rates, and moderate to steep slopes. Wind erosion processes are less affected by slope angle but are highly influenced by wind intensity. Semi-arid regions of much of the planning area have a low percentage of natural plant community ground cover, allowing the soils to erode naturally in wind and during infrequent rain events (Al-Hamdan et al. 2015).

While erosion occurs under natural conditions, rates of soil loss may be accelerated if human activities are not carefully managed. Soils are affected by surface uses that loosen topsoil and damage or remove vegetation or other ground cover. Surface-disturbing activities include any authorized actions that disturb vegetation and/or surface soil, thereby increasing erosion potential above normal site conditions. Surface-disturbing activities include construction of well pads and roads, pits and reservoirs, pipelines and power lines, mining, vegetation treatments, livestock grazing, and concentrated OHV cross-country travel.

Soil erosion rates can be controlled by managing vegetation, plant residues, and soil disturbance. Vegetative cover is the most significant factor in controlling erosion because it intercepts precipitation, reduces rainfall impact, restricts overland flow, and improves infiltration (Weltz et al. 2017). Biological soil crusts are especially important for protecting the soil and controlling erosion in desert regions, but are easily disturbed by various factors, including human activities (Weltz et al. 2017).

Wind erosion is particularly hazardous when surface litter and vegetation are removed by wildfire or other disturbances. Soils are considered fragile or of high erosion hazards if they contain the following characteristics: (1) Soils rated as highly or severely erodible by wind or water, as described in soil survey reports; (2) landslide areas, as identified in soil survey reports; and (3) Soils on slopes greater than thirty-five percent (Weltz et al. 2017).

Trends

The overall guidance for soil resources is to maintain or improve the ability of the soil to support vegetation and allow water and nutrients to be cycled by either macro or microorganisms, all of which promote and improve the health of the land. Degradation by excessive grazing, recreation, erosion, or land developments have caused a reduction in soil function as one or perhaps many of the soil properties are changed thereby affecting the functions necessary for healthy soils. These essential functions include maintaining adequate fertility, supporting plant growth, promoting water retention, and sustaining a diverse ecosystem. The interconnectedness of soil properties and functions underscores the significance of preserving soil health for overall ecosystem well-being. BLM's rangeland health standards work toward conditions in which vegetation and ground cover maintain soil conditions that can sustain natural biotic communities. By implementing sustainable practices like controlling grazing rates, these standards aim to strike a balance that supports both the health of the land and the diverse ecosystems it sustains.

In the planning area, impacts on soil resources have resulted from various factors, including increasing temperatures, changing precipitation patterns, wildfire seasons, infestations like pinebark beetle, juniper and cheatgrass invasion, compaction from livestock grazing, mineral and energy development, long-term increases in outdoor recreation, as well as natural processes like erosion and weathering, and other activities influencing the soil (NOAA 2022). The potential for maintaining or restoring these ecological communities and conserving the soil resource depends on specific soil types and how resource programs are managed. Different soil types, like sandy or clayey soils, have varying abilities to retain water and nutrients, affecting restoration. Resource program management, involving practices like erosion control, directly influences the success of conserving and restoring the soil.

3.15 Water Resources

Water quality on public lands is regulated by the Clean Water Act, 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 Clean Water Act (33 USC 1251 et seq.) mandates the protection, monitoring, and restoration of the physical, biological, and chemical integrity of waters in the United States. Sections 208 and 319 of the Clean Water Act specifically address the importance of implementing control strategies to address nonpoint source pollution. On BLM-administered lands, soil and water conservation practices, such as erosion control and watershed management, along with best management practices like proper grazing management, aim to prevent soil erosion and runoff. These practices reduce transport of pollutants into water bodies, effectively mitigating nonpoint source pollution on BLM-administered lands. The US EPA supports this perspective in their guidance (EPA 1987). The Safe Drinking Water Act presumes aquifers are underground sources of drinking water, unless they are specifically exempted or if they have been shown to fall outside the definition of underground sources of drinking water (Safe Drinking Water Act 1996).

As a designated management agency, the BLM must: (1) implement and enforce natural resource management programs for the protection of water quality on federal lands under its jurisdiction; (2) protect and maintain water quality where it meets or exceeds applicable state and Tribal water quality standards; (3)

monitor activities to assure they meet standards and report the results to respective states; and (4) meet periodically to recertify water quality BMPs (Weltz et al. 2017). BMPs include methods, measures, or practices to prevent or reduce water pollution, including but not limited to structural and nonstructural controls, operations, and maintenance procedures. BMPs are applied as needed to projects. BMPs work by using various strategies such as physical barriers and operational changes to prevent water pollution. Each project receives customized BMPs to ensure effective application.

3.15.1 Existing Conditions

The discussion of existing conditions contains a description of water resources for the planning area, regardless of landownership. Where specific to BLM-administered lands the description is limited to describing water resources associated with GRSG and their habitats. Wetlands and livestock water developments are important sources of water that influence GRSG and their habitat. Apart from wetlands and livestock water developments, other important water sources for GRSG include natural springs, creeks, and seasonal ponds.

Conditions within the Planning Area

Within the planning area, 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 they do flow in response to large precipitation events. Intermittent streams flow during spring runoff for an average water year, but they generally dry up later in the summer. Perennial streams contain some water all year. Lakes can be permanent or temporary. Wetlands and floodplains vary in extent on water inundation onto a floodplain and depth (degree of saturation) throughout the year. Permanent waters can also be in the form of ponds and reservoirs developed for human or livestock consumption. Additionally, snow melt contributes to recharge surface waters, influencing intermittent stream flow. Springs also serve as a source for surface flows.

Stream channels and floodplains play a vital role as their shape and condition significantly impact key aspects of river systems. The configuration and health of these components influence speed of water flow, determining how quickly water moves through the system. Additionally, their morphology contributes to water storage capacity within basins, affecting the retention and release of water. Furthermore, shape and condition of stream channels and floodplains have implications for water quality, as certain features can filter pollutants. The interplay of these factors also connects to erosional impacts, with shape and condition influencing the extent of erosion within the river system. Consequently, these factors have far-reaching effects on fish and wildlife habitat, agriculture, recreation, and the hazard and risk of local communities and landowners to floods. Hazard and risk, or vulnerability of streams and floodplains, also include impacts on water availability (i.e., how much water is stored within the basins) and water quality.

Surface Water

The United States is divided and sub-divided into successively smaller hydrologic units called regions, sub-regions, accounting units (basins), and cataloging units (sub-basins). Each hydrologic unit is identified by a unique hydrologic unit code consisting of two to eight digits. The fourth level of classification (sub-basin) is represented by an eight-digit hydrologic unit code, indicating a more detailed and specific identification compared to the other hydrologic units mentioned above.

Due to the semi-arid nature of BLM-administered lands within the planning area, surface waters are extremely valuable. Surface water flow volumes differ greatly throughout the year and across the planning area. Most surface runoff in the planning area comes from snowmelt or rainfall, producing peak discharges in the spring and early summer. Many streams in lower elevation semi-arid areas are either intermittent, with segments of perennial flow near springs, or ephemeral, with flow only during spring runoff and intense summer storms.

Springs and seeps occur in areas where water from aquifers reaches the surface. Many springs form the beginning of stream channels; others flow into small ponds or marshy areas that drain into channels. Some springs and seeps form their own channels that reach flowing streams, but other springs lose their surface expression and recharge alluvial fill material or a permeable layer. Springs and seeps are important to aquatic habitats because of the perennial base flow they provide to a stream. The outflow from springs in summer usually helps to maintain lower water temperatures because groundwater is of lower temperature by nature. In winter, especially in small streams, base flow helps to maintain an aquatic habitat in an otherwise frozen environment (Weltz et al. 2017).

Riparian areas are ecosystems that exist along rivers, streams, or waterbodies. These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence. The BLM uses proper functioning condition assessments for evaluating riparian-wetland areas. These assessments provide a comprehensive understanding of the health and functionality of these ecosystems. Proper functioning condition assessments consider factors like vegetation cover, soil stability, and hydrological processes to determine ecological health of riparian-wetland areas.

The historic scarcity of stream flow in the planning area has led to increased flow regulation by the states. Projects for irrigation, livestock, human use, and flood control have significantly altered natural flow regimes. This has changed habitat conditions, channel stability and timing of sediment, and organic material transport. Stream flow has been altered by management activities such as water impoundments, water withdrawals, road construction, energy and mining development, vegetation manipulation, grazing, wildfire suppression, and timber harvesting (Weltz et al. 2017). Water developments are also influential sources of water for GRSG. Water developments can function for multiple uses. They provide additional and alternative sources of water for wildlife and livestock, and can decrease use of riparian areas (Connelly and Doughty 1989). Within the planning area, the BLM maintains an unknown number of water developments.

Groundwater

Groundwater resources in the planning area include local basin-fill aquifers, deep, regional aquiferss and, in some areas, geothermal aquifers. Basin-fill aquifers are typically located within local basins, serving as sources of groundwater. Deep, regional aquifers extend over larger areas, providing a broader regional water source. Geothermal aquifers, found in specific areas, contain water with elevated temperatures suitable for geothermal energy extraction. Groundwater recharge primarily occurs at higher elevations where precipitation exceeds evapotranspiration. Excess precipitation either remains at the surface as overland flow or goes beneath the surface, recharging groundwater systems. Groundwater is used for irrigation, domestic use, and livestock use.

Quality of the groundwater is a function of the chemical makeup of the underground formation containing the water. Aquifer properties, such as hydraulic conductivity (the ability of an aquifer to transmit water) and primary and secondary porosity (open spaces in rock or soil), also influence water quality based on the residence time of the groundwater in the subsurface. Longer residence time means more interactions with the surroundings, influencing water quality. In the planning area, much of the geology consists of consolidated sedimentary formations with water-bearing properties that are largely dependent on secondary porosity from faults, fractures, and joints. The mineral content of several sedimentary formations underlying the planning area includes relatively high amounts of soluble minerals and salts. Most of the planning area contains water that is typically suitable for common uses; however, it is considered hard, indicating a higher concentration of minerals like calcium and magnesium. Additionally, it contains moderate levels of dissolved minerals, which may include substances such as bicarbonates, sulfates, and chlorides.

Groundwater near the land surface is available for plants and can contribute to the alluvium of stream systems. This occurs as plants draw water from shallow groundwater and release moisture into the atmosphere. This water movement through plants, known as transpiration, helps transport minerals and sediment from the groundwater into the soil. Over time, these transported materials contribute to the composition of alluvial deposits in stream systems. Alluvial aquifers are found along larger perennial, intermittent, and interrupted flow segments. Interrupted flow segments refer to areas where the continuous flow of water is intermittently disrupted or broken, potentially due to factors such as topography, geological features, or human activities. These interruptions in the flow contribute to the formation of the alluvial aquifers, which are typically composed of alternating coarse sand and gravel deposits with layers of clay, silt, and sand. The alluvial aquifers also serve as either a recharge or discharge zone for underlying bedrock aquifers. Springs and seeps occur in areas where water from aquifers reaches the surface. 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 by disturbing soil, vegetation, and natural drainage patterns, altering water flow, quality, and overall spring conditions. Well drilling or blasting can affect springs by reducing the volume of water in their aquifers or by affecting subsurface flow patterns. Moreover, when wells are drilled or blasting occurs, natural permeability of the aquifer may be disturbed, potentially causing a reduction in water volume by affecting the ability of the aquifer to store and release water.

Water Quality

Water quality, as defined by the Clean Water Act, includes the physical, biological, and chemical characteristics affecting existing and designated beneficial uses. Beneficial uses in the planning area are public and private domestic water supplies, industrial water supply, irrigation, livestock watering, fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, and aesthetic quality. Section 303(d) of the Clean Water Act is utilized to identify waters which are water quality impaired because they fail to meet standards for criteria. Section 303(d) requires each state develop a list of water bodies that fail to meet water quality standards, along with delineation of those segments and associated listing criteria. The 303(d) list of impaired waters is updated biannually, and each state is required to develop a total maximum daily load allocation for each pollutant of concern.

Water quality typically varies as a function of flow conditions. During high flow conditions, dilution may result in lower concentrations of pollutants. Conversely, low flow conditions can result in higher pollutant concentrations. This variability can be impacted by water uses (e.g., agriculture, oil and gas development, and surface disturbance), vegetation, groundwater interaction, and pollutants discharged into water bodies from point and non-point sources. The quality of runoff in ephemeral and intermittent stream channels is largely dependent upon the amount of salts, sediments, trace elements, and organic materials that accumulate in dry stream channels between flow periods. Periodic flushing of accumulated salts, trace elements, organic materials, and sediments occurs during peak flow events, which often represent the only time water quality samples can be collected. Factors that govern the accumulation of salt, trace elements, organic materials, and sediments include physical properties of the watershed (e.g., topography, geology, and climate), land use, and seasonal fluctuations in temperature and precipitation. Topography influences flow of water, determining the potential for sediment transport. Geology contributes to the types and amounts of minerals in the water. Climate affects the overall hydrological cycle, influencing precipitation patterns and evaporation rates. Land use practices can introduce pollutants and alter natural drainage patterns. Seasonal fluctuations in temperature and precipitation impact the rate of weathering and erosion processes, influencing composition of materials entering streams.

The major water quality concern for streams in the planning area has been water temperature (Danforth et al. 2016), which correlate to the beneficial use of fish spawning and rearing habitat. Conditions that affect stream temperature, such as the amount of near-stream vegetation, channel shape, and hydrology, operate through complex interactions. Near-stream vegetation helps regulate water temperature by providing shade. The type and density of vegetation influence the extent of shade. Channel shape plays a role in sunlight exposure; narrower channels may receive more direct sunlight, potentially leading to higher temperatures. Hydrology, which involves water flow rate and patterns, affects temperature dynamics. Some conditions vary daily or seasonally. In the planning area, conditions affecting stream temperature, such as the amount of near-stream vegetation, channel shape, and hydrology, are most associated with land use practices. Livestock grazing has been identified as a significant factor (Weltz et al. 2017). Other land uses associated with degraded streams include roads, trails, water withdrawal, reservoir storage, and release, which can contribute to stream degradation through mechanisms such as increased sedimentation, altered drainage patterns, and potential pollution. Construction and use of roads and trails, along with large-scale water withdrawal and reservoir operations, may disrupt natural flow patterns, impacting streambed stability, water quality, and overall stream health. (Weltz et al 2017).

Other water quality stream impairment in the planning area is due to a variety of causes, including pathogens, biological integrity, oxygen depletion, flow and habitat alterations, nutrients, toxic inorganics, metals, mineralization, and pH conditions. Lake and reservoir impairment is attributed to a variety of factors, including oxygen depletion, high temperatures, phosphorus, polychlorinated biphenyls and mercury in fish tissue, total dissolved solids, and acidic conditions. These impairments can be linked to activities such as animal feedlots, crop production, livestock grazing, habitat alterations, construction activities, permitted discharges from industrial, municipal, and stormwater sources, and lesser so from channelization, sewage disposal, mine tailings, hardrock mining, industrial forestry, and recreation and tourism. Not all areas with such activities resulted in water quality impairments as they are generally site specific in nature (Weltz et al. 2017).

Water Quantity

Water availability can vary annually, depending on the volume of water recharged and the volume of water used in the planning area. Since most water in the planning area originates from precipitation, yearly climatic conditions play an important role in the volume of water available. This, in turn, determines available riparian habitat and conditions, particularly in systems that are more dependent on snowmelt and local precipitation events (Weltz et al. 2017).

Peak flow times relate to spring runoff and snow melt, with a decrease to near base flow in later summer months, depending on winter accumulations of snow and other factors such as precipitation. Seasons, referring to periods such as summer or dry seasons, and years of low water yield are particularly crucial periods for most of the beneficial uses of water in the planning area.

States issue water rights for various beneficial uses for both groundwater and surface water. Consumptive water uses in the planning area are agricultural, municipal, mining and milling, industrial, stock watering, and wildlife. The BLM authorizes development of water-related infrastructure, such as ROWs, on BLM-administered lands, enabling applicants to apply water to beneficial use. When the United States reserves public land for 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. The date of priority, or seniority, of a federal reserved right is determined by the date the reservation was established.

Trends

As early land management reduced vegetation in the watershed, overland flow of water increased, and stream channels deepened. Channel incisions eventually lead to bank failures and subsequent channel widening. This process alters the natural dimensions and morphology of the channel. As channel widening and bank failures continued, new low flow channels began to form in the debris from bank failure. Many of the stream channels in the planning area were in the process of this initial buildup in the 1980s. This process was influenced by factors such as changes in land use, natural sedimentation processes, or alterations in hydrological conditions. New channels are usually lower than pre-disturbance channels, and the old floodplain now functions primarily as a terrace (a flat or gently sloping elevated area next to a stream). This shift in elevation is a consequence of the sedimentation and changes in channel morphology during the build-up process. Some terraces may be the result of climatic variations and associated changes in flow and sediment supply. Climatic variations influence river flow and supply of sediment. The resulting changes in sediment transport and deposition contribute to the formation of terraces along streambanks. Terraces, in this context, serve as indicators of past climatic and hydrological conditions. The stage of channel evolution results in a new bankfull channel (when a river is filled to its highest point without spilling onto nearby land) and active floodplain (the area next to a river that gets flooded regularly) at a new, lower elevation, which is observed in many stream channels in the planning area.

Existing climate change impact models in the planning area predict less water and water availability, a difference in timing of delivery, and increased stress on vegetation (Weltz et al. 2017). In particular, the models indicate longer and more severe droughts, changes in precipitation runoff and potential for changes in flooding patterns, increased wildfires, changes in the relationships among plants, water, nutrients, and soils on grazed lands, and increased susceptibility of ecosystems to invasion of nonnative species. Certain areas among the various states may experience trends that are not necessarily consistent with the rest of the range.

Activities associated with recreation, energy development, and grazing have resulted in significant impacts on water supply and quality within GRSG habitat. These include changes in stream morphology and vegetation, affecting the trends of water resources (Beck and Mitchell 2000). Within GRSG habitat, recreation activities have resulted in surface disturbance, such as erosion, sediment production and gully creation that require mitigation to prevent water resource damage (Weltz et al. 2017). OHV activity has increased significantly in more easily accessible wildland urban interface boundaries as well as more remote areas, due in part to population growth. Expansion of the wildland urban interface is anticipated to have long-term impacts on surface water quality and flow, including increased runoff, changes in nutrient levels, and altered sedimentation patterns.

Demands on water resources have increased over the past few decades. Although most early water rights were established for irrigation and mining, today's demand includes municipal water supplies, commercial and industrial supplies, and maintenance of adequate streamflow for fish, recreation, and water quality. These changes, driven by shifts in demand for water right uses, may significantly impact the hydrology of streams, riparian areas, and wetlands on BLM-administered lands. Alterations in water usage patterns can lead to changes in flow regimes, affecting the ecological balance of these ecosystems. The limited availability of water in much of the planning area may pose challenges for additional developments that depend on water, potentially impacting GRSG habitat and associated ecosystems. Water scarcity can influence the feasibility and sustainability of projects affecting the natural environment.. Changing and persistent drought conditions have also significantly impacted water availability and conditions (Weltz et al. 2017). Future water development for wildlife, recreation, and livestock would require a State water right before project implementation could occur. This crucial step ensures compliance with regulations and addresses potential impacts on GRSG habitat.

3.16 CULTURAL RESOURCES

A cultural resource is a definite location of human activity, occupation, or use identifiable through field survey, historical documentation, or oral evidence (BLM Manual 8100). The term cultural resources is inclusive and has been adopted and widely used to refer to the diverse human record found in sites, structures, objects and places created and/or used by people. These may comprise archaeological, historic, or architectural sites, structures, objects, or places, and may include locations of traditional cultural or religious importance to a particular social and/or cultural group, often referred to as Traditional Cultural Properties (See **Section 3.17**, Tribal Interests). The term includes "historic properties," as defined in the National Historic Preservation Act of 1966, as amended (NHPA), and the implementing regulations found at 36 CFR Part 800. Historic properties are cultural resources determined to be eligible for listing on the National Register of Historic Places (NRHP). The term also includes "archaeological resources" as defined in the Archaeological Resources Protection Act of 1979, and other sites, structures, objects, items, and places as addressed in other statutes/regulations (e.g., American Indian Religious Freedom Act of 1978, the Antiquities Act of 1906, NEPA, and the Native American Graves Protection and Repatriation Act of 1990). "Historic property" has a specific meaning under the NHPA, referring only to those properties determined to be eligible for or listed in the NRHP regardless of property type or period of use (e.g., traditional cultural property or archaeological site, and historic or prehistoric).

Cultural resources are represented by the full temporal range of human occupation of the continent, from the first known peoples' arrival and settlement in the planning area more than 12,000 years ago (Jenkins et al. 2012), possibly much longer (Davis et al. 2019), and subsequent expansion of tribal groups throughout to more recent incursions of fur trappers, homesteaders, miners, and ranchers of the last 200 years. Cultural resources can include surface and buried artifacts and cultural features made and left by human cultures in archaeological sites; items built by past cultures (e.g., houses/house remains and activity areas); and places associated with traditional cultural uses (See **Section 3.17**, Tribal Interests).

3.16.1 Considering Effects on Cultural Resources Pursuant to Section 106 of the NHPA

Cultural resources are most frequently identified and recorded through federal compliance with Section 106 of the NHPA (now recodified as 54 USC 305108) and subsequent consultation with Native American Tribes and State Historic Preservation Offices (SHPOs). Section 106 requires federal agencies that fund, approve, authorize, license, or permit actions or undertakings to consider effects on "historic properties" that could occur due to proposed undertakings.

Federal regulations define specific criteria for NRHP eligibility and provide the measures for evaluating cultural resources for their eligibility (36 CFR Part 60.4). Once a cultural resource has been determined to be eligible for the NRHP, the agency must consider potential effects of the proposed action on the historic property and provide measures to either avoid, minimize, or mitigate any adverse effects. Compliance with Section 106 provides a primary mechanism for federal agencies to assess and take into account effects of proposed federal actions or undertakings on cultural resources during NEPA reviews.

The BLM follows alternative procedures, defined in state specific protocols, for meeting Section 106 obligations allowed for and pursuant to the implementing regulations of the NHPA (36 CFR Part 800.14). In collaboration with the Advisory Council on Historic Preservation and the National Conference of State Historic Preservation Officers, the BLM developed alternative procedures that define how the agency will comply with Section 106 of the NHPA. These procedures are defined in a national Programmatic Agreement, revised in 2012, between the three parties. The Programmatic Agreement procedures are implemented by state specific protocol agreements with each state's SHPO. The protocols further define how the BLM will coordinate with the SHPO in each state to fulfill Section 106 responsibilities.

Prior to initiating proposed actions for protection and enhancement of GRSG and GRSG habitat, the responsible manager shall determine the area of potential effect, review existing information on known and anticipated historic properties that could be affected, seek information (in coordination with environmental review and land use planning processes) from Native American Tribes and other parties likely to have knowledge of or concern with historic properties (including places of traditional cultural and religious significance), determine need for field surveys or other actions to identify historic properties, make a good faith effort to identify and evaluate historic properties, assess and determine effects on historic properties, and identify measures to avoid, lessen or mitigate adverse effects on historic properties.

3.16.2 Conditions of the Planning Area

Given the vast planning area (see **Map 1.1**, Greater Sage-Grouse West-Wide Planning Area [**Appendix 1**]) types of cultural resources as well as the types and amount of data available about them vary greatly. Therefore, information about current conditions of cultural resources is high level and qualitative. The majority of the planning area has not been inventoried since resource inventories are driven by project-based cultural resource. New discoveries are documented regularly through regulatory compliance actions.

Some well-known historic properties and districts do occur across the planning area. These properties, along with other properties eligible for listing on the NRHP in the planning area, would need evaluation for the effects of proposed undertakings related to GRSG habitat improvement prior to implementation. Formal determinations of eligibility have not been completed for most known cultural sites in the planning area but known resources are treated as eligible until determined otherwise. Areas not previously inventoried would be subjected to full cultural resources analysis for ground-disturbing actions.

Cultural areas are often correlated to physiographic regions, with the current planning area falling within the Great Basin, Plateau, and Plains culture areas (d'Azevedo 1986). These cultural areas roughly correspond to distinctly different Indigenous groups with different languages and resource-based economic systems and social structures. While these areas are associated with cultural groups and distinct Tribes, cultural boundaries are fluid and overlapping. Tribes with interest in the planning area are listed and further discussed in **Section 3.17**, Tribal Interests.

3.16.3 Trends

Cultural resources are subject to deterioration over time due to both anthropogenic and natural processes. BLM-administered lands are currently and will continue to be managed for the protection and preservation of cultural resources, pursuant to pertinent regulation and policy. More concerted government-to-government consultation with Tribes is occurring to address tribal interests and concerns, including those regarding cultural resources. For example, the 2021 Secretary's Order 3403: *Joint Secretarial Order on Fulfilling the Trust Responsibility to Indian Tribes in the Stewardship of Federal Lands and Waters* furthers these interests. Efforts have also increased in public education and outreach to create awareness about our nation's cultural heritage and tribal contributions. These efforts continue to improve public understanding and awareness, resulting in increased preservation of cultural resources. Cultural resource inventories continue to regularly document previously unknown resources. Trends relevant to cultural resources and more specific to the planning area include increasing recreation use and demand (see **Section 3.19**, Recreation and Visitor Services), grazing (by livestock as well as wild horses and burros), and continued development like that related to mineral resources, renewable energy development, and utilities (**Section 3.9**, Lands and Realty [Including Renewable Energy], and **Section 3.10**, Mineral Resources).

3.17 TRIBAL INTERESTS

Tribal interests include economic rights such as Indian trust assets, resource uses and access guaranteed by treaty rights. Traditional cultural resources or properties include areas of cultural importance to contemporary communities. These areas can encompass sacred sites, resource gathering areas, locations tied to historical reenactment, or places significant to various communities, such as those related to Japanese internment, among others. While this section addresses traditional cultural resources or properties in the context of Tribal interests, it is important to recognize that traditional cultural resources or properties extend beyond Tribes and can hold significance for diverse ethnic and cultural groups.

The federal government has a unique and distinctive relationship with federally recognized Native American Tribes as set forth in the Constitution of the United States, treaties, statutes, Executive Orders, judicial decisions, and agreements. This relationship is different from the federal government's relationship with state and local governments or other entities. The United States government has a trust responsibility to federally recognized Native American Tribes that covers lands, surveys, boundary risk assessments, resources, money, or other assets held by the federal government in trust, and the ability of those Tribes to exercise their rights. Tribal members use BLM-administered lands to gather plants or other native materials (e.g., stone for flint-knapping), hunt animals, and fish. The United States recognizes Native American Tribes as sovereign nations. The Tribes maintain active interests in the planning area.

Native American treaties are negotiated contracts made pursuant to the Constitution of the United States and are considered the "supreme law of the land." They take precedence over any conflicting state laws because of the supremacy clause of the Constitution (Article 6, Clause 2). Treaty rights are not gifts or grants from the United States, but are bargained for concessions. These rights are grants-of-rights from the Tribes rather than to the Tribes. The reciprocal obligations assumed by the federal government and Native American Tribes constitute the chief source of present-day federal Native American law.

The BLM and other federal agencies have the responsibility to identify and consider potential impacts of project alternatives identified for GRSG planning on Native American trust resources, including fish, game, and plant resources, and on off-reservation, treaty-reserved fishing, hunting, gathering, and similar rights of access and resource use on BLM-administered lands. This also includes rights of access and use for ceremonial and other traditional cultural practices. The BLM, as lead federal agency, also has the responsibility to ensure meaningful consultation and coordination concerning GRSG planning is conducted on a government-to-government basis with federally recognized Tribes to consider tribal treaty rights and trust resources. BLM-administered lands retain social, economic, and traditional value for tribal people, as well as contemporary and ongoing spiritual and cultural uses. Through consultation with the Tribes, the BLM is aware of their treaty and trust obligations and the Tribes' desire to capitalize on opportunities that maintain or enhance resources critical to the exercise of treaty rights, traditional customs, subsistence, and cultural uses of the land.

BLM consultation with Native American Tribes, as it pertains to tribal interests, treaty rights and trust responsibilities, is conducted in accordance with the following direction:

- Executive Order No. 13175 – Consultation and Coordination with Indian Tribal Governments, November 6, 2000
- Secretarial Order 3317 – Department of Interior Policy on Consultation with Indian Tribes, December 1, 2011
- Bureau Manual Handbook H-1780-1 – Guidelines for Conducting Tribal Consultation (Transmitted 12/03/04)
- The National Historic Preservation Act of 1966 as amended (PL 89-665; 80 Stat. 915; 16 USC 470; recodified as 54 USC 305108).
- Archaeological Resources Protection Act of 1979 (PL 96-95; 93 Stat. 721; 16 USC 470aa et seq.) as amended (PL 100-555; PL 100-588)
- American Indian Religious Freedom Act of 1978 (PL 95-431; 92 Stat. 469; 42 USC 19960
- Native American Graves Protection and Repatriation Act of 1990 (PL 101-601; 104 Stat. 3048; 25 USC 3001)
- Executive Order No. 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, February 11, 1994
- Executive Order No. 13007 – Indian Sacred Sites, May 24, 1996
- Executive Order No. 13084 – Consultation and Coordination with Indian Tribal Governments, May 14, 1998
- Government-to-Government Relations with Native American Tribal Governments (Memorandum signed by President Clinton; April 29, 1994)
- Tribal Consultation and Strengthening Nation-to-Nation Relationships (Memorandum signed by President Biden on January 26, 2021)
- Uniform Standards for Tribal Consultation (Memorandum signed by President Biden on November 30, 2022)
- Order No. 3175 – Departmental Responsibilities for Indian Trust Resources (Section 2 of Reorganization Plan No. 3 of 1950 – 64 Stat. 1262; November 8, 1993)
- USDA Department Regulations 1340-007 and 1350-002
- Joint Secretarial Order on Fulfilling the Trust Responsibility to Indian Tribes in the Stewardship of Federal Lands and Waters (SO 3403)
- Departmental Manual Part 303: Indian Trust Responsibilities, Chapter 7: Standards for Indian Trust Lands Boundary Evidence (303 DM 7)

In the planning area, there is extensive geographic, environmental, historic, economic, social, ethnic, and religious diversity reflected in tribal interests and traditional cultural resources that may be valued by American Indian communities. There is no comprehensive way to define all of the resources on this broad scale, especially where confidentiality is often required.

Known topics of interest or concern to tribal communities with interest in this planning effort include GRSG population and habitat condition, cultural practices related to the GRSG, ethnographic resources (locales and sites, structures, objects, and landscapes assigned cultural significance by traditional users), grazing, and energy or mineral development (BLM and Forest Service 2015). The effects of this planning effort on tribal interests would largely be tied to implementation level actions. The BLM continues to inform and consult with interested federally recognized Native American Tribes as the BLM implements projects. Federally recognized Native American Tribes that are located within or have cultural ties to the planning area are listed in **Table 3-23** (**Appendix 9**).

Traditional cultural resources or properties are places associated with cultural practices or beliefs of a living community. They can be considered a subset of the broader category of cultural resources discussed in **Section 3.16**. Traditional cultural properties are rooted in the community's history and are important in maintaining cultural identity. Examples include natural landscape features, aboriginal title lands, ceremonial and worship places, plant gathering locations, traditional hunting and fishing locations, ancestral archaeological sites, artisan material locations, rock art and communal resources such as community-maintained irrigation systems. The boundaries of these resources and impact areas are often difficult to assess. Resources tied to particular locations and that meet the criteria for eligibility can be listed on the National Register of Historic Places. Some traditional cultural resources have values that do not have a direct property referent and may not manifest themselves by distinguishable physical remains, but still are subject to consideration in planning. It is the continuity of their significance and importance to the maintenance of contemporary traditions that is important.

While many traditional cultural resources are well known, some locations or resources may be privileged information that is restricted to specific practitioners or clans. For Tribes, maintaining confidentiality and customs regarding traditional knowledge may take precedence over identifying and evaluating these resources, resulting in information being unavailable for inclusion in the NEPA analysis.

Resource-gathering areas are a broad category that can include trust assets; treaty and subsistence rights and resources; and culturally significant plants, animals, fish, and minerals. Plant resources can include foods that were established as part of a traditional seasonal round. Examples include traditions of gathering pine nuts, berries, and a variety of seed plants. Other examples include fibers used for basketry and weaving, and wood for building, carving, and fuels. Many plants are gathered for medicinal and religious use. Plant gathering is often a communal activity with cultural and religious significance. Loss of access to these plants or gathering locations, or losing the ability to maintain their habitats, can affect religious and ceremonial uses.

Most Native American Indian Tribes and individual tribal members conceive of spirituality, or sacred sites and daily activities, as interconnected (Forest Service 1997). Many of the resource uses and use areas also have a spiritual or sacred dimension. Sacred sites can also include places that are an expression of belief systems in the land or nature. For some sacred areas, there may be no observable cultural function to an outsider or even to tribal members who have not been entrusted with the information. Locations such as landscape features, mountain tops, trails, water courses, springs, caves, offering areas, shrines, and rock art sites often figure in these groups' oral traditions concerning their origins, mythology, and nature of the world. There are frequently active or ancestral ceremonial locations that are treasured. Archaeological sites, burials, and historic sites are often seen as important ties to ancestors and traditions that are not to be disturbed (Bengston 2003).

Tribal resources would experience trends similar to those experienced by cultural resources. Similar to cultural resources, tribal resources are expected to move away from desired conditions over time unless management actions exist to protect these resources. The status of the local ecosystem, including but not limited to vegetation composition and any wildlife, is integral to many native cultures. Potential changes in local ecosystems associated with effects of climate change may alter the availability of plants, wildlife, or other natural resources for traditional uses.

3.18 LANDS WITH WILDERNESS CHARACTERISTICS

Section 201 of FLPMA requires the BLM to maintain on a continuing basis an inventory of all public lands and their resources and other values. This inventory requirement includes maintaining information regarding wilderness characteristics. Section 202 of FLPMA requires the BLM to rely on resource inventories in the development and revision of land use plans, including inventory information regarding wilderness characteristics. Lands with wilderness characteristics inventories will be updated for any site-specific project NEPA analyses conducted in the planning area to determine if a project will have impacts to lands with wilderness characteristics identified in accordance with BLM Manuals 6310 – Conducting Wilderness Characteristics Inventory on BLM Lands (BLM 2021a) and 6320 – Considering Lands with Wilderness Characteristics in the BLM Land Use Planning Process (BLM 2021b). These revised policies do not address or affect policy related to Congressionally designated Wilderness or existing Wilderness Study Areas (WSA) pending before Congress. The Wilderness Act of 1964 requires the BLM to preserve the wilderness character of each designated wilderness area while FLPMA mandates that BLM manage WSAs so as not to impair their suitability for wilderness preservation until Congress either designates them as wilderness or releases them for other uses. No such statutory authority exists with regard to non-wilderness, non-WSA lands possessing wilderness characteristics. Although lands with wilderness characteristics share the same criteria used to identify wilderness and WSAs, they are not subject to protective requirements prior to a planning or project-level management decision, though consideration for protection opportunities is part of the land use planning process.

3.18.1 Current Conditions

Within the planning area, there are approximately 14,246,000 acres outside of existing designated Wilderness Areas and WSAs the BLM has identified as having wilderness characteristics. Of these lands with wilderness characteristics units, approximately 2,673,600 acres include PHMA, approximately 2,515,700 acres include GHMA, and approximately 88,000 acres include OHMA (**Table 3-24** [**Appendix 9**]).

The portions of the planning area within the state of California contain approximately 2,400 acres of BLM-administered lands that have been inventoried for lands with wilderness characteristics that overlap with GRSG PHMA. The Eagle Lake Field Office and Surprise Field Office in California completed their RMPs in 2008. These field 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 wilderness characteristics identified through previous or updated inventorying.

The portions of the planning area that are within the state of Colorado contain approximately 673,000 acres of BLM-administered lands that have been inventoried for lands with wilderness characteristics that overlap with GRSG habitat, 261,000 in PHMA and 392,000 in GHMA and 20,000 in OHMA. Within the Colorado River Valley Field Office and Grand Junction Field Office, the BLM is currently completing lands with wilderness characteristics inventories but is deferring determinations of management actions for lands with wilderness characteristics until the release of the revised RMPs for those field offices.

The portions of the planning area that are within the state of Idaho contain approximately 417,000 acres of BLM-administered lands that have been inventoried for lands with wilderness characteristics that overlap with GRSG habitat - 283,000 in PHMA, 89,000 in GHMA, and 45,000 in OHMA. The BLM has completed lands with wilderness characteristics inventories in the Bruneau, Jarbidge, Salmon, and Pocatello Field Offices. The Upper Snake Field office has a draft inventory, and partial inventories have been completed in the Owyhee, Shoshone, and Burley Field Offices. The Pocatello Field Office has no lands with wilderness characteristics. The Bruneau, Salmon, Owyhee, Burley, Shoshone, and Jarbidge Field Offices found areas that do contain lands with wilderness characteristics. Currently no Field Offices have taken their lands with wilderness characteristics through a complete planning process to determine how they will be managed.

The portions of the planning area within the state of Montana contain approximately 18,900 acres of BLM-administered lands that have been inventoried for lands with wilderness characteristics that overlap with GRSG habitat, 9,200 in PHMA and 9,700 in GHMA. Currently no field offices have taken their lands with wilderness characteristics through a complete planning process to determine how they will be managed.

Portions of the planning area that are within the state of Nevada contain approximately 167,000 acres of BLM-administered lands that have been inventoried for lands with wilderness characteristics that overlap with GRSG habitat - 87,000 in PHMA, 57,000 in GHMA and 23,000 in OHMA. Seven units were found to possess wilderness characteristics within the Winnemucca District Office during the most recent RMP revision in 2015 and are currently managed to meet multiple use and sustained yield objectives. Within the Battle Mountain, Elko, Ely, and Winnemucca Districts, the BLM is currently completing updated lands with wilderness characteristics inventories. The Carson City District and Southern Nevada District have recently updated inventories for lands with wilderness characteristics. Other than the seven units within the Winnemucca District which have decisions from the 2015 RMP revision how to manage lands with wilderness characteristics, the BLM is deferring determinations of how all other inventoried areas will be managed until updated RMP revision processes are undertaken.

As part of the original FLPMA Section 603-mandated inventories, inventories were conducted for the North Dakota Field Office beginning in 1978. The initial phase of inventories resulted in all lands within North Dakota being dropped from further wilderness consideration (the only solid block of BLM-administered lands within the planning area acres is also a developed oil and gas field).

Portions of the planning area within the state of Oregon contain approximately 3,001,000 acres of BLM-administered lands that have been inventoried for lands with wilderness characteristics that overlap GRSG habitat, 1,360,000 in PHMA and 1,641,000 in GHMA. Eastern Oregon is currently completing lands with wilderness characteristics inventories but is deferring determinations of management actions in the Burns, Lakeview, Prineville, and Vale Field Offices for lands with wilderness characteristics until the release of revised RMPs.

Portions of the planning area within the state of South Dakota contain approximately 73,000 acres of BLM-administered lands within 4 units that have been inventoried for lands with wilderness characteristics. None of these areas were found to possess wilderness characteristics.

Portions of the planning area within the state of Utah contain approximately 986,000 acres of BLM-administered lands that have been inventoried for lands with wilderness characteristics that overlap GRSG habitat. Of these areas, 13 units totaling approximately 52,000 acres are natural areas managed for wilderness characteristics in the Uintah Population area where some land uses are restricted or prohibited under the Vernal RMP. The remaining lands with wilderness characteristics areas that overlap GRSG habitat do not currently have determinations made in an RMP for the specific management of these areas.

Portions of the planning area within the state of Wyoming contain approximately 12,000 acres of BLM-administered lands that have been inventoried for lands with wilderness characteristics that overlap GRSG habitat - all are in GHMA. The Newcastle Field Office has not identified any parcels potentially meeting the 5,000-acre roadless requirement nor have any citizen's groups nominated parcels that may contain wilderness characteristics. Thus, no inventory forms have been produced to date. One unit in the Buffalo Field Office has wilderness characteristics and is currently managed for their protection. Within the Casper Field Office the BLM is currently completing lands with wilderness characteristics inventories, but is deferring determinations of protection for lands with wilderness characteristics until the next RMP revision for those field offices. The Cody and Worland Field Offices identified 45 units for lands with wilderness characteristics, but no specific management for retention of wilderness characteristics was carried forward. Lander Field Office identified 8 potential units for lands with wilderness characteristics, but management was only carried forward for one unit. Kemmerer Field Office, Pinedale Field Office, Rawlins Field Office, and Rock Springs Field Office are not managing the inventoried lands with wilderness characteristic areas in their RMPs for Wilderness Characteristics. However, those inventories are considered and reviewed in all site-specific NEPA analyses.

3.18.2 Trends

As the BLM completes its inventories of wilderness characteristics, 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 an inventory update will be considered in alternatives 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 BLM-administered activities, which will be subject to project-level NEPA analyses.

3.19 Recreation and Visitor Services

The BLM's Recreation and Visitor Services Program manages recreation resources and visitor services to offer the greatest benefits possible to individuals and communities and to better enable communities to achieve their own desired social, economic, and environmental outcomes (BLM 2019a). The planning area offers abundant settings for a wide range of recreational opportunities requiring no permits and no or minimal fees on BLM-administered lands. Most recreation users on BLM-administered lands participate in dispersed recreation activities, including hunting, fishing, camping, biking, hiking, horseback riding, skiing, off-highway vehicle (OHV) use, snowmobiling, rafting/floating, swimming, photography, rock climbing, boating on area lakes and rivers, pleasure driving, and wildlife viewing. Users often participate in these activities individually or in small groups. In parts of the planning area where recreation is a primary resource management consideration, the BLM designates and manages recreation management areas.

The BLM issues permits for a variety of organized activities, such as commercial river permits, big game hunting permits, and permits for organized groups, competitive events, or other types of commercial recreation outfitters such as bike tours. The BLM manages organized, commercial, and competitive recreation activities on BLM-administered lands and related waters with special recreation permits (SRPs). Issuance of an SRP is discretionary, with proposed activities subject to NEPA compliance and mitigation requirements specific to the proposed activity. The BLM may deny a permit request for several reasons, including if an assessment indicates unacceptable impacts, if an approved moratorium or restricted allocation system exists for the proposed activity, location, or timeframe, if there are serious health and safety concerns, or if past performance by an applicant has been deemed unacceptable and problematic.

3.19.1 Trends

Five key drivers are causing changes to recreation in the planning area:

1. Changing public expectations and demand for outdoor recreation opportunities, especially for dispersed recreation (BLM 2019b).
2. Continued growth in the recreation and tourism industries (BLM 2019c).
3. Increased energy development in portions of the planning area, which can lead to potential conflicts with recreation associated with placement and design of industrial infrastructure, concerns regarding visitor safety, as well as noise, smell, and air quality concerns (BLM 2022a).
4. Close proximity of BLM-administered lands to private property, and the growing use of BLM-administered lands as a community-based recreation asset (BLM 2019c).
5. Technological advances, such as all-terrain or utility vehicles and e-bikes, affordable global positioning system (GPS) units, as well as better outdoor equipment and clothing.

These drivers will impact the activity opportunities that can be offered and the recreation experience and opportunities that can be produced by land managers and partners.

3.20 Travel and Transportation

Visitors to BLM-administered lands use roads and trails for a variety of activities involving various modes of travel. Most roads in the planning area are not managed by the BLM. Motorized travel in the planning area ranges from standard passenger vehicles driving on maintained roads to OHVs operating on primitive roads and trails. Transportation routes are mainly concentrated around urban areas or where surface activities, such as mineral extraction, require access. Portions of the planning area are remote and rugged, limiting motorized travel on roads and trails in those areas.

An OHV is any vehicle capable of, or designed for, travel on or immediately over land, water, or other natural terrain. OHVs include dirt motorcycles, dune buggies, jeeps, four-wheel drive vehicles, and snowmobiles (43 CFR Part 8340.0-5(a)). Executive Order 11644 and CFR (43 CFR Part 8340) both require the BLM to designate all BLM lands nationally as open, closed, or limited for OHV use, defined as:

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

3.20.1 Trends

Overall trends in travel management on BLM-administered lands within the planning areas include an increase in OHV use, hiking, and mountain biking as human populations increase within and adjacent to the project boundaries, and throughout GRSG habitats. Many areas currently designated as open to cross-country travel will need to be changed to limited or closed designations to minimize resource impacts in the future.

However, changing areas from OHV to OHV limited or closed may not be possible due to RS 2477 rights associated with existing roads.

Construction of new routes for underground mining and renewable energy projects are also expected to increase as minerals, oil and gas, solar, and wind resource demands increase with energy demands in areas surrounding the project areas. New energy and mining developments will require new roads for transportation of resources. Previously constructed roads may also require upgrading in width and ROW as drilling operations are transported to collection and production facilities. Recreationists will also use these routes even though they are not designed for improved recreational experiences.

Private properties adjacent to BLM-administered lands will likely continue to be subdivided. Subdivision of private property has increased the number of adjacent properties owners and the number of new access routes to public lands within planning zones. This may result in continued unauthorized social trails that are unmanaged and user-created routes that will impact GRSG resources as they cut through habitat. However, the remoteness of many areas within GRSG habitat may be beneficial for these areas as they have not experienced significant changes from travel disturbances.

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